

**SOCIAL SUPPORT, RESILIENCE, SELF-ESTEEM AND MENTAL
HEALTH AMONG OBESE AND NON OBESE**

Thesis Submitted for the Award of the Degree of

DOCTOR OF PHILOSOPHY

in

Psychology

By

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DECLARATION

I, hereby declared that the presented work in the thesis entitled “**Social Support, Resilience, Self-Esteem and Mental Health Among Obese and Non Obese**” in fulfilment of degree of **Doctor of Philosophy (Ph. D.)** is outcome of research work carried out by me under the supervision Dr. Mohammad Amin Wani, working as Assistant Professor Psychology, School of Social Sciences and Languages, Lovely Professional University, Punjab, India. In keeping with general practice of reporting scientific observations, due acknowledgements have been made whenever work described here has been based on findings of another investigator. This work has not been submitted in part or full to any other University or Institute for the award of any degree.



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CERTIFICATE

This is to certify that the work reported in the Ph. D. thesis entitled “**Social Support, Resilience, Self-Esteem And Mental Health Among Obese And Non Obese**” submitted in fulfilment of the requirement for the reward of degree of **Doctor of Philosophy (Ph.D.)** in the Department of Psychology, School of Social Sciences and Languages, is a research work carried out by MOHAMED YOUSUF M.A., Registration No. 41800397, is bonafide record of his original work carried out under my supervision and that no part of thesis has been submitted for any other degree, diploma or equivalent course.



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ABSTRACT

The present research was undertaken to explore social support, psychological resilience, self-esteem and mental health among obese and non-obese. Since, the obesity becomes worldwide health issues due to an excessive amount of unwanted fat deposition in body, and number of studies are conducted to highlight its behavioural and psychological aspects. As a platform to line with same, in present study the researchers aimed to assess social support, resilience, self-esteem and mental health among obese and non-obese people.

This exploratory study has 600 overall population (300 obese and 300 non-obese) selected from urban and rural areas of Kattumannarkoil and Chidambaram taluk of Cuddalore district in Tamil Nadu, India, selected through purposive sampling technique. Measuring tool Multidimensional Perceived Social Support Scale (MDPSS) by Zimet et al (1988), Psychological Resilience Scale (PRS) by Khan & Bhat (2018), Rosenberg's Self-Esteem Scale (RSES) and the Mental Health Inventory (MHI38) by Veit & Ware (1983) were used for assessment. The body mass index of the participants was calculated from their measured weight and height, and demographic sheet contains questions related to their age, gender, family type, location and income status.

The obtained primary data was statistically analysed through SPSS version 26. Kolmogorov-Smirnov test and Shapiro-Wilk test was used to check the normality of the data. For mean differences Mann-Whitney test and Kruskal-Wallis test, for relationships Spearman's rank correlation, and for influences linear regression analysis were used.

The findings showed that high level of social support was more among obese (76%) than non-obese (57%). Similarly, 79% of obese people showed average, above average and high resilience than non-obese (66%). In self-esteem, around 89% of obese people have scored low level of self-esteem in compare with only 73% from non-obese people. Non-obese people have scored 18% in above average, 11% in high and 8% in extremely high level of mental health than obese which was 10% in above average and only 2% in high. Thus, among obese only 6 participants have scored high level of mental health while non-obese it was 57 participants. The significant mean difference is found in social support

among obese and non-obese, Mann-Whitney $U = 36743.5$, Wilcoxon $W = 81893.50$, $Z = -3.940$, $p = .000$ with higher mean rank 328.02 in obese people. Similarly, resilience has showed significant mean difference among obese and non-obese with higher mean rank 332.91 in obese, Mann-Whitney $U = 35277.00$, Wilcoxon $W = 35277.00$, $Z = -4.678$, $p = .000$. But self-esteem have showed there was no significant mean difference among obese and non-obese people, Mann-Whitney $U = 42297.500$, Wilcoxon $W = 87447.500$, $Z = -1.279$, $p = .201$. Whereas, mental health has showed significant mean difference among obese and non-obese with higher mean rank 330.82 in non-obese, Mann-Whitney $U = 35903.500$, Wilcoxon $W = 81053.500$, $Z = -4.286$, $p = .000$.

Results also showed social support, resilience and mental health have significant positive relationship with each other at the level of .001, while self-esteem showed significant negative relationships with social support, resilience and mental health at the level of .001.

Further social support has significant positive influence on mental health among obese, the regression co-efficient $B = .425$, $R = .397$, $R^2 = .158$, adjusted $R^2 = .155$ and $p = .001$ in lesser positive influence than non-obese, the regression co-efficient $B = .667$, $R = .486$, $R^2 = .236$, adjusted $R^2 = .234$ and $p = .001$. Similarly, resilience also showed significant positive influence on mental health among obese, $p = .001$, $R = .422$, $R^2 = .178$, adjusted $R^2 = .173$ and the regression co-efficient $B = .210$ in lesser degree than non-obese, $p = .001$, $R = .539$, $R^2 = .291$, adjusted $R^2 = .286$ and the regression co-efficient $B = .426$. Whereas, Self-esteem showed significant negative influence on mental health among obese, $p = .000$, $R = .434$, $R^2 = .189$, adjusted $R^2 = .180$ and the regression co-efficient $B = -.598$, in lesser degree than non-obese, $p = .000$, $R = .574$, $R^2 = .330$, adjusted $R^2 = .323$ and the regression co-efficient $B = -1.24$. These findings revealed that there is significant positive influence of social support and resilience on mental health, and significant negative influence of self-esteem on mental health among obese and non-obese. The regression co-efficient and co-efficient of determination with social support, resilience and self-esteem on mental health in obese people was much lesser than non-obese people.

The findings also infer that social support with respect to age, gender and income status have showed significant statistical mean difference with p-value .015, .002 and .001 respectively. While family type and location have no significant difference in social support with p-value .473 and .078 respectively. Resilience with respect age, location and income status have showed significant mean difference at level of .001. While gender and family type have no significant difference in resilience with p-value .478 and .215 respectively. Self-esteem with respect to age and income status have showed significant statistical mean difference with p-value .004 and .038 respectively. While gender, family type and location have no significant difference in self-esteem with p-value .169, .712 and .236 respectively. Mental health with respect to location and income status have showed significant statistical mean difference with p-value .001 and .050 respectively. While age, gender and family type have no significant difference in self-esteem with p-value .345, .490 and .061 respectively.

To sum-up it is concluded that obese people showed high social support, high resilience, low self-esteem and low mental health than non-obese people. But, the influence of social support, resilience and self-esteem on mental health lesser degree and less prediction in obese than non-obese. Social support and resilience have showed significant positive influence over mental health, while self-esteem showed significant negative influence over mental health. Social support, resilience, self-esteem and mental health have showed varying degree of mean difference with respect to demographic variable respectively.

Chapter-01

Introduction

People around the world population begin to shift towards urbanisation in which there is a transition from hard physical work to high use of labour free latest technology in all activities of life. In other end, the learning which have been processed in term of one's food behaviour is altered due to availability and rich abundant highly palatable food makes every individual to create their own food policy. In, Biology we see the term “energy balance” in which there is an equilibrium in the energy distribution between the food intake and expenditure within our body where ATP (Adenosine Triphosphate) acts as cellular currency. Our body cells utilise the energy from ATPs which is the principal chemical for storing and transferring energy in cells. The food substance what we consumed are converted into ATP as stored energy substance, glucagon and fats as stored food substance in our body. The stored food substance also produces ATP upon metabolism which can be utilised as energy when our body needed it. Thus, the state at which the number of calories (energy) from consumed food substance equals the number of calories utilised by our body cells is in equilibrium, such state is termed as energy balance which can influenced by various factors such as food intake, physical activities, body size, body stored fat, muscle mass and hereditary influences. When the energy intake through the consumption of food substances is above the energy expenditure through basal metabolic rate, energy utilised by physical activity, and diet-induced thermogenesis shifts energy balance curve into positive as positive energy balance which increases body weight and leads to obesity. Thus, the excessive food substances beyond energy utilised by our body are converted into fat and is stored in adipose tissue which increase body mass. Increase in body mass beyond the standard dimension is termed either overweight or obesity based on body mass index (BMI). Usually, average fat distribution in body differs among women and men. In women it is almost 20% -27% of their body composition and in men it is 15% - 22% (Taylor, 2015). The formula which is used to measure one's body mass value in epidemiological studies is the body mass index where weight of an individual in kilograms divided by the square of the height of the individual in centimetres.

Table 1.1., WHO classification of overweight and obesity

Body Mass Index (BMI)	WHO classification	Common terms
<18.5	Underweight	Thin
18.5–24.9	Healthy weight	Healthy
25.0–29.9	Overweight	Overweight
30.0–34.9	Obesity I	Obese
35.0–39.9	Obesity II	Obese
40 or greater	Obesity III	Morbidly or seriously obese

Courtesy: Hankey and Whelan, (2018).

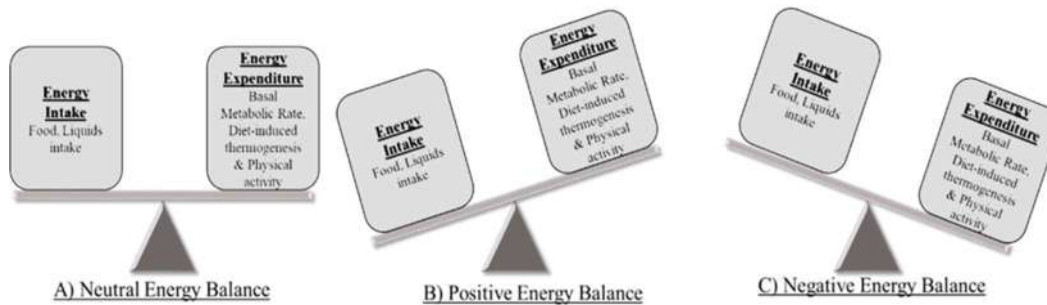
Table 1.1 provides World Health Organisation classification of body weight based on body mass index (Hankey & Whelan, 2018). Technically, obesity is characterized by presence of excessive amount of body fat beyond the normal limit. But, the measuring exact amount of body fatness is practically impossible. Thus, the degree of fat content or adiposity can be measured using body mass index which works on the assumption that weight of an individual on particular height varies in association with body fat (Friedman, 2014). Further, the desirability of our body weight irrespective with amount of body fat, varies based on two criteria, namely attractiveness and healthfulness. Here, attractiveness of an individual affects one's mental health as well as his or her self-esteem. The studies among teenagers revealed that many teenage girls were willing to lose their body weight in order to make them attractive to others. Similarly, one's the health-related perceptions, morbidity and mortality show individual differences among men and women. Individuals with certain weight proportion with their specific height have low prevalence rates with chronic illness and they live longer than others (Sarafino & Smith, 2011).

1.1 Weight and Energy Balance

Energy otherwise termed as calories, the balance in which ratio of calories consumed through eating and drinking to calories utilised by the body cells which plays an important role for maintaining a healthy body weight. There are four types of

macronutrients such as carbohydrate, fat, protein and alcohol which produce energy as calories upon consumption. Comparatively carbohydrate and protein yield less calories (4Kcal/g) than alcohol (7Kcal/g) and fat (9Kcal/g). The energy produced by the food consumed are relayed on the calories produced and the grams of carbohydrate, fat, protein and alcohol in the consumed food substances. The term one calorie defines as the amount of heat, or energy needed to increase one gram of water by 1°C (Paolicelli, 2016). The value of energy from consumed food substances also depends on the degree of absorption occurs in digestive system and the content of nutrient composition of consumed food substance (Brannon *et al.*, 2018). Thus, the energy content of the consumed food substance depends on energy values of food substance and its absorption in digestive system. The weight of an individual is stabilised when there is an energy balance between the calories consumed from consumed food and energy expenditure from the body cells. The daily energy expenditure within our body cells is carried through three phenomenon such as basal metabolic rate (BMR) diet-induced thermogenesis and energy utilised through physical activity. The basal metabolic rate is the amount of energy utilised for body functioning at resting state from breathing, circulation, metabolic, glandular and nervous activity to maintain body state in equilibrium in respective to body temperatures, water level, pH and body chemicals levels. BMR varies based on one's demographic variables such gender, age, location and environment and utilise 60-75% of daily calories expenditure of an individual. The energy utilised in diet-induced thermogenesis (DIT) are through digestion, absorption, transportation and storage of food and it varies based on body environment of an individual and type of diet consumed by an individual. Usually, the energy needed for diet-induced thermogenesis (DIT) for healthy individual with a balanced diet as 10% of the total amount of energy consumed over 24 hours by them. For example, if a person takes 2500 Kcal of energy in 24 hours, then Diet-induced thermogenesis is 250 Kcal. Routine physical activity consumes about 20-30% of the total calorie expenditure which includes both physical activities as in active lifestyle behaviours such as walking, standing, climbing and formal exercise in order to maintain body weight within a neutral energy balance.

Figure 1.1., represents energy balance from energy intake & energy expenditure



Source: Grave *et al.*, (2018).

The energy balance is carried through energy intake and energy expenditure, in which our body weight is adjusted. Our body maintains stable weight through neutral energy balance where energy intake equals with energy expenditure through basal metabolic rate, diet-induced thermogenesis and physical activity as seen in the given figure 1.1 which can be interpreted either as positive energy balance and negative energy balance. In positive energy balance, the energy intake is higher than energy expenditure leads to obesity where unutilized energy and as well as unutilized food substances favour fat deposition. But in negative energy balance, there is inadequate in consumption of energy intake compare to energy expenditure which mobilizes fat storage and decrease body weight (Grave *et al.*, 2018).

Thus, the energy balance follows the first law of thermodynamics in which “energy can be neither created nor destroyed; but, one form of energy can be converted to another form; the total energy within a closed system remains constant”. Generally, if we eat it, we have to burn it or we will store it. Here we have only two options based on first law of thermodynamics, that either energy utilization or energy storage. Based on this interpretation, if our behaviour of increased energy intake and decreased calorie expenditure are as prime learned activity, then the weight gain can be happened as secondary of our behaviours. Here, the behavioural dimension of an individual such as food consumption, individual activity and one’s psychology play to shift his or her own energy balance shift towards positive or negative. Similarly societal as well as environmental phenomenon such as food production, the activity environment with

societal influences also have role in it. These ‘nurture’ circumstances promote one's behaviour towards high energy intake. In other end, the low-calorie expenditure also possible through one's tendency to have minimum physical activity and sedentary lifestyle which in turn leads to positive energy balance shift and weight gain. Beyond 'nurture' interpretation of the first law of thermodynamics in energy balance, it also follows the concept of the ‘nature’ in which our body have tendency to store consumed energy as fat through biochemical forces beyond our control. In such circumstances, we have to eat more, and our energy balance shifts towards positive to gain body weight. Here the weight gain acts as prime goal and minimal physical activity as secondary (Lustig, 2011). The state of positive energy balance created due to lifestyle and behavioural issue of an individual in which genetics, metabolic and hormonal factors act as predisposing contributor in weight gain (Friedman, 2014). In positive energy balance, there is excessive amount of energy intake which induces adipose tissue to grow in either of two ways as increase in number of the cell or increase in size of the adipose cell. But, number of adipose cells are fixed and have set early in life based on genetic factors. When energy intake exceeds expenditure as in positive energy balance will increase size of adipose cell as a protocol for fat deposition. While in negative energy balance, it decreases size of adipose cell through mobilization and broken down of fat molecules as energy in order to equalize negative energy balance in neutral one. So, both nurture as well as nature govern major role in maintaining energy balance with weight gain or weight loss.

1.2 History of Obesity

Several artifacts, which depict obesity were identified across world in Europe especially from southwestern France to Russia in north to the black sea which have showed history related to palaeolithic period approximately 23,000 to 25,000 years ago which have described on obesity with historical ideas about palaeolithic women figures immortalized in sculpture as fatty body appearance (Bray & Bouchard, 2014). Similarly, neolithic period artifacts particularly mother goddess artifacts identified in Turkey showed the pendulous breasts and large abdominogluteal areas with exaggeration of hip and belly. These

representations regarding artifacts from palaeolithic as well as neolithic period revealed documentation related to excessive body fat and presence of obese individuals present in manuscripts and medical text from many ancient civilizations from Mesopotamia to Arab, China and to India (Kopelman *et al.*, 2010). Such, 'bigness' symbolize abundance, rich and wealth of them. But prehistoric human were hunter-gatherers, and the food availability in that period was severely limited. So, the nature favoured them to store their energy as fat. Among rich and famous people in that days had no such worries and they were fed more than normal humans and they also had limited physical activities. Later in neolithic period, beginning of agricultures and establishment of human settlements have been recorded and the gene map from palaeolithic people to neolithic people were also altered based on their environment. These variation in gene mapping is due to evolutionary forces, environmental condition and cultural differences. Body type of palaeolithic worked to store energy as fat for later usage due to limited food availability, because of their nature of work to get food as hunter-gatherer. But, in neolithic period, they showily gathered their food from agriculture in association with animal food. So, the Gene necessary for fat storage varies from palaeolithic to neolithic period. But artifacts related to them symbolize their richness and greatness.

Later, medical tradition among all cultures from Mesopotamian civilization to Egyptian, Chinese, Tibetan, Indian, Meso-American, Greco-Roman, and Arabian civilization have been developed related health and illness. The literature related to obesity had been found in all medical traditions irrespective of geographic regions.

Mesopotamian medicine: This civilization lived area in between the Tigris and Euphrates rivers who had rich sources of medical knowledge from 3000 BC. A terracotta statuette with fat thighs and arms was identified which was dating from elamite period around 1200 BC which revealed representation of obesity through their artifacts. Sumerian physician had more than 120 minerals and 250 herbs such as cannabis, mustard, mandragora and belladonna which can control harm from obesity.

Egyptian medicine: This was in parallel with Mesopotamian one. Various studies about mummies especially Amenophis II and Rameses III, and Queen Henuttawy and Ahmose Inhapy revealed they were obese.

Chinese and Tibetan medicine: They had rich sources of herbal medicines, acupuncture and traditional medical technique. They had medical technique to treat obesity by placing sharp objects in the pinna of the ear to reduce appetite and therapy to treat obesity.

Indian medicine: It was based on medical text from ayurveda, siddha medicine and yoga exercise to shape their body appearance. Ayurveda was Sanskrit text based, while siddha was Tamil text based medical tradition. They had more than 700 medicinal herbs to treat various diseases including obesity.

Meso-American medicine: Prior to Columbus journey to American land, there were three high culture traditions such as Incas, Mayan and Aztecs. Some of them were suffered with various disease including spinal defects, endemic goitres and obesity.

Greco-Roman medicine: Present modern medicine and unani medicine have more influence from Greco-Roman medicine in which the medical texts of Hippocrates mentioned clearly about health hazards related to obesity as "sudden death is more common in those who are naturally fat than in the lean". The famous roman physician Galen identifies two types of obesity namely moderate as natural, and other immoderate as morbid.

Arabic medicine: After the decline of roman power after AD 400, scholarly tradition shifted to Byzantium and to Arabic world. Avicenna, an Arab physician who wrote more than 40 works in medicine and 145 works in philosophy in which he also discussed about obesity.

European culture and tradition slowly reappeared after Arab and Roman tradition due to worldwide trading and travel in association with industrial revolution 'Renaissance' to begin with the scientific medicines after 1500 AD. In 1595, First thesis on obesity were published, and scientific world discovered and differential various topic in obesity through anatomical, biochemical, physiological, genetic, medicinal and surgical aspects, till the introduction of ultrasound for measuring fat thickness were analysed to know regional fat

distribution. Therapeutic and behavioural approach to treat obesity begins from the time of Greek physicians such as Hippocrates and Galen in which diet and exercise as a prime part of the treatment for obese patients like performing hard work before food, their meals should be with sesame, eat only once a day as behavioural approach. Similarly various therapeutic strategies carried to treat obesity were available both in scientific and medical literatures (Bray & Bouchard, 2014).

1.3 Epidemiology of Obesity

Most of human history especially before scientific era documented the state of being fat is obesity as a sign of social status, prosperity and health. Later over a period, the over-consumption of calories rich food substance in association with sedentary lifestyle especially lack of physical activity led to health hazards in the form obesity. The documentations and descriptions about prevalence and epidemiology of obesity was very difficult to know due to various protocol to define obesity in many countries. World Health Organisation (WHO) data facts sheet on obesity and overweight revealed there was an increase in worldwide obesity approximately tripled from 1975. Till 2016, around 1.9 billion adults were in overweight and 650 million were in obese. Nowadays, the world population in many countries where in dangers to die due to obesity than malnutrition problem (WHO, 2021). World Health Organisation classified overweight and obesity based on body mass index (BMI), BMI over 30 and above is considered as obesity, while BMI equals or above 25 is defined as overweight. For the past 50 years there was an increase urbanization as twofold, which changed the dietary pattern of the world population in association with sedentary lifestyle. While, the people in rural regions take their traditional diets with high in grains, fruit and vegetables and low in fat. But those who shifted their residence from rural to urban for the purpose of education, Job and career experiences increase intake of western diet which contains increased amount of sugar, refined grains and fat. Moreover, their lifestyle also become sedentary with diminished physical activities and exercises. In other end, government economic policies also favoured obesogenic environment through food marketing policies and to increase desirability of eating behaviour towards palatable one in order to increase their economic growth (Hansen,

2013). Hedonistic pleasure-seeking tendency of human nature are inherited either from birth or learned as early in life. Since prehistoric man who were our hunter-gatherer ancestors consumes plenty food when they had food to avoid starvation. Now, there is no such threat regarding starvation food scarcity in the world population. Consumption of high calorie food from hunter-gatherer ancestors as evolutionary basis and due to nature of palatability contains high sugar, high salt and high fat. Our food environment in urbanized society favours convenience to take such high calorie food through food vending machines, food courts and fast-food restaurants in location unrelated to food restaurant especially in school, college, hospitals, pharmacies and petrol station (Ayers, 2007).

In world population, the prevalence of obesity is high among countries such as United States, Tunisia, Australia, Saudi Arabia, Canada etc. While it is low in countries such as China, Mali, Japan, Sweden and Brazil (Ogden, 2012). Thus, obesity rates are high in the western countries and low in Asian nations. In most countries, women population are with more obese than man (Sarafino & Smith, 2011). National Health and Nutrition Examination survey (NHANES) data suggested more than 35% of American were in obesity. The majority of the adult in USA are in either overweight or obese leading to use the term 'obesity epidemic'. Minority populations in US have high obesity rate than Hispanic adults (Paolicelli, 2016). The obesity data related to demographic factors such as age, gender, ethnic race, and socio-cultural status also show variations in the obesity prevalence rate. Obesity increases with age till 50 or 60 years. Women population have higher prevalence rate than men especially older than 50 years of age. In industrialized or developed countries, low education and low-income people show higher obesity rate than other. But it is opposite in developing countries where there is increase obesity among educated and high-income people due to new lifestyle towards urbanizations (Kopelman et al., 2010).

In European countries, there was increase in obesity from 13% to 24.9% among men, while in women from 16% to 25.2%. The UK based government's foreign report, namely Tackling obesities future choices (2007) suggested 60% of men and 50% of women in England become obese by 2050. Among black American women who aged 40-59 years

with 58% obese, with 17% above 40 kg/m² and 30% were in overweight. Similarly Mexican American women aged between 40 and 59 years showed 31%, 48% and 8% prevalence rates with respect to overweight, obesity and morbid obesity (BMI above 40 kg/m²) as per data (21). Data from middle east countries showed increasing levels of obesity especially in Iran adults with above 20 years in Tehran city show high prevalence rate in overweight (43% Men, 38% Women) as well as obesity (14% men, 30% women). But it is lower in rural regions of Iran, where only 17% of them in overweight or obesity. Similar rates showed in other middle east countries like Egypt. WHO Global InfoBase Data (2007) 26% Men and 40% Women have obesity in United Arab Emirates, 28% men and 30% women in Kuwait, while in Saudi Arabia it showed 26% men and 74% women. Obesity becomes emerging problem in many African countries due to urbanization in associated with obesogenic lifestyle factors. Among Asian countries, the prevalence of obesity is relatively low and typically less than 10% of adult are affected with obesity. Comparatively Asian population showed higher rate of abdominal (visceral) obesity than general one. China National Nutrition and Health Survey revealed 23% of Chinese adult were in overweight and 7% of them in obese (Williams and Frühbeck, 2008). In southeast Asian countries, the obesity prevalence is high in Malaysia, and two out of three Malaysian are in either overweight or obese due to increase in obesogenic environment (Andoy-Galvan *et al.*, 2020). Usually, the people from Asian origin have high ratio of body fat due to abdominal visceral adipose tissue distribution when compared to white populations. Especially Indian have greater fat distribution in truncal, intra-abdominal and subcutaneous adipose tissue area than white populations which triggers more insulin resistant and increased waist circumference. Thus, Asian Indian have higher risks for weight-related diseases especially diabetes and health complication even at lower body mass indexes (Atri *et al.*, 2020). The prevalence of overweight in India increased to 15.5% from 8.4% among women while obesity 5.1% from 2.2% during period between 1998 and 2015 (Luhar *et al.*, 2020). National Family Health Survey (NFHS) in India conducted mega health survey in association with ministry of health and family welfare as large scale, multi-round survey throughout India since the first survey (NFHS-1) in 1992-93. There was an increase in

overweight and obesity from 12.6% in NFHS-3 (2005-2006) to 20.6% in NFHS-4 (2015-16), with 31.3% in urban area and only 15% in rural area. In gender, datasets showed significant different in overweight and obesity as men was comparatively low and have 26.6% in urban and 14.3 in rural area. Obesity in Indian women population is becoming danger and threat as emerging public health issues. There was an increase in prevalence rate in India from 13.6% in NFHS-3 (2005-06) to 19.75 in NFHS-4 (2015-16) and further 27.3 in NFHS-5 (2019-20).

Table 1.2., *showed overweight and obesity percentage among men and women from various states of India from NFHS-3, NFHS-4 and NFHS-5.*

Overweight & obesity in Indian states	Women			Men		
	NFHS-3 (2005 - 06)	NFHS-4 (2015 -16)	NFHS-5 (2019 -21)	NFHS-3 (2005 -06)	NFHS-4 (2015 -16)	NFHS-5 (2019 -21)
India	14.8	20.6	24.0	12.1	18.9	22.9
Andaman & Nicobar Islands	NA	31.8	38.1	NA	38.2	45.3
Andhra Pradesh	17.7	33.2	36.3	17.7	33.5	31.1
Arunachal Pradesh	10.5	18.8	15.2	10.6	20.6	16.2
Assam	9	13.2	15.2	6.7	12.9	16.2
Bihar	5.3	11.7	15.9	8.5	12.6	14.7
Chandigarh	NA	41.5	44.0	NA	32	34.4
Chhattisgarh	6.7	11.9	14.1	6.5	10.2	14.9
Dadra, Haveli Damu & Din	NA	23.3	26.8	NA	26.3	21.4
Goa	27	33.5	36.1	20.8	32.6	32.6
Gujarat	20.3	23.7	22.6	15.5	19.7	19.9
Haryana	21	21	33.1	14.4	20	28.3
Himachal Pradesh	17.3	28.6	30.4	16	22	30.6
Jammu & Kashmir	22.7	29.3	29.3	8.7	20.5	31.6
Jharkhand	5.9	10.3	30.1	5.3	11.1	30.9

Karnataka	18.1	23.3	38.1	14	22.1	36.4
Kerala	34	32.4	38.1	24.3	28.5	36.4
Lakshadweep	NA	40.6	33.5	NA	24.1	41.3
Ladakh	NA	NA	18.8	NA	NA	28.3
Madhya Pradesh	8.6	13.6	16.6	5.4	10.9	15.6
Maharashtra	17.1	23.4	23.4	15.9	23.8	24.7
Meghalaya	7.1	12.2	11.5	8.2	10.1	13.9
Manipur	17.6	26	34.1	13.4	19.8	30.3
Mizoram	12	21	24.2	16.9	20.9	31.9
Nagaland	8.9	16.2	14.4	8.4	13.9	23.9
NCT-Delhi	32.9	33.5	41.3	24	24.6	38.0
Odisha	7.6	16.5	23.0	6.9	17.2	22.2
Punjab	37.5	31.3	38.8	30.3	27.8	32.2
Pondicherry	NA	36.9	46.2	NA	37.2	43.3
Rajasthan	10.2	14.1	12.9	8.4	13.2	15.0
Sikkim	19.5	26.7	34.7	17.3	34.8	36.3
Tamil Nadu	24.8	30.9	40.4	19.4	28.2	37.0
Telangana	NA	28.6	30.1	NA	24.2	32.3
Tripura	7.8	16	21.5	5.2	15.9	23.4
Uttar Pradesh	11.9	16.5	21.3	9.1	12.5	18.5
Uttarakhand	16	20.4	29.1	11.4	17.7	27.1
West Bengal	12.5	19.9	22.7	6.1	14.2	16.2

Source: National Family Health Survey, India & Ministry of Health and Family Welfare, (2018).

Table 1.2 showed overweight and obesity percentage among men and women from various states of India from NFHS-3, NFHS-4 and NFHS-5. Among women population, it is 14.8 in NFHS-3 (2005-06) to 20.6 in NFHS-4 (2015-16) and further 26.7 in NFHS-5 (2019-20). It is 12.1 in NFHS-3 (2005-06) to 18.9 in NFHS-4 (2015-16) and further 27.8 in NFHS-5 (2019-20) among men population. NFHS-4 data mentioned Nicobar Island showed prevalence of overweight and obesity among men was 38.2% high as compared to

women 31.8%. While in Chandigarh, it was reverse women showed 41.5% high in compared to 32% in men. Prevalence of overweight and obesity was least among women in Bihar (11.7%) and among men in Meghalaya (10.1%). Andaman & Nicobar Island, Andhra Pradesh, Goa, Lakshadweep, Tamil Nadu, Chandigarh, Delhi, Punjab, Kerala, Pondicherry have higher prevalence of overweight and obesity, than mean prevalence of rate of India, while Bihar, Assam, Meghalaya, West Bengal, Chhattisgarh, Jharkhand, Madhya Pradesh and Rajasthan have lower prevalence rate than mean among Indian state.

Table 1.3., showed prevalence obese and non-obese (overweight) from NFHS-5 which have conducted recently (2019-21).

Overweight & obesity in Indian states	NFHS-5 (2019-21) urban		NFHS-5 (2019-21) rural		NFHS-5 (2019-21) overall	
	Men	women	men	women	Men	women
India	29.8	33.2	19.3	19.7	22.9	24.0
Andaman & Nicobar Islands	37	41.7	50.6	35.7	45.3	38.1
Andhra Pradesh	37.7	44.4	28	32.6	31.1	36.3
Arunachal Pradesh	32.4	28.9	26.6	22.9	27.6	23.9
Assam	25.4	23.8	14.5	13.6	16.2	15.2
Bihar	18.7	25.2	13.6	14.2	14.7	15.9
Chandigarh	34.4	43.9	NA	NA	34.4	44.0
Chhattisgarh	22.4	23.1	12.7	11.3	14.9	14.1
Dadra, Haveli Damu & Din	27.6	34	16	20.3	21.4	26.8
Goa	32.5	38.1	32.8	33.1	32.6	36.1
Gujarat	25.6	30.4	15.6	17	19.9	22.6
Haryana	30.2	37.5	27.4	30.9	28.3	33.1
Himachal Pradesh	35.7	38.3	29.8	29.2	30.6	30.4
Jammu & Kashmir	40.8	33.4	28.2	27.9	31.6	29.3
Jharkhand	21.7	21.6	12.8	8.6	15.1	11.9
Karnataka	39.4	37.1	25	25.6	28.5	32.4
Kerala	40.1	40.4	33.2	36.0	36.4	38.1
Lakshadweep	42	34.2	39.4	31	41.3	33.5
Ladakh	43.4	28.5	36.4	28.2	28.3	18.8
Madhya Pradesh	25.7	26.0	12.1	13.0	15.6	16.6
Maharashtra	28.9	29.6	21.3	18.3	24.7	23.4
Meghalaya	30.2	17.9	10.6	9.7	13.9	11.5
Manipur	33.4	39	27.9	31	30.3	34.1

Mizoram	38.3	29.7	24.2	16.9	31.9	24.2
Nagaland	31	17.1	19.8	13	23.9	14.4
NCT-Delhi	37.9	41.2	43.7	44.6	38.0	41.3
Odisha	32.2	40.1	19.7	19.2	22.2	23.0
Punjab	35.2	44.3	30.2	38.8	32.2	38.8
Pondicherry	43.6	47.6	42.5	43.2	43.3	46.2
Rajasthan	19.1	20.6	13.6	10.5	15.0	12.9
Sikkim	40.1	41	33.9	30.8	36.3	34.7
Tamil Nadu	43.1	42.6	31.6	35.4	37.0	40.4
Telangana	40.2	41.7	28.1	23.8	32.3	30.1
Tripura	28.3	29.2	21.4	18.4	23.4	21.5
Uttar Pradesh	24.9	30.6	16.2	18.3	18.5	21.3
Uttarakhand	31.4	39.1	25.0	25.4	27.1	29.1
West Bengal	20	27.9	14.5	20.3	16.2	22.7

Table 2.3 showed prevalence overweight and obesity from NFHS-5 which have conducted recently (2019-20) as phase-I survey includes only 22 Indian states. The prevalence of Overweight and obesity is very high among rural men population of Andaman and Nicobar Islands which 50.6% almost one in two rural island men have either overweight or obesity. Among women population in India, the prevalence of overweight and obesity was highest in urban area of Andhra Pradesh which is 44.4%. These data set revealed the probability to increase one's body weight is shift in energy balance towards positive one due to change in lifestyle factors and obesogenic environment. In India, the overweight and obesity is becoming as epidemic and threats our society. India showed comparatively very less prevalence rate among world population, only 4.4% overweight (43% men, 4.5 Women) and 0.5% obesity (0.3% men, 0.5% women) during 1998, while United States showed approximately 62% overweight 28% obese.

1.4 Causes of the obesity

The energy balance is the key concept in the homeostasis of equilibrium in energy level and body weight. When the energy balance shifted towards positive side as the failure to maintain homeostatic activity of the body which regulate body weight through over eating and sedentary lifestyle results increase in the body weight via fat deposition. The

biology of obesity in which energy balance is moving toward positive one is either nurture or nature, there are numerous questions arising in defining body weight regulating variables (Kopelman *et al.*, 2010). The nature where fat storage and distribution play as prime goal in homeostasis of energy balance favours an increase in energy intake towards positive energy balance, in such cases the heritability of obesity as the genetic tendency to become obese usually plays 40% to 70% a role in causing obesity which can be possible either through genetic factors from ancestor food scarcity tendency or epigenetic factors (Hankey & Whelan, 2018). Around half century before, the "thrifty gene hypothesis" forwarded by Neel (1962) stated about hunter-gatherer population, our genes favour energy storage through decrease energy expenditure to enhance survival in an energy-less environment. But, in current condition, there is no possibility for energy less environment due to presence of calorie rich food and sedentary lifestyle makes us obese and become as worldwide threat as obesity epidemic. This tendency makes our body to store fat beyond emotional control through biochemical forces, which further increase energy intake and decrease energy expenditure to facilitate weight gain. This concept can be understood through biological process which carried through the hormone leptin in which everybody of us has personal threshold for leptin which set genetically through inherited. The state of leptin-replete is featured by high physical activity, minimised appetite and increased emotional feelings towards well-being (Lustig, 2011). Fat cells secrete leptin hormone to regulate body weight and acts as mediator in energy balance for longer period by suppressing food intake and stimulating weight loss. The level of leptin hormone in circulation decreases below normal within 12 hours even before weight loss begins in situation such as caloric limitation and starvation, stimulate ventromedial part of hypothalamus which further decreases release of α -melanocyte stimulating hormone (α -MStt) results lack of anorexigenic pressure through melanocortin-4 receptor and altering pathway of energy balance by sympathetic and parasympathetic nervous activities (Sbraccia & Finer, 2019).

The homeostasis of energy balance through food intake and energy expenditure are mainly regulated by the brain especially from hypothalamic area in association with or

without brain stem, cerebral cortex, and smell and taste areas in the brain. When meal enters into gastro-intestinal system gives signals to release hormone and neuronal activities to perform behavioural and physiological changes in our body. There are two types of pathways are available in the homeostasis of energy balance namely afferent pathways and effector signals. In afferent pathway, vagus nerve plays main role in which hormonal and mechanical signal from gastro-intestinal system stimulate vagal neuron area in central nervous system to favour food intake and regulation of fat distribution. In other end, the homeostasis of energy balance through sympathetic and parasympathetic nervous activities also alters or regulate neuroendocrine systems, hormonal system, autonomic nervous system and behavioural function especially related to feeding and physical activities. These regulations either induce weight loss through fat mobilisation, fatty acid oxidation, increased energy expenditure and diminished energy intake, or stimulate fat storage resulting obesity through diminished energy expenditure, high food intake and favoured fat deposition. Thus, sympathetic activity favours negative energy balance to reduce body weight, and parasympathetic nervous activity create positive energy balance to induce fat deposition (Youdim, 2015).

Adipose tissue where fat deposition takes place as primary function, also secret various biologically active endocrine like substances, termed as adipose tissue-derived cytokines also known as adipokines. These adipokines have wide physiological functions especially in energy balance such as food intake nutrient metabolism, homeostasis, repair, coagulation, blood pressure regulation and cardiac function. Among these adipokines, leptin is identified major adipokines which plays important role in energy balance, and secreted by adipose tissue which have discussed earlier. The circulating level of leptins are dynamic and have circadian rhythm in which it shows peak from midnight to early morning and gets lowest in between noon to early evening irrespective with either the lean or obese people. Serum leptin levels have positive relationship with body fat level and obese persons have high leptin levels than the lean persons. Similarly, women have higher levels of leptins compared to men. Leptin levels in circulation can be regulated by various factors such as insulin, proinflammatory cytokines, glucocorticoids, melatonin, catecholamine,

beta-adrenergic receptor activation and through energy intake. Leptin functions through binding with its receptors (LepRs) in the membrane which found in central nervous system and peripheral tissues like heart, liver, adrenal gland, pancreas and adipose tissue. Leptin receptors (LepRs) have six different isoforms LepRa to LepRf based on alternative splicing in leptin receptor gene. Various gene mutation related to leptin were identified in animal studies reported presence of hyperphagia, obesity, diabetes, infertility and neuroendocrine abnormalities with or without hypo leptinaemia. Ghrelin is also adipokines acting as a potent or exogenic hormone which secreted by the empty stomach. It reaches peak during fasting and low after feeding. It stimulates orexigenic effect (stimulating effect on the appetite) through neural activation in central nervous system especially hypo-thalamus, and acts as mediator in energy balance. It decreases secretion and action of leptin. Similarly, leptin level decrease release of ghrelin to the blood stream (Ahmad & Imam, 2016).

The genetics system has major role in cause and control of many diseases associated with body function. The genetics of obesity plays vital role in regulation of energy balance. It is necessary to study the genetics of obesity to understand hereditary and evolution beyond obesity epidemic situations and to identify genes related to obesity. Weight loss intervention through temporary dietary restriction carried to obese subject in 1950 as an experiment to understand genetics pathogenesis of obesity. The subjects were found short-lived and the intervention seemed to be considered as starvation unlike part of therapeutic measure which revealed presence of genetic component beyond obesity. Further study on obesity resulted around 40% to 70% of obesity were attributed with genetic considerations. In United States within 50 years, there is dramatically increase rate in obesity, shows importance of environment and behavioural factors beyond genetic one. Genetic factor acts as one's personal factor in which parents and grandparents altered gene mapping related to obesity behaved as epigenetic factors. Present environmental factor transfers signals to next generation as genome. The genetic factors of the obesity have influences or relationship over our bio-chemical process which regulate energy balance, such as the energy intake pathway, the energy metabolism and the adipogenesis. Based on the number

of the gene involved, genetics in obesity is considered as monogenic obesity and polygenic obesity. Monogenic obesity is very rare, but severe which have manifested as early as in childhood life. Example, syndromic obesity or mendelian obesity disorder. While polygenic obesity is the most common and present in interaction with factors such as multiple genes, behavioural habits, lifestyle factors and environmental factors. Beyond monogenic and polygenic factors related obesity, the genetic research further goes to new term "epigenesis" in which the expression of the gene based on the genomic imprinting from the parents of origin (Akabas *et al.*, 2012).

Food intake is a way of taking food substance into the body in order to get the energy and various nutrients such as protein, lipids, vitamins, minerals and water for body maintenance and growth. This phenomenon is viewed by the researches in different prospective such as biological, psychological or cultural. There is possibility to create a conflict in which people take food (energy) intake beyond our body requirement to maintain energy balance and growth which is termed as emotional eating where people take food for the purpose of taste, smell, mental well-being, purpose to fulfil societal obligations and cultural rituals, and to influence social, peer, or personal relations. Thus, concisely we can be termed the phenomenon of normal eating as bio-behavioural bridge in which person eats on behave of biological needs as well as his behavioural performances (Hankey & Whelan, 2018). Human beings are neither herbivores nor carnivores, but omnivore in which their eating habits are not biologically or genetically programmed to restricted food type. Based on their biological and psychological desires we plan to take any food substances.

Present obesogenic environment in association with the human omnivores habit are responsible for obesity to become as epidemic in world populations. Even though, the role of genotype persists in causes of obesity, it is either potentiated or alternated by non-genetic factors such as environmental nutritional, metabolic, physical activity, biological, psychological and social factors (Bray & Bouchard, 2014). Many studies carried to determine cause of obesity for last 50 years show the present prevalence of obesity cannot be determined only to sudden genetic changes. But new insights into epigenetics studies

revealed possibility of increased changes in gene mapping due to non-genetic factors as seen in the foresight obesity system map. Many researches numerated various classification to organise non-genetic adipogenicity factors. Here, the researches discussed the causative factors for obesity under three headings, namely global and social factors, personal factors, and behavioural factors.

1.4.1 Global and social factors

Our cultural, religions, societal value related to food and eating behaviour acts as major stimuli in bringing positive energy balance through impact on stimulating food intake, eating practices and lifestyle habits. The following tabular columns represents factors related to global and social one for obesogenic environment which covers food environment, socio-economic status, family structure variation, cultural & societal influences, parenting, community dynamics, healthcare, pregnancy, medications, and non-traditional factors such as environmental xenobiotic chemical (Endocrine descripting chemicals) and gut micro biome. All these factors are in control of governmental as well as societal organisations. The policies related to health and obesogenic environment play major role in causation of obesity and making our energy balance towards positive to gain weight (Steelman & Westman, 2016).

Table 1.4., Obesity: Global and Social Factors.

Main factors	Sub-Factors	Interpretation
<i>Food environment:</i>	Availability of energy-dense foods. Example: soft drinks, cheese, fat products and Sugary foods.	Increase threshold to satisfy their hunger and satiety signals.
	Numerous convenient eating option. Example: delivery options, fast food cafeteria, Food court in malls & theatres, snack & soda machine.	Promoting eating behaviour as non-home cooked meals and increases meal frequencies.

	Presence of food varieties in dining table. Example: combo meal, menu options, & buffy party system.	Option to take more choices of starters, sweets, snacks & other refined food substances.
	Large portion sizes. Example: unlimited food option, and buy one & get one option.	Over consumption of palatable food behaves as similar to adaptation as in drug addiction.
<i>Socio economic status:</i>	Lower income, minority urban neighbourhoods and rural areas.	Have limited or selected access to food choice
☐ Income,	Food insecurity due to low-income favours cheap and processed food.	Buying cheap quality with calorie rich food which leads to obesity
☐ Education,	Healthy families willing to take more nutrient-dense food. Example: fruits, vegetables and whole grains.	They concentrate on nutrient value than calorie one.
☐ Occupation.	High income, people who newly incorporated to western or urban lifestyle.	Consumes modernized food rich with more taste & appearance.
Family structure variations:	Based on family food behaviour in consuming types and amounts of food & beverage. Example: rice product and wheat product	South Indian takes more rice product than north Indians
☐ Cultural & societal influences	Based on habit of interest via smell, taste, and appearance such textures, taste and food combination. Example: Parotta, Pizza, Pongal etc	Based on taste & smell, people consumes and addicts to food

□ Influences from attitude, beliefs and behaviour.

Traditional & Religion factors. Limited access to food
Example: Halal food reduces consumption

Food linked with social interactions. Example: food eating as enjoyment and court in malls & theatres, Street amusement beyond food, social media, delivery survival.
options - Zomato, Swiggy.

Cultural beliefs. Example: Vegetarian people avoid vegetarian meals, beef meat, and taking animal products.
pig (polk) meat Muslim eats only Halal food.

Food with holidays. Example: Holidays & festival can holiday tours, free breakfast, & induce seasonal weight gain unlimited food option.

Media influences. Example: Have greater influence to Food competition, cooking change one's attitude, belief channel, YouTube channel. and behaviour.

Governmental food policy - It plays an important role to Example: allowing processed change attitude & food. tax free organic food, and consumption of food fat taxation. materials.

Parenting:

- Material attributes
- Material attributes
- Feeding practices
- Monitoring activities

Eating more than three times Prone to overweight & Obesity

☐ Family food environmental	Consumption of snacks	Contributes to obesity
☐ Genetic influences	Period of fasting between meals.	More important than composition of food
☐ Family resources	Overweight parent	Change one's attitude
☐ Parental Beliefs	Monitoring activity	increase awareness towards eating habits
☐ Parental attitudes	Sleep quantity & duration	Sound sleep & more duration decreases one's food intake
☐ Parental Practices	Activities such as video gaming, TV matching, smart phone addicts	Increase food intake
☐ Family norms	Parental-role model	influences children behaviour towards eating habits & body image
<i>Community dynamics:</i> - The living & Working conditions Such as,	Population density	Urban life related with lower energy need and have low nutrient value.
	Street connectivity to food access	Poor connectivity needs extra measures such as walking, bus connection to consume desired food.
☐ Urban planning,	Access to Fast food restaurants, and supermarkets	Convenience increases food intake tendencies
☐ Transportation,	Access to parks and recreational factors	Limited access to outdoor entertainment increases food eating habits.

☐ Public safety, and	Public transport system. Example: bus route, bike and care	Have influences on obesity rate
☐ Food industry	School and peer environment	School food policy and peer group food policy have role on food intake
<i>Health care</i>	Abnormal perinatal environments. Example: malnutrition, maternal diabetes	will predispose to getting obesity and diabetes
- Pregnancy	Parental under nutrition or over nutrition	Can induce change in gene expression related to obesity
	Gestational weight gain	Associated with obesity to offspring after three years
	Low birth weight foetus	Can prone to obesity at later life
	Developmental abnormalities	Predispose to obesity
	Maternal smoking	Associated with increased risk for obesity in childhood and adult
- Medications	Anti-psychotics Anti-depressants Anti-epileptic drug	Acts as iatrogenic or secondary factors in aetiology of obesity.
☐ Psychotropic drug	Mood stabiliser	
☐ Steroid hormones		
☐ Anti-diabetes agents		
☐ Antihistamine	steroid such as corticosteroids and contraceptive pills	induce obesity

□ Antihypertensive	Insulin	Cause obesity if consume high dose for long duration.
	Sulphonyureas	
	Loratadine	
	Alpha & Beta-blocker	
	Calcium channel blocker	
<i>Non-Traditional factors</i>	Climate change such humidity, increase temperature	To maintain body temperature body utilise certain amount of calories and alters metabolic rate
	Reduced sleep time	• Decreases leptin secretion, • Increases ghrephin, cortisol through sympathetic action • Delays night time secretion of growth hormone may alter circadian system • Increases hunger and uncontrolled & emotional eating due to decreased cognitive restrains
<i>Environmental Xenobiotic chemicals</i>	Environmental xenobiotic chemicals i.e., endocrine disruptive chemicals (EDCs)	• It disrupts endocrine system results to obesity and fertility issues. • Increase the number of Fat cells by altering BMR. • Mimic or block hormonal actions.
	Synthetic organic compounds,	
	□ Pesticides,	

	☐ Diethylstilbestrol, ☐ Bisphenol-A ☐ Phthalalates ☐ Dioxims ☐ Natural Phytoestrogens ☐ Some solvents ☐ Heavy metals Teflon. ☐ Food and food additives - Example, Monosodium glutamate Smoking & Smoking cessation	• Modifying epigenome and alters sympathetic nervous system activity • Stimulate inappropriate storage of fat in liver. • Disrupt some epigenetic structural & functional mechanism in energy balance. • Nicotine has both thermogenic & appetite suppression effect. • Has anti-estrogenic effects
Gut Micro-biome	Gut microorganism population. • Bacteroides • Firmicutes • Lactobacillus	• Can possible through changes in diet. • Important to food digestion, metabolism, regulation of energy balance and immune-modulation.

1.4.2 Personal Factors

Beyond global and social factors through societal interaction and politics related food environment and food behaviour, one's personal factors such as genetic influences, age, sex, race, ethnicity, biological circadian system, hormonal, biological pathways, psychological consideration, eating pattern, inflammatory condition and infections play major role in regulation of energy balance and induce fat deposition which shifts energy towards positive energy balance ends obesity. The following tabular column includes various sub-factors and interpretations related to one's personal factor.

Table 1.5., Obesity: Personal and Psychological Factors.

Main Factor	Sub Factors	Interpretations
<u>Genetic:</u>		
Polygenic Obesity:	1. Metabolism:	Here, gene mapping related to metabolism, feeding behaviours, pattern of fat storage and basal metabolic rate of lipolysis and oxidation acted in such a way shift energy balance towards positive to gain weight
- Biological pathway linked with genetics influences 40% to 70% contribution, - Risk of extreme obesity (BMI 45) - Associated with environmental factors	- Resting metabolic rate - Thermic effect of food - Energy use - Energy output - Energy tolerance - Sedentary lifestyles	
- Epigenesis - Genome-wide Association studies (GWAS) identifies around 141 suggestion loci for obesity	2. Feeding behaviour: - Appetite (hunger satiety) - Calorie intake 3. Pattern of fat storage: - Lipoprotein lipase activities	

- Hepatic lipogenesis

4. Basal rate of lipolysis & Oxidation

Monogenic obesity	Gene mutation Autosomal dominants	Conditions like achondroplasia, Albright hereditary osteodystrophy, Angel man syndrome, Insulin resistance syndrome
	Autosomal recessive	Alstrom-Hallgren, Cohen, Fanconi-Bickel syndrome...etc.

Biological factors:

1) Age	Young	Early maturation induce risk for obesity
	Middle aged	Increasing age with obesity in association & other factors
	Old Aged	As age become more than 65 years, the optional BMI is higher than younger one.

2) Sex	Onset of menarche	Early menarche risks for obesity, and vice versa
	Hormonal difference	Women prone to obese than men due to hormonal influences
	Menopause	Change in body weight
3) Race and Ethnicity	Race & Ethnicity, - food related beliefs, preference	African American gets more obese than European-American
4) Circadian system	Biological rhythm.	Disruption in circadian rhythm by light, work shift, food timing, social contact, physical Activity and sleep deprivation affects adipokines secretion such as leptin, adipsin, adiponectin...etc
	Round clock Body Activities 10% to 30% under the Genetic control	
5) Hormonal imbalance & Biological pathways	Thyroid: Low Tri-iodothyroidism, Hypothyroidism	Low T3 with aging & weight reduction. In low thyroid hormone low BMR & weight gain
	Growth Hormone deficiency	Decrease in Height increased visceral fat mass
	Testosterone - Hypogonadism	Predispose to central weight gain
	Estrogenic imbalance	Disturbs energy balance and lipid metabolism

leptin: leptin resistant, central leptin insufficiency	Susceptibility to weight gain, Decreased energy & expenditures
Ghrelin -imbalance	Due to diet-induced weight loss and sleep deprivation.
Cushing's disease -Increased ACTH	elevates cortisol, and weight pain
Polycystic ovarian syndrome (PCOS)	associated with central obesity, insulin resistance, hyper insulinemia & diabetes
Metabolic syndrome	Predispose to thruncal obesity & diabetes
Central melanocortin	-involved in energy balance. via leptin, ghrelin & Agouti-related protein
PPAR (Peroxisome proliferator-activated receptor)-Disrupt	plays important role in pathogenesis of obesity
Peripheral satiety signallers lipoprotein lipase	- stomach stretch receptor Fat-storage enzyme stimulated by testosterone
peptides that stimulate appetite	via neuropeptide y, melanin-concentrating hormone, ovexin A/B, Galanin
Hypothalamus -through structural damage	cause obesity

	-Affect by emotion through depression	stimulates the hypothalamic appetite centres to increase food intake
	-Hunger-increasing neuropeptides opioids	Increased (or) Released with respect to intake of highly palatable food that stimulates appetite
	-Hunger increasing neuropeptides Dopamine	Decreased indolamines D ₂ receptors induce eating
	Adipocytes & Adipokines, - Abnormal deposition of fat deposit Example, Adiponectin,	Causes increased insulin sensitivity & decreased TNF-alpha. It decreased in obesity and affects metabolic functions of fat cells, Substances tissues & intra-abdominal viscera
<u>Psychological Factors:</u>		
Psychological considerations,	- Restraint Dis-inhibition	- Due to gene-environment interaction
Behavioural expression - cause excessive food intake altered body image depression	-Failure to control overeating	-results consumption of energy
	-emotional eating -stress eating	-dense, nutrient-poor foods
	Abuse -either emotional physical sexual	results stress eating & protection against unwanted sexual attention

Eating patterns & Disorders	Binge eating disorder	Consumption of large amount of food within two hrs.
	Bulimia nervosa	Remove excessive food intake via vomiting
	Night eating syndrome	Abnormally increased food intake in the evening & Night times
Other Factors		
Inflammatory state	Mild state of inflammation Adipocyte hyperplasia & hypertrophy	Cause to stimulate weight gain Weight gain through energy fat cells
Infectious origin	SMAM-1 (Arian adenovirus)	cause fat deposition in chickens, have some association with human
	Adenovirus-36	obesity, Suspected
	Chlamydia Pneumonia	infections agent causing
	Selenomonas hoxia	obesity
	Herpes Simplex Gut microflora	

1.4.3 Behavioural Factors

Behavioural related to dietary intake, daily energy expenditure, and physical inactivity disturbs our energy balance equilibrium and can cause obesity. Actually, Healthy lifestyle can nullify or prevent the genetic predisposition to obesity. The global and social factor is under governmental or societal control, while personal factor is based on one's physical and biological as well as psychological nature. The behavioural factor works based on our behaviour through which we prone to weight gain as in positive energy balance. Similarly, we can alter our behaviour in controlling weight gain or make energy

balance curve towards negative side to reduce or prevent obesity. Apart from medical or surgical intervention to prevent or treat obesity, we can prevent or minimize our body weight to normal one through one's behaviour modification related to dietary intake, daily energy expenditure and physical activity. Previously, our excessive body weight or obesity makes issues due to our belly than brain. But, present situations, it is considered as problem in neurobiology as well as disruption in neuronal signal mechanism which can modify or alter by cognition and behavior. Even though there are numerous development in modern medicine, we cannot solely cure or treat obesity as such with biology. Our behavior pattern acts main role in controlling our energy balance as neutral one. The following table explains sub-factor involved in behavioural factors.

Table 1.6., Obesity: Behavioural Factors.

Main Factors	Sub-Factors	Interpretations
<u>Energy Intake</u>		
- Dietary (or) Nutrition intake - - Even small extra calorie as low as 100 calorie per day also cause obesity over time.	Rate of eating	Decreased Biting or mastication in quiet eater, inactive neutral histamine which suppresses physiological food intake
	Time of eating - Importance Breakfast	Skipping breakfast leads to weight gain. While eating breakfast regularly protect weight gain. High carbohydrates & protein in breakfast prevent weight gain
	Time of eating – Chrononutrition	Feeding time affects body weight usual feeding disrupt circadian rhythm sodium ethanol & caffeine alter circadian rhythms.

Type of intake - Sugar sweetened beverages	Associated with weight gain
Taking Food with micronutrients	Low calcium intake promote fat storage Excess vitamin triggers Niacin stimulate appetite
Dietary Factors. -High energy density, -Sugared Beverages and habitual intake of fast food	Associated with Higher BMI
Dietary Factors, - Complex Carbohydrates, High fibers, Fruit & Veg	Associated with lower BMI

Energy Expenditure:

Daily energy expenditure	Physical Activity	It alternate the genetic influence to obesity Genetic predisposition to weight gain can & altered by PA & lifestyle
	Basal Metabolic Rate (Resting Metabolic Rate)	Based on lean body mass low Thyroid hormone reduces BMR
	Thermic effect of food	Energy used for digestion, absorption, & Metabolism of nutrients.
	Non-energy activity & thermogenesis (NEAT)	Low NEAT leads to weight gain low Neat is due to laser saving works.
Physical inactivity	Excessive setting, sedentary lifestyles	Associated with obesity & diabetes

1.5 Health Hazards of Obesity

The prevalence rates of the obesity in global population are threatening us as major health problem for future generation. Even if it considered as just cosmetic issue, then consequences are only social stigma. The feeling of ridiculous, discrimination and prejudice in all social interaction level in health care environment also burden our psychological and mental status which further cause diseases in association with other chronic illness such as diabetes, cardio-vascular problem and obesity related cancers. Apart from these social and mental health issues, the average health-care cost utilized by obese individual is 30% higher than normal weight person (Youdim, 2015). These increase in medical expenditure itself revealed health status of obesity. Thus, some medical professions termed obesity as “adiposities multiangled malady”, in which there is combination of pathogenesis such as hypertension, dyslipidaemia, hyperlipidaemia, sleep apnoea, cardio-vascular pulmonary problems, diabetes mellitus and cancer (Kutty & Elengoe, 2021). It is associated with gallbladder disease, Osteoarthritis, hyperuricemia, gout and infertility. Primarily the adipose tissue stores energy as triglyceride when there is positive energy balance in which energy intake is greater than energy expenditure. If it is negative energy balance, same adipose tissue releases free fatty acids for energy utilization. In addition to these fat mobilisation function, adipose tissue produced number of substances which can act as adipokine which have paracrine and /or endocrine type of activity as hormonal, biochemical and anti-inflammatory substances, so such substances are collectively, termed as adipokines. Example, leptin, resistin, adiponectin, interleukin, Tumour Necrosis Factor (TNF)- α , angiotensin II etc. The following tabular contains lists of various disease which can possible as consequences of obesity based on our body system.

Table 1.7., Health Hazards of Obesity

System	Diseases	Descriptions
Metabolic	Type 2 Diabetes	Develops as result of insulin resistance or pancreatic beta cell dysfunction. 80 to 95% of DM2 are obese (Steelman & Westman,

		2016). Further, medication for diabetes, produce weight gain.
	Dyslipidaemia	Increase in triglyceride High LDL cholesterol low HDL cholesterol (This condition can be atherogenic) due to abnormal lipoprotein metabolism and over production of LDL cholesterol
	Gout	It is the state of hyperuricemia produce painful swollen knee joint and Muscular pain
Cardiovascular	Hypertension	Strongly related with obesity, it is 6 times more prevalence in over weight and obese individuals, it is due to increased sympathetic activity. Hyperlipidaemia and lipid regulation of angiotensin II receptors
	Cardiac Failure	Physiological functions behind cardiac failure are multifactorial such as increased cardiac work, insulin resistance, diabetes sleep apnea& hypertension associated with cardiac rhythm abnormalities
	Coronary artery disease	It is 3.3 times greater risk among women with BMI higher than 29. Dyslipidaemia acts as risk factor in developing atherosclerosis and angina attack (Youdim, 2015).
	Stroke	The risk of ischemic stroke can possible among obese
Cancers	Breast cancer	30% higher risk, especially increased risk of postmenopausal breast cancer.

	Prostate cancer	The risk for prostate cancer is there with increasing BMI among men
	Colorectal cancer	Studies revealed chance of getting non-metastatic colorectal cancer with high BMI greater than 30
	Endometrial cancer	Less aggressive type, not like prostate one. Endometrial carcinoma with morbid obese (BMI 40kg/m ²) have high risk for death
Gastrointestinal	Fatty liver Disease	It is strongly associated with obesity, Excess fat causes insulin resistance and inflammatory signals in which pancreas secretes excessive insulin favours further fat deposition.
	Gall-bladder disease	Being overweight or having obesity may make you more likely to develop gallstones, especially if you are a woman.
	Gastro-Oesophageal reflex	It is due to excess belly fat which gives pressure on the stomach, to causes the backflow of acid
Respiratory	Obstructive-sleep apnoea	it has positive correlation with obesity. As BMI increases, fat deposits in the upper respiratory tract which narrow the airway; resulting in sleep apnoea
	Hypoventilation syndrome	it is a breathing disorder, commonly seen in obesity in which blood contains more carbon dioxide and less oxygen.
Renal	Obesity-related Glomerulopathy	it is a type of metabolic disease caused secondary to obesity.

	Chronic renal failure	Obesity is associated with increased risks for chronic renal failure.
Endocrine	Polycystic ovarian syndrome	Obesity is most common finding among the person with PCOS and 40–80% of women are reported to be overweight or obese.
	Infertility	Overweight and obese women have high risk for infertility issue.
Musculoskeletal	Osteoarthritis	Osteoarthritis (OA) is a disabling degenerative joint disorder with pain. It has linear correlation with obesity.
Psychological	Mental Health Disorder, especially Depression and other psychological disorder.	Many studies have showed positive relationships between obesity and various mental health issues, including depression, eating disorders, anxiety, and substance abuse which impacts one's quality of life, with increased social stigma and discrimination due to their weight

1.6 Psychological burdens of obesity

The health hazards of the obesity result as the consequences of energy balance between energy intake and energy expenditures in which positive energy balance leads to obesity. We have already discussed the health consequences of obesity which are mainly due to fat distribution and their abnormality. The attractiveness of our body i.e., body image and the health related to obesity cause psychological distress and burdens. The focus to control energy balance in our body is multi-dimensional include toxic food environment, present physical neighbourhoods, genetic predisposition, our physiological mechanisms and our psychological status (Buckroyd & Rother, 2008). Each dimension in energy balance have control over other. The Foresight Programme by United Kingdom Government Office for science framed conceptual Model using 108 variables as the

"Obesity System map", in which more than 300 correlation relationship either positive and negative were described in which seven principal dimensions represented as Biology (Genetic & Physiology), Food behaviors, Food environment, Physical Activity behaviour, Activity environment, individual psychology and societal influences (Gill, 2015). The psychological distress and psychological wellbeing have bidirectional relationship with obesity.

Our psychological status such as anxiety, depression, emotional instability, negative affect, low self-esteem and low psychological resilience have ability to disturbance in energy balance and cause obesity. Similarly, the obesity has psychological consequences such low self-esteem, anxiety, depressions, social stigma, low perceived social support and eating disorder such as binge eating, bulimia and anorexia. The psychological burdens which resulted due to overweight and obesity, can cause further psychological distress lead increase body weight through positive energy balance by over consumption of food intake and decreased physical activity in the form of sedentary lifestyles. Body image or body attractiveness often feels as dissatisfaction due to their body weight or body shape. This dissatisfaction has linked with behavioural changes such as dieting, skipping meals self-induced vomiting and fasting in association with low-self-esteem and depression. As a consequence, there is an increased chance for coping strategies difficulties such as low psychological resilience, low perceived social support, low self-esteem and poor mental health in changing behaviour in association to obesity either related to energy intake or related to physical activity. Many review studies suggested the presence of 20% - 60% of obese individuals perceive psychological burdens such as depression, anxiety, eating disorder, substance abuse, low self-esteem, poor quality of life, social stigma and discrimination, sexual abuse, physical abuse and emotional neglect. Depression has bidirectional relationship with the obesity, especially women have stronger relationship than men. It is due to experiences of social stigma and discrimination. The person with obesity undergoes anxiety while infertility treatment, or any other medical and surgical procedure. Disordered eating is very common among people with overweight and obesity. Many of them in weight loss intervention program revealed their problem with emotional

eating or binge eating. The loss of behavioural as well as emotional control is main reason behind emotional eating or binge eating behaviour. They have difficulty in controlling the frequencies of their eating, food type, portion etc. Usually overweight and obesity can affect one's self-esteem and have difficulty to recognize or estimate their own talent and abilities in controlling their body weight. The main health hazards of obesity is psychological which further burdens their health-related quality of life. Many studies reported that there was negative relationship between body weight and quality of life (Fontaine & Barofsky, 2001). Similarly, body dissatisfaction has negative correlation with body weight (Kolotkin *et al.*, 2001). Person with obesity have decrease tendency to attend function related social interaction such as parties and social gatherings. Obese women are less willingness to get marry and have low earnings compared to normal weight women (Sarwer *et al.*, 2008). The obese individual has possibility to get high occurrence of sexual abuse, verbal abuse, physical abuse and emotional neglect in association with anxiety separation issue, divorce, substance abuse or other family dysfunction (Sarwer & Polonsky, 2016). The obese women have significantly lower mean for self-efficiency and more external barrier in performing physical activity compared to overweight women (Al-Otaibi, 2013). Risk for metabolic syndrome, weight underestimation, depression and low self-esteem are characteristic features among the individual with central obesity (Kassier *et al.*, 2019). In obesity, there is disruption in the hypothalamic pituitary adrenal axis (HPA axis) in association with immune system plays major role in causation of mental health problem especially depressive disorder (de Wit *et al.*, 2010). Gender role in obesity also plays significant role in mental health issues. Obese female has high rate of getting depression (70%) than obese male (30%). Thus, mental health issue among women affects twice than men (Patankar, 2013). Coping strategies especially psychological resilience are helpful in controlling emotional eating or binge eating, But the obese individual has low psychological resilience and high social stigma than non-obese (Andrews *et al.*, 2011). Social stigma due to weight issue have associated with negative and psychological health problems which further lead to poor health behaviour such as disordered eating, mental health issues, decreased physical activity, stress-related illness, low health-related quality

of life and insufficient utilization of healthcare facilities (Brochu *et al.*, 2018). Psychological resilience has close relationship with the weight of an individual. Extremely lower BMI and extremely higher BMI individuals have poorer in psychological flexibility level as well as psychological resilience (Ciarrochi *et al.*, 2014).

1.6.1 Social support

The main causation in the aetiology of obesity is due to behavioural and psychological issue behind the predisposing factors such as genetic and biology. The genetic and biological causes of obesity can be modified through behavioural intervention which have seen in epigenetic study. Here, as a part of obesity study, the social support acts as one of controlling or contributing factor in development of obesity as well as in management of obesity. Social support refers to support available from social environment such as family, friend and significant person. In short, it defines as one's perception of care and support from family, friend and significant person. Social supports have positive influence over one's behavioural practices and mental health. Social support has two dimensions based on theoretical prospects namely structural (social network size & interaction frequency), and functional (emotional & instrumental) (Ozbay *et al.*, 2008). Social support plays as contributing factors in both physical and mental illness. The relations between social support and behavioural issues were studied and postulated even one century years ago by Durkheim in his book "suicide" during 1897 (Gofman, 2014). Albrecht and Adelman (1984) defined social support as the interaction carried between receiver and supporter through either verbal and non-verbal decrease unwanted consequences of stress situation as well as produce ability to gain self-control over one's personal experience. Social support makes one's psychological state as safe, respectable, valued, and competent to participate in performing behavioural acts related to his/her wellbeing (Lam, 2019). The social support system includes three level in social environment such as community level, the social relation, and intimate relationship (Lin, 1986). The behavioural processes related to body weight derive from a set of universal potentials like neuro-psychological mechanisms of one's emotion and cognition, cultural

interpretations, and experiences in terms of self-stigma, and support structure present in neighbourhood environment (McDonnell, 2014).

The functions of social support attachment between person with respected person or group are to promote one's emotional stability, assist in learning new skills and give feedback about his/her performance and identity (Lam, 2019). Cobb (1976), mentioned the support elements in social support as emotional support (care for love and affection), esteem support (considered as esteemed and valued) and network support (mutual optimum interactions). Gottlieb (1978), divided social support as four type such as emotionally related, problem-solving, personal influence and environmental action. The tendency of one's behaviour to be acted either autonomy and independence, are two opposite elements against support structure, where autonomy refers to interpersonal ability to act as self-orientation, while independence defines as not to get any help, support, or guidance for any interpersonal issue. Here, the opposite of independence is dependence which needs social support. But, the opposite of autonomy is being controlled, and not dependence. The support structure in social support is further controlled by one's individual factors. Even though there are many intrapersonal element or abilities to strengthen their behaviour, the social support acts itself to promote or enhance their behaviour if they perceived it in affirmative way. The support structures in social support are as emotional, esteemed or valued and optimum interaction. These structures get in role to enhance or promote one's behavioural based on the support perception which works based on appraisal of the support structure. Such appraisal is termed as perceived social support or subjective perception of social support (Pierce et al., 1997). Few studies documented to explain the power of support structure in stability of one's health status for a period in minimizing negative consequences of healthy status and act as preventive measures in getting illness especially obesity (Roy, 2011).

The relationship between social factors and health of an individual were discussed analytically starting from century by Emile Durkheim as relationship between social tie and mortality. George Engel who was one founders of American psychosomatic society, proposed "Bio-Psychosocial Model" in 1977 as importance of social factors in health and

illness. Simultaneously, Cobb (1976) to relate social support and health and Cassell (1976) to review biological prospecting of social support to strengthen the bio-psychosocial model. In 1985, Cohen and Wills found support structure in social system have health-enhancing effects. James House (1988) reviewed an article under topic "Social relationships and Health" and indicated social structure have independent protective effect on disease consequences and the mortality. Thus, the social support compromise behaviour enhancing action to prevent health problems includes obesity, diabetes and cardio-vascular disease (Uchino, 2004). World Health Organisation (WHO) stated the definition for health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. It defines importance of social structure for optimum health status. Cohen, Gottlieb and Underwood, (2000), designed the pathways in which social relationships have impact on health promoting behaviour such dieting and physical exercise through social influence, social service provided, information gathered from social environment and psychological state perceived from social relationship. The psychological states such as worry, sad, depression guilty, or inferiority causes neuro-endocrine disturbance in body equilibrium. Neuro-endo disturbance in association with health behaviour & social relationships can cause physical disease, and neuro-endo disturbance with one's psychological state also cause mental health disorder (Cohen *et al.*, 2000). Social support has mediating effect on physical activity (Cohen *et al.*, 2000; Trost *et al.*, 2003; & Brunet *et al.*, 2014) and health-promoting behaviour (Pender, 2011; & Cho *et al.*, 2013). Social support minimizes peer victimization to prevent mental health illness (Lim, 2018), and stabilize emotional adjustment (Reid *et al.*, 1989; & Graetz, 2000). Smith *et al.*, (2020), stated influences of social networks to obesity under three processes namely shared environment, social selection and social influence. In order to prevent weight gain even after surgical procedure (Bariatric surgery) social support structure is highly recommended to stabilize their health behaviour (Tolvanen *et al.*, 2020). The study conducted by Yoshida *et al.*, (2020) revealed that the social support minimizes negative consequence of obesity. Pender et al (2006) postulated Health Promotion model in which interpersonal and social factors play main role in enhancing health behaviour. The support structure in social

support includes tangible and intangible help and guidance from friends, family member and from any significant special person, which act as important contribution in controlling chronic disease especially obesity and other cardio vascular disease, and also helpful in enhancing health related behaviour and adherence towards medical treatment as well in obesity prevention (Brannon *et al.*, 2018). Thus, social support has hypothetically high correlation with health and illness. Here, in this study, the researcher considered social support especially perceived social support from friends, family members or special person have taken as an independent variable to analysis correlation and mean difference among obese and non-obese with respective to demographic variables such as gender, age, location, family type and socio-economic states.

1.6.2 Resilience

The fundamental psychological ideas present in prevention of illness and disease beyond medicinal resources are how to manage challenges, how to protect vulnerabilities and how to increase own resources against illness and disease. We are not getting our life as planned like in route map, but it has lot of twists & turns from daily hassles to stressful events. Nothing is happening as expected, but few things are passing like the thunderstorm without any predictions. The only word in which we can manage challenges in life, can protect, can reduce consequences from any threat and increase our resources against illness is resilience. Many psychologists define it as the process of adapting us comfortability against tragedy, trauma and threats. In short, it is the ability to bounce in to normal with new skills and resources or "bounce back from adversity". Usually, resilient person contain three characteristic features such as accepting reality without hesitation, strong beliefs on life with values and meaningful and have peculiar talents to improvise the situations (Goleman *et al.*, 2017). The definition for resilience by Bonanno (2012) as "a stable trajectory of healthy functioning in response to a clearly defined event". The factors which contributing to resilience are one's education, income and his or her social networks (Abraham *et al.*, 2017). Resilience have coping strategies which adapt challenging situations lead to strong physical & mental health (Gurung, 2019).

The senses of purpose, humour, and coherence related to his/her life, trust with others and religious belief are available resources which can enhance one's resilience and coping skills (Taylor, 2015). The benefits present behind increasing one's resilience are, minimize psychological distress, reduce difficulties arise from medical and functional problems and promote optimum wellbeing through mastery and growth. In the resilience model, the brain acts as computer (Hardware), while resilience acts as software or programming which have various skills fall under fine categories, namely regulating arousal, managing negative emotions, increasing happiness, coping strategies, and preparing it for adverse situations (Schiraldi, 2017). The American Psychological Association (2012) listed few types to enhance resilience such as social connection, ignoring crises, accepting changes have goal, carrying proper action plan, maintain positive hope and take care about self.

The psychological resilience with social support act as buffering action against stress and illness (Celik *et al.*, 2021). The study conducted by Foster and Weinstein (2018) revealed resilience especially emotional acted as protective factor to prevent obesity among children irrespective to socio economic status. Another study among Chinese centenarian stated high resilient centenarians have low mortality rate and better health (Gu & Feng, 2016). Lutz et al (2016) carried study among young adults where resilience has positive correlation with adherence to the dietary behaviour. Many studies conducted by various researcher revealed psychological resilience had positive correlation with health-related quality of life (Mohlin *et al.*, 2021). The psychological resilience has significantly low-positive relationship with physical activity (Seçer & Çakmak yıldızhan, 2020). An exploratory study to access the role of resilience in food behaviour during covid-19 pandemic times revealed the people with high resilience have scored higher value in dietary guideline adherence index (Spinosa *et al.*, 2019). Psychological resilience acts contributing or controlling role in link between socio-economic and health outcomes so, psychological resilience plays as a preventive factor for obesity in controlling eating behaviours (Williamson *et al.*, 2021).

1.6.3 Self-esteem

Being as human we have ability to judge predict or evaluate things around us with respect to our own. The overall opinion about ourselves that how we feel about our capabilities, and weakness, is collectively termed as self-esteem. If we have low self-esteem, we always think negative about ourselves, and unworthy. But, in another way if we have, healthy self-esteem, we feel good ourselves and see ourselves as respective person in the society. So, self-esteem acts as essence of optimum psychological survival and central to positive mental health and physical well-being. Low self-esteem distresses our mental health which can lead to anxiety, depression, and psychosomatic issues, creating unhappy relationships, eating disorder, social difficulties, poor academic performance, alcohol abuse, substance abuse, and sensitivity to criticism (Schiraldi & Ebrary, 2001). Social scientists define self-esteem in various prospective such as one's competence to manage achievement which is meaningful, one's attitude or feeling of worth i.e., worthiness about himself or herself, and the relationships between these two factors (Mruk, 2013). The word "esteem" developed from the Latin word "estimare" which mean an estimation about one's own value. William James (1890), was one who first described the construct in self-esteem as sense of positive self-regards (James, 1890). High self-esteem people have highly favourable opinion about themselves, while low self-esteem people contain low-evaluations of the self and negative feeling about themselves (Smith *et al.*, 2020).

Self-esteem begins to develop from early childhood life itself. There are many factors which influence one's self-esteem such as thoughts, feelings, social interaction, childhood experience, age, social status, illness, disability, and injury. Many studies revealed low self-esteem on their body image and eating disorder have relationship a even from one's childhood life children creates their self-concept and sense of self-worth as early as possible, which is similar as personality development. Early literature identified self-esteem as prime construct in preventing obesity as well as eating disorder wells. Wells (1976), defined self-esteem under few categories object/attitudinal approach, relational approach, psychological approach and personality function component approach. Our thought, feelings, and behaviours are considered as object which have influence over own

opinion toward self. The relationship between these objects relates our judgment on ourselves. Similarly psychological or emotional reaction such as positive or negative feelings also affect one's self worth. Final approach interpreted self-esteem as a part of our personality. Later, Smelser (1986) explained self-esteem with cognitive, affective and evaluation components in which cognitive as descriptive aspects of one's self, affective as positive or negative feeling perceived by them about their own, and evaluation component as level of worthiness about themselves based on societal or community considerations (Guindon, 2009). APA Dictionary of Psychology defined self-esteem as "the degree to which the qualities and characteristics contained in one's self-concept are perceived to be positive". In short, it is defined as one's subjective estimation of their own worth. Rosenberg (1965), defined self-esteem as "one's positive or negative attitude toward and evaluation of their overall own thought and feelings towards themselves".

Self-esteem system consists of a global component and a selective component. Global self-esteem tells an overall esteem of one's general self-worth with relatively stable traits, while selective self-esteem defines as an estimation of specific traits within the overall self (Guindon, 2009). Healthy self-esteem is to be fundamental & most required human need. People with high self-esteem are associated with good communication skills in interacting with social environment, and have buffering action with their negative experience especially due to social rejection and failures (Zeigler-Hill, 2013). Many research studies were documented regarding significant negative correlation of self-esteem with respect to body image, satisfaction especially among adolescent girls (ALAhmari *et al.*, 2017). Similarly, obese adults have low self-esteem due to stigmatization issues which causes fear of negative appearance in evaluation (Almenara *et al.*, 2017). Obesity in association poor self-esteem leads to physical, social and mental health issue especially adolescence population (Ercan & Özcebe, 2020).

1.6.4 Mental health

The disturbance occurs in energy balance shifts towards positive energy balance in which energy intake is higher than energy expenditure causes weight gain. The body mass index has greater association with mental health of an individual. Many studies revealed

that BMI and obesity have 'U'-shaped association in which underweight and obese people are possible to have mental health disturbance than normal weight people. Mental health of an individual consists of one's emotional, psychological and social well-being. It mainly influences our thought and behaviours, through how we think, feel and act. Mental health of an individual is very important at each and every stage of life from early childhood, adolescence and adult. Many factors such as genetic, brain composition life experience, abuse, and emotions contribute to maintaining optimum mental health. Obesity causes mental health problem through social stigma, peer victimization, bullying, teasing, body image dissatisfaction, and in association with low self-esteem, low social support and less psychological resilience.

An individual to gain optimum mental health should have good physical health, psychological well-being and good quality of life. Positive mental health gives and acts as resources to manage one's life successfully. Thus, the concept and definition for health by WHO (1946) includes mental health as key component in overall health and well-being of an individual, stated as "a state of physical, mental, and social well-being and not merely the absence of disease or infirmity". So, mental health is a positive resource for life, in contribution with social, human and economic status of society. Positive mental health is key component in life, and it is better than absence of symptoms related to mental health disorders. WHO (2001) defined mental health as a "state of well-being in which the individual realizes his or her own abilities, cope with the normal stresses of life, works productively and fruitfully, and makes a contribution to his or her community. It defines various aspects which includes subjective well-being emotional balance, learning new skills to manage life, and maximise our talents and potential to participate in society. The conceptualization of mental health developed through positive emotion or positive affect, in contribution with resilience and personality attributes such as self-esteem, and senses of control, to a level it has capabilities and abilities to develop in all dimensions such as psychologically, emotionally, intellectually, physically, socially, and spiritually. Begins from traditional cultures in which everybody should have the senses of purpose in life,

hope for future, belonging in society, and meaningful life which focus for optimum mental wellness (Barry, *et al.*, 2019).

The inequalities in mental health status within society begins from early childhood itself through present or wired as genetic inheritance or inherited derive especially aggression. The interpersonal field also contributes to create equalities in mental health status. Childhood period is internally vulnerable occasions in which emotional disturbance affects one's mental health such children have poor school performance, absentees or avoidance. During late childhood and adolescence period factors such as low parental support, urban living domestic violence further disturbs their mental health. Teenagers with behavioural issue have high rate to get poor mental health. Events such as natural disasters, covid-19 pandemic, flood and trauma threatens one's mental through post-traumatic stress disorder (PTSD). The childhood victimisation, sexual abuse, neglect, bullying and social stigma play as a crucial role in developing gender based on body image-based inequalities in their mental health. In association with these factors, social circumfluence's also contributes mental health as seen in Durkheimian concept (Rogers & Pilgrim, 2003). Later in adulthood, social integration and victimization in association with socio economic status and psychological adversity such as low self-esteem, low resilience, stressful life-events, hectic daily hassles, homelessness, loneliness, separation contribute to create mental health inequalities, Beyond lifespan circumferences, 21st century challenges such as job insecurity, health emergency, threats in physical health, lifestyle changes, cyber insecurity, political situations, financial crises added in list related to mental health issues. The study conducted by Almandoz *et al.*, (2020), during covid-19 pandemic stated obese individual irrespective with covid-19 infection have influences on mental health, substance use and weight-related health behaviour issues (Almandoz *et al.*, 2021). A recent study by Cattane *et al.*, (2020), revealed the intrauterine environment such the foetal programming and maternal behaviour affects neonatal outcomes which later lead to mental health issues and obesity.

Past studies which had conducted to correlate obesity and mental health revealed various relationship with obesity. The obesity and mental health issues are two separate

entities both have genetic as well as environmental factors in association with behavioural aspects. The mental health issues include depression, anxiety and emotional disturbance the relationship between obesity and depression is bidirectional one in which obesity to depression association and depression to obesity association can be possible. Population-based studies revealed 80% of studies showed significant relationship in obesity to depression, while only 53% stated in depression to obesity (Faith *et al.*, 2011). Similarly meta-analysis carried by magallares and Pais-Ribeiro, (2012), stated only women with obesity have low mental health than men (Magallares & Pais-Ribeiro, 2013). Another study by Heidari-Beri *et al.*, (2021) revealed among female individuals abdominal obesity had positive relationship with anxiety, while male individuals did not show any association. In relationship between obesity and mental health, physical health acts as mediatory factor (Knoesen *et al.*, 2012). Few studies mentioned models relationship between obesity and emotional disorder especially among women population (Scott *et al.*, 2007; & Simon *et al.*, 2006). Seo *et al.*, (2020) conducted an exploratory study from the National Health Insurance Database of Korea stated depression incidence were high among metabolically unhealthy obese people and in gender wise metabolically healthy female with obesity have positive correlation than men. Hence, we carried further research to find out association between obesity and mental health, even with respective to demographic variables such as age, gender, location, family type and socio-economic status.

1.7 Rationale of the study

During the past few decades, the obesity has been becoming modern health threat to world population, due to its rapid growth and prevalence rate. Centers for Disease Control and prevention (CDC) stated the obesity prevalence in united stated was 42.4% during 2017-2018. But, the obesity data in 1960-1962 revealed prevalence of obesity as 13.3% (10.7% men and 15.7% women). It reached 30.9% in U.S at 1999-2000, but it was 2.2% in India and increased to 5.1% at 2015 (Hales *et al.*, 2020). Similarly, the overweight population in United stated was 44.8% and now it reached more than 70% (Luhar *et al.*, 2020). In India, during 1998 it was 8.4%, increased to 13.6% at 2005-2006, 19.75% in

2015-2016. It was more in urban area (31.3%) than rural area (15%) NFHS-5 (2019-2021) data facts about India revealed further an increased prevalence from 19.75% (2015-2016) to 25.75 (2019-2020) (National Family Health Survey, India & Ministry of Health and Family Welfare, 2018). These statistical data revealed there is an increase in statistical data revealed there is an increase in overweight and obesity population throughout world population irrespective of nations and geographical area. Beyond epidemiological rate. Centers for Disease data and information about overweight and obesity, the medical and biological aspects of obesity also give challenges among medical as well as surgical professional. Still now, there was no single drug or molecule in the form of hormone to control (or) reduce obesity. Major medical professionals are in confusion to handle medical intervention with obese patient due to patient body weight. Treatment regimen for obese patient usually varied from non-obese patient, and doctors advised obese patient bluntly to reduce their body weight. Apart from stigma related to obesity such as social, and health care, the cost of medical expenditure also high comparatively to obese patient than non-obese one. Thus, obesity plays a challenging role to maintain optimum health and increase attractiveness in 21st century.

The researcher has discussed various aspects of obesity from introduction, epidemiology, aspects of obesity from introduction, epidemiological aetiology, and medical aspect to psychological burdens in detail. The Management of obesity highly relayed with energy balance in which negative energy balance favours weight loss while positive energy balance leads to weight gain and obesity. In reduction of body weight, one should shift his/her energy balance towards negative energy balance where decrease in energy intake and increase in energy expenditure irrespectively of any diseases or any other causes. Usually, obesity plays as bidirectional pathways with metabolic diseases either metabolic diseases such as diabetes, thyroid disease, and polycystic ovarian syndrome can cause obesity or obesity can cause metabolic diseases. Around 50 years before, the prevalence of obesity was very low, which was less than 5% even in United States, and less than 1% in world population. In India, it was even less than 0.5% like many other chronic diseases, obesity also have genetic factor in which obesity developed due to

hereditary origin. The increased in the prevalence rate of obesity to more than 45% revealed there was involvement of another factor beyond genetic one named as epigenetic factor in which genetic factor strengthened or formed due to impact from environmental and behavioural factor as the researchers discussed academics to conduct their research and under the handling aetiology of obesity. Thus, behavioural factor plays major role in controlling or preventing obesity in association with environmental and psychological factors. The negative energy balance needs behavioural modification to limit energy intake, and to increase energy expenditure through physical activity. The energy intake (food intake) can be controlled or limited through behaviour change in which one's social support, self-esteem, resilience and mental health have major role in it. Similarly, the energy expenditure through physical activity can be increased or enhanced through one's social support, self-esteem, resilience and mental health.

One's social support, self-esteem, resilience and mental health to be in optimum level in order to control his/her energy intake and increase energy expenditure. In facts, it is very well-known that obesity can cause a wide-range of co-morbidities like diabetes, hypertension, cardiac diseases, kidney diseases, dyslipidaemia, non-alcoholic fatty liver disease, infertility sleep apnoea, and arthritis. Also, can consequence psychological burdens such as mental health issue, poor self-esteem, peer victimization, personality disorder, psychiatric challenges, binge eating, and eating disorder. In order to prevent obesity or control normal body weight needed four types of behavioural activities namely 1) Behavioural change to control emotional eating, 2) Behavioural action to manage physiological urge to increase food intake, 3) Behavioural activities to increase energy expenditure and 4) Maintain internal behaviour in psychologically healthy status to avoid unwanted biochemical changes like hormonal and neuronal which give room for fat deposition. The optimum behavioural styles and performances in energy balance either to shift toward negative or favour it toward positive can have individual difference. Before one should perform weight reduction activity such as decrease in energy intake and/or increase in physical activity for negative energy balance, have to consider his/her social and mental constructs which include social support, resilience, self-esteem and mental

health. Therefore, it is necessary for academics to conduct their research and highlights these variables for obesity reduction and obesity management activities. Thus, the researcher shows his keen interest to highlight the role of social support, self-esteem, resilience and mental health with respect to obese and non-obese individuals. This study will also highlight mean difference of these variable among obese and non-obese individuals. The regression analysis part of this study further give information and interpretation for further orientation and base for further research related to obesity in behavioural and psychological aspects.

1.8 Summary

This chapter started with an in-depth introduction about weight and energy balance in detail with physiological and historical prospective. The prevalence of obese and non-obese is discussed from worldwide data facts to Indian state level including data from different time interval such as 2005-06, 2015-16, and 2019-21 under the title epidemiology of obesity. Various causes of obesity are tabulated under heading global and social factors, personal factors, and behavioural factors. Obesity has two main consequences as medical consequences were listed in health hazards of obesity and psychological consequences in psychological burdens of obesity. At end, main research variables social support, resilience, self-esteem and mental heath were discussed with rationale of the present study.

CHAPTER-02

LITERATURE REVIEW

It is essential to identify, evaluate, and synthesize related to research activity as literature reviewer. The relevant literature within the field of research illuminates our knowledge, highlights from carried research activities in similar field, and emerges new conceptual frameworks in relation to latest research environments. Usually, literature refers to availability of published articles, information, and materials related to present research. It may be available in the form of books, and journal articles from low to high academic values. A review means identifying, evaluating and establishing new concepts or theoretical frameworks from available literatures. Thus, the review of literature gives us overall summary of relevant sources. There are many ideas and steps to review available literature. The main objectives in literature reviews are first, surveying the literature within chosen field of the study, second synthesizing the relevant information as summary, and third analyzing it critically to identify research gaps, limitations, and future direction. Finally, presenting it in a structured and organized manners. Here in obesity research, the researchers are targeting to psychological and behavioural aspect in order to maintain energy balance which can either positive or negative. Psychological variables such as social support, resilience, self-esteem and mental health play main role in one's behavioural activities as the researchers discussed in rationale of the research. In this chapter, the researchers mentioned various literature reviews related to social support, resilience, self-esteem and mental health in association with obesity.

2.1 Literature Review related to Social Support

Gonzalez-Mulé & Yuan, (2022), revealed based on study to know benefits of workplace social support on diurnal cortisol patterns and body mass index, supervisor support with no co-worker support exhibited declined cortisol diurnal pattern from morning to evening, and with little increase in body mass index over a period of four years.

Lincoln & Nguyen, (2022), carried an exploratory study to identify association between social relationships with body weight from database from National Survey of American Life (N=5684). The results revealed social support especially emotional support

have positive as well as negative relationships with body weight with respect to age, race and ethnicity.

Athanasiadis *et al.*, (2022), conducted online based exploratory study to identify impact of perceived social support on weight loss surgery among obese with the electronic medical record. The findings stated social support structure were associated with weight loss outcome after obesity surgery.

Guevara-Valtier *et al.*, (2021), carried correlation study to know the association between social support in social network and health behaviour such as food habits and physical activity in overweight and obesity among 188 adolescents using body mass index (BMI), social network perceived social support scale, the healthy eating scale, physical activity questionnaire and questionnaires to measure physical barrier against healthy eating and physical activity. The results showed 52% of the participants were in overweight, 37.8% of them have friends on social network, and 82.7% of them reported low physical activity. Among overweight adolescents 38.8%, 39.8%, and 39.8% of them have perceived barrier as no information, no motivation and no access to healthy food respectively. Thus, significant positive relationship was there between social network support and physical activity and healthy food behaviour which can impact on body weight.

Tolvanen *et al.*, (2021), performed a qualitative study as semi-structured interview among 16 participants who regain weight after bariatric surgery. The samples were recruited from obesity specialist clinic, with BMI greater than 35 Kg/m² even after weight regain, and they interviewed using semi-structural questionnaires to open their perception, opinions and feeling about their post-operative support and were conducted during April 2018 to December 2019. Thematic analysis was carried through six steps such as notes collection, labelling with code, grouping the code, renewing the theme, defining and refining the theme and finally illustrate the quotes. Thematic analysis identified finally with two overall themes such "A lonely struggle" and 'others as sources of compassion and control". Thus, insufficient support which perceived by them in association with information barriers and empowering their support acted as their barrier against weight regain even after bariatric surgery.

Baillet *et al.*, (2021), carried a meta-analysis with six databases to identify factors highly correlated with social support on body mass index especially in obese category from relevant articles till 2020. The findings showed that social support in weight management, motivation for weight loss has good effect on body mass index, lack of motivation and low social support acted as barrier for physical activity.

Iguacel *et al.*, (2021), conducted a study to find out social vulnerabilities and their impact on body mass index as meta-analysis from various databases such as PubMed, Science Direct, and Scopus till 30th March 2020. The results revealed socioeconomic status with social support has buffering action on social vulnerabilities in childhood obesity.

Seehausen *et al.*, (2020), conducted National population-based study with 21 thousand above postpartum women in 266 hospitals to find out relationships between pre-pregnancy weight and breastfeeding with social support. The findings revealed class I and class II obese had lower odds in breastfeeding, and there was no such association not seen among normal weight women.

Yoshida *et al.*, (2020), conducted an exploratory study to understand mediating role of social support between acculturation and obesity with 2946 Mexican adults using measuring tools such as body mass index (BMI), waist circumference, and questionnaire to measure emotional support and financial support. The finding revealed that more acculturation among Mexican adults, men population showed significant mean difference in obesity than their women population. Further in the level of social support with acculturation revealed higher obesity rate among low or no social support.

Ersoy (2020), carried an exploratory study with 2158 students using healthy lifestyle behaviours scale-11, and multidimensional scale of perceived social support (MDPSS) revealed risk for obesity and unhealthy lifestyle behaviours among university student due to low perceived social support.

Li *et al.*, (2019), conducted longitudinal study to detect the influence of long work hours of mothers and fathers on overweight and obese among children in Germany. The weight and height of 2413 children with their parent's work hours were collected at an

interval from ages 0-1, 2-3, and 5-6 years. The finding revealed at begin (0-1year) about 5% of them were in overweight and obesity, and increased to 12.4% at 2-3 years and 11.85% at 5-6 years. Employment status of their mother changed gradually till their children become toddlers as such, approximately 84% of them were unemployed at begins, and decreased to 46.6% and further 32.8% when their children reached 2-3 and 5-6 years of age respectively. Thus, at begin 9.4% of mothers, at 5-6 years about 44% of them in work. But, when compared to father's employment status, at begins 11% of them were not worked, then 8.8% at 2-3 years of their children and further 6.5% at 5-6 years of their children. When compared with their employment status, maternal employment was associated positive influence over risk of obesity. But, father's body mass under (BMI) scores were associated with higher opportunity for their children to get obesity. Further, the results revealed there was mean difference in work threshold per week between mother and father, as ≥ 35 hours per week and ≥ 55 hours per week respectively. Beyond, these work hours acted as risk factor for overweight and obesity.

Katzow *et al.*, (2019), carried a longitudinal study with 262 economically low Hispanic mother & child pairs to examine relationship between social support and infant adiposity. The data like anthropometric details of infants were collected form respective hospitals, and other measuring such as prenatal social support, socio-demographic and psychosocial details were obtained directly from them through survey type questionnaires during 3rd trimester of their pregnancy. Maternal social support index (MSSI) was used to measure prenatal social support. The finding revealed that 65% of women were in pre-pregnancy overweight or obesity. Similarly, 20% of women have low social support. High prenatal social support as a dimension of resilience correlated with lower infant adiposity. Thus, role of social support acts as prevention factor related to adverse perinatal outcomes such as adiposity, low birth weight and preterm birth.

Tymoszuk *et al.*, (2018), conducted the study to explores the level of body mass index (BMI), and waist to hip ratio (WHR) variations from mid adulthood to older age in association with social support, through dataset and objectively measuring height, weight, waist & hip circumferences along with social support measures by close person

questionnaire at appropriately time line from phase-I to phase-II as white hall II study started from 1985-1988 till phase 11 at 2012-2013. The findings concluded as high level of poor social support especially from closest person showed a steep increase in BMI and WHR among men population. Among men, there was further negative correlation presents between emotional support and BMI.

Ashe & Lapane, (2018), carried a cross-sectional study with 4672 women aged above 40 years through National Health and Nutrition Examination Survey (2003-2008) revealed women had perceived experience of obesity due to food insecurity at low level of social support.

Assari & Caldwell, (2017), conducted a study among 1170 African American and Caribbean black with age group between 13-17 years using data from the National Survey of American Life- Adolescent Supplement (NSAL-A) stated significant positive relationship between low family support and risk of obesity especially among African American female but, no association among African American male.

Yayan & Çelebioğlu, (2017), performed a study to investigate social support and obesogenic environment on body mass index among 270 school students. The results stated there was significant positive corelation between obesogenic environment and body mass index. Social support from family and peer group has positive effect on health-related behaviours.

Mackey *et al.*, (2017), performed to study role of social support, pre-operative exercise, and pre-operative binge eating with BMI after bariatric surgery among 101 adolescents aged 12-21 with pre-operative BMI ranged from 35 to 87. The measures for perceived social support for exercise, exercise activity, binge eating, and BMI obtained by using appropriate measuring tools. The majority of the participant were from female (76%) and from ethnic minority (79%). The results revealed perceived social support for exercise was statistically significantly correlated with weight loss after surgery. But it was related with exercise activity and binge eating habits. As perceived social support increases will increase further activity and decrease binge eating. Thus, social support acts as main factors in controlling one's behaviour related to weight loss and weight maintenance.

Kaminsky & Dewey, (2014), studied 46 diabetic adolescents with 27 non-diabetic adolescents with body mass index, social support, body image, physical activity, and self-esteem. The findings revealed no significant difference between diabetic and non-diabetic adolescents. But it showed body mass index had significant relationship with poorer self-esteem and low level of social support particularly with diabetic adolescents.

Wang *et al.*, (2014), conducted a longitudinal study using data from 633 employed adults involved in weight gain prevention intervention stated support from friend and co-worker help them to have healthy eating behaviour, and support from family encouraged them in physical activity.

Johnson *et al.*, (2014), performed a study with 195 non-obese (overweight) and obese African American women among ongoing weight loss intervention to examine prevalence of social support for healthy eating and physical exercise. The findings revealed social support factor were not correlated with body mass index. Overweight and obese have minimal social support effect for healthy behaviours.

Brunet *et al.*, (2014), carried an exploratory study with 630 Caucasian children using dataset from Quebec Adiposity and Lifestyle Investigation in Youth to detect their parental perceived social support with respective from moderate to vigorous physical activity (MVPA) to prevent risk factor for obesity or overweight even if one of parent were in obese. The measures such as perceived social support, and moderate to vigorous physical activity were obtained by appropriate measuring tools namely the parent support scale, and ACTi Graph LS 7164 respectively. The results conducted as there was no statistically significant mean differences among gender and weight status. But It showed statistically significant positive correlation among normal-weight girls with respective to perceived social support and moderate to vigorous physical activity behaviour. Similarly paternal tangible social support showed such significant relationship with MVPA behaviour.

Cho *et al.*, (2013), conducted a cross-sectional, correlational study to identify a conceptual link between health promoting behaviour and interpersonal social support among 126 women in obesity, and data were collected from September 2010 to November 2011. The measure was collected using Health promoting Lifestyle profile-II and (HPLP-

II) and Interpersonal support Evaluation List (ISEL). The results stated that the conceptual link in the study have positive correlation between interpersonal social support and health promoting behaviour among women in abdominal obesity.

Vander, (2012), conducted an exploratory study to monitor health risk behaviours and attitudes in association between perceived peer and family social support with body mass index from 4598 adolescents. The results stated obese adolescents have unhealthy weight control behaviours than healthy weight adolescents.

Tamers *et al.*, (2011), conducted study to find out association of social support with diet practice and physical activity among non-obese and obese people. The findings showed there was no significant association between worksite social support and body mass index, but higher worksite social support have higher physical activity and better diet practices.

Herzer *et al.*, (2011), performed a study with 74 obese youth and their caretaker mentioned obesity among youth primarily due to support structure from close friends, parents and teachers. But classmate played positive role in HRQOL of obese youth.

Lim *et al.*, (2011), carried the study to examine social support as moderation effect in the relationship between mental health (depression) and peer victimization among obese individuals. The measuring tools such as anthropometrics, schwartz peer victimization scale (SPVS), children's depression inventory-short form (CDI-SF), Multidimensional scale of perceived social support (MSPSS) and demographic questionnaire were used to collect data. The Findings revealed peer victimized and social support acted as significant influence for mental health of obese individuals. While perceived social support have moderation effect between peer victimization and mental health. Thus, social support may act as protective role of depression among abuse girls.

Herzer *et al.*, (2011), carried an exploratory study to understand correlation between social support and Health related quality of life in obese person. 74 obese youth with their primary care given were participated in this study through behavioural weight management program in which the researchers gathered the data from them using child and adolescent social support scale (CASSS), BMI, and sizing me up (specific self-report

HRGOL tools). The results concluded as close friends and parents social support were scored more than social support from classmates and schools. Thus, close friends, then parents act as significant role as social support among obese Youth.

Kim *et al.*, (2008), carried an exploratory study among 228 women with gestational diabetes mellitus with their body mass index to examine the relationships between social support and self-efficacy with physical activity and body mass index. The findings stated low to moderate social support and self-efficacy from family and friends were associated with physical activity and better dietary scores. Further, there was no significant relationships between psychosocial factors with BMI.

Ingenski *et al.*, (2007), conducted correlational study to know relationship within weight, social support and quality of life among 107 overweight youth. Various measures were collected with appropriate tools and questionnaires such as anthropometric measurement, demographic questionnaire, paediatric quality of inventory (PedsQoL) and multidimensional scale of perceived social support (MSPSS). The results stated that social support have significant influence over quality of life among youth. Male showed good physical QOL than female. This study showed gender-based variation in terms of association with quality of life. But perceived social support were showed statistically significant relationship with quality of life.

Xie *et al.*, (2005), carried a study from data of 1655 Chinese adolescent to know relationship between perceived peer isolation, perceived social support with BMI and depression. The findings revealed perceived social support acted as buffering agent in minimising perceived peer isolation on mental health and BMI. Among girl high body mass index had significant higher correlation with depressive symptoms.

2.2 Literature Review related to Resilience

Mathieu *et al.*, (2022), performed a study to know relationship between resilience, childhood adverse experience and mental health among 200 surgery seeking obese people with resilience scale for adults (RSA) and structured interview. The findings revealed resilience acted as mediation role in psychosocial component of them. Low resilient people have higher childhood adverse experience and poor mental health.

Li *et al.*, (2022), carried an exploratory study to examine correlation between resilience, stress and body mass index using adolescent resilience questionnaire among 39 adolescents with obesity. The findings revealed resilience was associated with low adiposity and the greater resilience had negative correlation with metabolic disease outcomes.

Cuevas *et al.*, (2021), conducted cross-section survey as population based National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) among 34,653 non-obese and obese participants with about 10,169 obese to explore resilience related stressful life events as obesogenic risk factors and to examine association between resilience related stressful life events with obesity. The findings stated association between resilience related stressful life events with body mass index varies with age, gender nativity status, quality of residence, and socioeconomic status of them.

Heerman *et al.*, (2021) conducted cross-section study with databases from National Survey of Children's Health during 2016-2018 to examine relationships of family resilience with childhood obesity and adverse childhood experience among 49,365 children in age groups between 10 and 17. The results showed higher family resilience scores helps high BMI against adverse childhood experience. Overweight child among non-obese and obese child has greater exposure to adverse childhood experience.

Stefanovics *et al.*, (2021), carried multivariate correlational study using baseline data from National Health and Resilience in Veterans Study to examine the relationship between personality nature and body mass index. The findings revealed extraverted personality had higher body mass index, high resilient emotional stable personality had negative association with body mass index.

Nishimi *et al.*, (2021), performed an exploratory study using data structure from a longitudinal cohort study (Growing Up Today Study) among 3767 young adults to find out relationship of psychological resilience to adversity with respect to healthy behaviour and body mass index. The results stated that there were no differences between resilience and adversity with respect to healthy behaviours. Non-resilient individuals were less healthy and have higher body mass index than resilient individuals.

Maffoni *et al.*, (2021), conducted retrospective cohort study to identify resilience-based lifestyle changes and body mass index among 1304 subjects with 973 females and 331 males. The findings revealed the mean body mass index differed significantly among different classes with respect to water intake, minimising alcohol intake, physical activity, desert consumptions.

Al-Ahmed, (2021), conducted an exploratory study to access psychological resilience and its relationship with respect to body image among students studying grade 8,9 and 10. The measures were collected using appropriate measuring tools for psychological resilience, and body image. The results revealed that there was no gender difference in the psychological resilience among male and female students. But, have suggested with possibility in presence of some positive psychological variable among overweight students for those preparing for counselling intervention.

Williamson *et al.*, (2021), performed the empirical study to examine resilience influences over dietary intake through practically guided social status among 132 Hispanic American adolescents in age groups between 15 to 21 years old, with BMI ranges from 18.5 to 40 Kg/m² using appropriate measuring tools such as anthropometries measurements, resilience scale, and other tools with demographic questionnaires. The study showed psychological resilience have significant interaction with energy intake via practically guided social status. An increase in social status, there was an increase in resilience score and decreases in energy intake. Thus, psychological resilience acted as mediating role in controlling or diminishing dietary energy intake.

Celik *et al.*, (2020), studied to investigate the mediating role of social support in relation between resilience and quality of life among cancer patient. Using measuring tools such as resilience scale, the multi-dimensional perceived social support scale and the European organization for research and treatment of cancer quality of life (QoL) questionnaire. The results revealed social support acted as mediator role among resilience and functional QoL, and have negative correlation with their resilience as well as on functional QoL. Thus, patient does not want mercy or pity from others as social support.

Secer & Yildizhan, (2020), conducted a correlational study to examine the association between physical activity level to shift energy balance towards negative one and psychological resilience among 1734 university students using psychological resilience scale (PRS) and international physical activity questionnaire (IPAQ). The findings revealed 46.1% of male students were in high level, while 52.8% of female students were in middle level physical activity. This stated male students were more active than female. But, the level of psychological resilience was not statistically significant among male and female students. There was low level positive association between physical activity and psychological resilience. As per other studies, physical activity showed negative correlation with weight. In psychological resilience, which showed significantly higher level among normal weight student than thin student.

Sińska *et al.*, (2020), conducted an exploratory study to investigate correlation between resilience and dietary adherence during covid-19 pandemic period among 1082 adult level in Poland, using measuring tools PSS-10, scale, the brief resilient coping style (BRCS), polish version of BHI-12 questionnaire and dietary guidance adherence index (DGA index) The results concluded there was highest level of adherence towards nutrition with adequate coping. But such adherence was poor to an individual who have low level of psychological resilience due to stress and mental issues. Thus, during critical circumferences such as covid-19 pandemic period, adaptation of psychological approach needed to have effective dietary adherence and to maintain healthy body weight.

Wood & Shukla, (2019), performed a study to understand association between parental resilience and parenting style related to child behaviour and weight among 338 parents who asked to fill Wagnild and Young's resilience scale and questionnaire for parenting style concern about child's weight and management. The findings suggested that the personal competence component of parental resilience have statistically significant moderation effect on parenting style concerned to child's weight. The authoritative parenting style have high parental resilience which have significantly positive influences over child behaviour related weight concerns. Thus, parental as well as family resilience are considered as effective measures in preventing and controlling childhood obesity.

Loi & Cheskin, (2019), carried a review study based on personal, familiar or environmental factors to maintain normal weight in obesity prone environments using keyword as "resiliency and obesity" and "resilience and obesity" in published search. The results revealed 47 articles were finalised, and suggested the strategies in our personal resilience such as "shift-and-persist" mindset helps us to create positive and optimistic future outlook related to obesity. Thus, training related to resilience and family meals are very effective strategies to prevent or control obesity.

Foster & Weinstein, (2018), conducted quantitative study to examine resilience at family as well as child level have correlation with risk of obesity after perceived stress, among 24,405 children aged 10-17 years through 2016 national survey of children's Health (NSCH) in which data related weight status, income status, resilience of them under community, family and individual level, physical health and activity, and socio-ecologic model of stressors in all aspect from community, level, family level to individual levels. The results suggested that prevalence of obesity was statistically significant among low-income level, in which 22.9% of children were in obesity whose family were at <100% of the federal poverty limit (FPL) 21.2% were 100-199% of the FPL, 15.8% at 200-399% while 9.2% were at above 400% FPL. Resilience at family level were not correlated with child's obesity, while the individual level such as child's resilience and emotional stability were statistically significant in relationship among three out of four income strata group. Physical activity has positive association with emotional resilience which from have negative relationship with obesity. As emotional resilience increases, the obesity decreases among them. Thus, resilience particularly emotional have preventive role in controlling child obesity irrespective of any income stratum.

Stefanovics *et al.*, (2018), conducted a study from data sample of 3122 participants in the National Health and Resilience in veteran study (NHRVS) stated there was increase in prevalence of obesity due to greater health burden through trauma, chronic disease, nicotine dependence, poor physical & mental performance and poor active lifestyle as result of diminished psychological resilience.

Johnson, (2018), carried an exploratory study through medical research council as new investigator research grant. The findings revealed body size dissatisfaction with low cardio-metabolic resilience to obesity led to further obesity and risk factor for many chronic diseases.

Gu & Feng, (2016), carried a study to understand psychological resilience in association with survival and health among more than 7,400 centenarians in China, using questionnaires related to their demographic details, psychological resilience and mortality risk and health outcomes, arranged them as five resilience categories based on grade of membership method such as high, upper middle, low middle, low and unable to answer question. The results revealed 50% male centenarians, and 60% female centenarians were 0% membership in high resilience group. While only 9% in male and 6% in female were in 80%-100% of membership among centenarians. 10% increase in membership in high resilience group lowers 2%-4% mortality risk, 36%-55% increase in no cognitive impairment and health, and 7%-12% higher in daily activity. Thus, psychological resilience was highly associated with decrease in mortality and increase in health and well-beings.

Lutz *et al.*, (2016), conducted a cross-sectional study to examine correlation between dietary adherence and psychological resilience among 834 female and male participants from army and air-force were studied using block food frequency questionnaire (FFQ), healthy eating index (HEI-2010) and resilience scale. The results revealed only 656 with filled sample in which high-resilience group were from African American and more educated than low resilience group. High resilience group were older and have high mean in healthy index scores than low resilience group. There was no statistically different among male and female higher diet quality have positive correlation with higher healthy eating index was common among high resilience group. Thus, better encouragement with optimum nutritional plan in association with high resilience prevents one's weight gain and decrease food intake measure to prevent obesity.

Crawford *et al.*, (2015), carried a study to investigate individual, social and environmental variables influence fat deposition and their resilience to control weight gain in which 1457 children invited in the study, in which 771 accepted to participate, among

them 613 mothers of children involved in T₁ phase of survey. Later T₂ they are requested to participate in T₂ where 360 mothers were attended. Finally, 262 children with their mother were participated in which 200 with healthy weight and only 62 were overweight / obese. They were asked to fill questionnaires related to home, social, and neighbourhood environment in add with demographical details and body mass index measurement. Children were classified based on their BMI. The results suggested that maternal efficiency prevents practicing of sedentary behaviour in their children which lower BMI at follow up session. Preventing sedentary behaviour among socio economically poor communities decrease their body mass index.

Brogan *et al.*, (2012), conducted an exploratory study to identify factors in weight resilience among 32 weight resilient and 35 obese female African-American adolescents in obesogenic environment, they were asked to involve in program in which data related to individual measures such as food intake, physical activity sedentary, sleep-activity and self-efficacy were measured in association with family measures through the brief symptom inventory, social support for eating habits and exercise scale, and parental monitoring of diabetes care scale. The findings suggested the healthy energy individual factor was highly associated with weight resilience. The energy balance was not alone considered as preventive measure, but obesity environment played major factor in obesity in association with psychosocial factor. Thus, high psychosocial weight-resilience factor acted as significant role is preventive strategy for obese even residing in obesogenic environment.

Ball *et al.*, (2011), carried a cross-sectional study to analyse socio demographic as well as behavioural characteristic of overweight resilience women in which 3235 women with age from 18-45 years old were participated, as resilience for eating and activity despite inequality study. They were asked to fill questionnaire related to height, weight, dietary behaviour, physical activity and details for their cognitive social and neighbourhood environmental characteristics with demographic details. The results concluded as women who classified as "resilient to obesity" were young, highly educated, unmarried, have more

leisure time physical activity, and consumed less junk food & soft drinks than obese women. Social, cognitive and behavioural factors also have direct and indirect effect on obesity.

2.3 Literature Review related to Self-esteem

Pindikura *et al.*, (2022), carried case-control study to examine relationship between body mass index, body image and self-esteem in tertiary health-care units of psychiatry with 50 healthy controls using body mass index and self-esteem evaluation questionnaire. The findings revealed schizophrenia group significantly differ from control group in body mass index and self-esteem. There was negative relationship between body mass index and self-esteem with Spearman correlation analysis.

Meland *et al.*, (2021), performed a longitudinal cohort survey to identify self-esteem and impaired self-rated health with body mass index among 1225 Norwegian high school students. The findings stated body mass index had negative effect on self-esteem and self-rated health.

Park & Ju, (2021), carried a study to identify association of self-esteem, body dissatisfaction, and depression with body mass index and eating disorder among 136 adolescents. The findings revealed body mass index indirect effect on eating disorder through mediation action of self-esteem, body dissatisfaction and depression.

Frayon *et al.*, (2021), conducted a study to find out relationships between body mass index, body dissatisfaction and self-esteem among new Caledonian adolescents. The findings revealed low self-esteem was highly associated with body mass index and body dissatisfaction.

Dağ & Türkkan, (2021), performed a study to investigate associations of psychological issues such as anxiety, depression and low self-esteem with respect to body mass index among 33 obese and 30 non-obese adolescents using Rosenberg Self-Esteem Scale and direct interview with measures of body mass index. The results stated that self-esteem and anxiety had significant difference between obese and non-obese, but there was no significant difference in depression and social isolation.

Tikhomirova *et al.*, (2021), conducted an exploratory study to know characteristics of self-assessment of body weight with self-esteem among 250 men and women with

average age 23.5 +/- 10.3 years. The findings stated there was significant in self-reported weight among men and women, in which women overestimate their own weight and men were more objective with their self-esteem.

Ercan & Özcebe, (2020), conducted cross-sectional study to find bilateral correlation between obesity and self-esteem among 1955 school student in 42 schools. The data collected by using or measuring anthropometric measurements, self-esteem scale and tools to measure peer bullying. The finding revealed the prevalence of overweight and obesity were 15% and 7.2% respectively. 45% of students have low-self-esteem. There was strong relationship between obesity and physical bullying irrespective of low self-esteem. And also, obesity was significantly associated with low self-esteem even without physical or emotional bullying. But peer bullying further worsens obese individual, which leads to mental health problem.

Gow *et al.*, (2020), carried meta-analysis using electronic databases related to obesity, obesity treatment and self-esteem which were published till June 2019. The results stated out of 64 studies, 49 studies showed improvement in self-esteem, among those who underwent obesity treatment and 40 studies revealed there was improvement in their body-image. Thus, obesity intervention increases one's self-esteem and body-image which in turn improve their psychological outcomes.

Neeraj & Ahluwalia, (2020), carried an exploratory study with 300 male college teachers using Rosenberg's self-esteem scale, International physical activity questionnaire (IPAQ) with BMI. The findings stated physical activity negatively associated with BMI, self-esteem had significant positive relationships using physical activity.

Polat & Serin, (2020), performed a cross-sectional study using Rosenberg's self-esteem scale and sexual quality of life questionnaire among obese women. The findings revealed high self-esteem increase quality of sexual life. Physical activity increase self-esteem as well as quality of sex life.

Lin et al (2019) performed a study to investigate the outcomes perceived stigma to mental health issue through internalized stigma and self-esteem among 699 students in Taiwan during March 2018 to July 2018. The measures were collected through

questionnaire regarding their age, parental education, and parental marital status, number of siblings with other demographic details, weight self-stigma questionnaire, weight Bias Internalization scale, the beliefs about obese-persons scale (BAOP), and hospital anxiety depression scale (HADS) among with BMI measurement. The results concluded that perceived weight stigma have significant statistically correlated relationship with internalized stigma and self-esteem, which in turns associated which anxiety. Thus, overweight adolescent has positive correlation between perceived weight stigma and anxiety.

Unlu *et al.*, (2019), conducted an exploratory study to identify self-esteem and body image dissatisfaction with body mass index among 240 women in age groups from 18 to 64 with 80 normal weight, 80 overweight and 80 obesity women as cross-sectional study in which data were collected using coppersmith self-esteem inventory, body image concern inventory and BMI measurements. The results revealed normal weight women have high self-esteem compared then overweight and obese women, and the mean differences between the groups were statistically significant. There was negative relationship among BMI, Body image and self-esteem. Thus, obesity affects negatively their self-esteem and body image. Obesity not only consequences into physical health problem. But it also causes psychological consequences.

Aggarwal, (2019), performed a longitudinal cohort study during 2004-2010 among 2278 children in Canada. The finding revealed bidirectional correlation between body mass index and self-esteem, showed mild to moderate significant negative relationship. Thus, greater body size affects self-esteem, similarly physical activity increases one's self-esteem, and shifts energy balance towards negative aspects through physical activity and health related behaviours.

Cella *et al.*, (2019), conducted correlation study to associate self-esteem, Body mass index and eating disorder through structural equation model (SEM) among 1156 high school students, 13–20 years old in Italy. The measures were collected using appropriate measuring tools such as parental bonding instrument (PBI), Rosenberg self-esteem scale (RSES), experience of shame scale (ESS), multidimensional perfectionism scale (MPS),

eating disorder inventory-3 (EDI-3) and body mass index (BMI). The collected data were analysed using structural equation Model (SEM). The results stated that parental care and protectionism have significant positive relationship over self-esteem. But self-esteem negatively relate to dysfunctional and positively to functional perfectionism. Among all variables in predicting one's body shame, only self-esteem and BMI acted as predictors. Similarly, self-esteem and BMI had indirect influences over eating disorder through body shame, parental protectiveness.

Gentile *et al.*, (2018), conducted an exploratory study to examine relationship of social stigma and self-esteem with body mass index among 413 participants in age group between 18 and 26 years old using Rosenberg self-esteem scale, and Perception of teasing Scale. The findings stated body mass index was directly related with social stigma and negatively correlated with self-esteem.

Al-Ahmari *et al.*, (2017), carried a study to investigate relationship between self-esteem, body mass index and perceived body image among 907 Saudi females using Rosenberg self-esteem scale and Stunkard figure rating scale. The results mentioned that 6.1% of college female were in low self-esteem, but prevalence was high among overweight or obese women. Self-esteem scores have significant negative relationships over body mass index and perceived body image.

Almenara *et al.*, (2017), carried a study to understand self-esteem as the role of mediator in correlation between weight related self-devaluation and disordered eating among III obese Canadian women using weight self-stigma questionnaire (WSSQ), the Rosenberg self-esteem (RSES), the fear of negative appearance evaluation scale (FNAES) and eating disorder examination questionnaire (EDE-Q). The Findings revealed self-esteem and fear of negative appearance evaluation acted as significant influence over weight stigma and disordered eating among obese women. Self-esteem played as affective mediating role in relationship between weights related self-devaluation and disordered eating.

Murray *et al.*, (2017), reviewed and performed meta-analysis to understand self-esteem among overweight and obese adolescents due to weight Management Interventions

using six databases such as the Scopus, MEDLINE, Psych Info, Cochrane Library, Cumulative Index to Nursing and allied health literatures and Embase databases. The results revealed thirteen studies with 1157 overweight or obese adolescents, and showed there was no significant change in self-esteem among them. This conclusion suggested only weight reduction activity is not required to change one's self-esteem. But it needed multi component approach in weight management interventions.

Durso *et al.*, (2016), conducted an exploratory study to know correlation between various psychometric properties of the weight variables among overweight adults in behavioural weight loss program, using the weight bias internationalization scale (WBIS), the anti-fat attitudes questionnaire (AAQ), the Rosenberg self-esteem scale (RESE), depression anxiety stress scales (DASS), and the body shape questionnaire (BSQ) among 90 obese or overweight with BMI over 27 kg/m² in age groups between 21 to 73 years old. The findings stated weight bias internationalization scale positively related to body image, depression and stress, and negatively associated with self-esteem.

Alvani *et al.*, (2015), studied the relationship between body weight status and self-esteem among 450 pre-university students in Iran where students are divided into three group such as healthy weight, overweight and obese. The measures were collected using appropriate tools such as Rosenberg self-esteem scale and body mass index. The findings revealed that self-esteem was significantly associated with body mass index similarly there was significant gender difference in body weight status in which males were in healthy weight than women population.

Taylor *et al.*, (2011), carried a study to understand the role of perceived parenting style as moderator in association between overweight or obesity with self-esteem among 158 children with their caregivers. The regression analysis among them using the measures for body weight, perceived parenting style and self-esteem stated that perceived parenting style was not significant with weight of the child. But self-esteem was significant low and body dissatisfaction was significantly high among obese children. Perceived parental style showed positive relationship with child self-esteem.

Griffiths *et al.*, (2010), carried a review study to understand self-esteem and quality of life among young people with obesity from published articles and journals through search strategies in electronic database such as Medline, Embase, Psy-Info, database of abstracts of reviews of effect (DARE), and health technology assessment (HTA) database during period from 1994 to march 2009, using terms like "self-esteem", "self-worth", 'obesity', 'overweight', 'body weight', 'fatness', 'body mass index', and 'adiposity' which yielded around 845 article without duplication. After, further meta-analysis resulted 17 self-esteem and 25 quality of life articles related to obesity were identified. The results concluded as there were strong influences in relationship between obesity and self-esteem obesity scores lower in self-esteem score as well as quality of life level. Thus, obese youth have high risk of low self-regard and poor quality of life.

Wang & Veugelers, (2008), conducted a study among 4945 students to know interrelationship between body weight, self-esteem and school performance. The findings revealed obesity acted as risk factor for low self-esteem. Healthy eating behaviour and active lifestyle among children & youth encourage cognitive development and mental health.

Franklin et al., (2006), conducted a study with 2813 children revealed obese children associated with low perceived athletic competence, body appearance, and global self-worth with low self-esteem.

Debate & Thompson, (2005), carried a pilot study through curriculum-based running program among 322 girls from 8-12 years old to understand factors such as self-esteem, and body size satisfaction for eating attitudes among them who involved in sport activity. The measures were collected by Rosenberg self-esteem scale, children's eating attitudes test, and body mass index in the intervention program. The results revealed female adolescents who involved in the intervention program showed positive effects on self-esteem. Low self-esteem has correlated with poor body image among overweight females and have eating disorders. The interventions positively influence over self-esteem especially among young female and improve their self-concept, body image which further protect them from eating disorders.

Klaczynski *et al.*, (2004), conducted an exploratory study to examine the psychosocial relationship due to weight, through various weight related negative stereotypes of obesity, "ideal thin belief", and perceptions over obesity. The results revealed a negative relationship between one's belief on weight and self-esteem through negative attitudes on thin idealization & obesity.

Silvera *et al.*, (1998), carried correlational study to demonstrate relationship between self-esteem and eating disorders. In this study, the researchers composed two factors such as self-liking and self-competence in self-esteem. 92 participants from teaching and nursing college were asked to participate in a diagnostic interview and appropriate measuring questionnaire for self-esteem and eating disorders. The results stated there was strong association between self-liking and eating disorder, but there was no such correlation among self-competence and eating disorders.

2.4 Literature Review related to Mental Health

Duan *et al.*, (2022), conducted a study to examine relationship between body mass index, sleep status, anxiety, depression among 1457 college students during December 2020 to January 2021 using body mass index, scores of self-assessment lists of sleep (SRSS), Zung self-rating anxiety scale (SAS), and Zung depression self-rating scale (SDS). The findings revealed body mass index positively correlated with anxiety and depression, and non-medical students were in high body mass index than medical students.

Yi & Park, (2022), performed a study to explore predictors of quality of life based on mental health and body mass index among 1022 adults with aged more than 65 living in Sheung City, South Korea during August to October 2018. The results revealed the predictors of quality of life were body mass index, mental health, body functions, daily living activities, social activity involvement.

Perry *et al.*, (2021), conducted cohort study among 10463 individuals from Avon Longitudinal Study of Parents and Children in age group from 1 to 24 years with measurements for body mass index and mental health during July 2019 to March 2020. The findings revealed there was adolescent based increase in body mass index had associated with depression and not with psychosis.

Huo *et al.*, (2022), conducted a study to identify anti-psychotics induced weight gain among mentally compromised patient in age groups between 5 and 18 years. The findings stated there was significant pre-post change in body mass index.

Czepczor-Bernat *et al.*, (2021), carried an exploratory study to anxiety and weight status during Covid-19 period among 671 women in mean age 32.5 +/- 11.38. They formed four types of clusters as healthy body weight with low anxiety, and healthy body weight with high anxiety, excess body weight with low anxiety, and excess body weight with high anxiety. The results showed that excess weight clusters people have higher body dissatisfaction and poorer mental health than healthy body weight clusters.

Mishra *et al.*, (2021), conducted a study to identify prevalence of mental health based on lifestyle behaviours, coping strategies and body mass index among 588 medical students in KIIT University, India during September to October 2020 using semi-structured questionnaire, Depression anxiety stress scale (DASS-21), Brief COPE, and body mass index. The findings stated body mass index, presence of chronic diseases, high soft drink consumption had significantly high psychological distress and poor mental health.

Barbuti *et al.*, (2021), carried an exploratory study to investigate the relationships of psychiatric comorbidity with body mass index among patients in pre-surgical evaluation during January 2004 to November 2016. The results stated that most of patient were body mass index above 40 kg/m², 27.6% in binge eating disorder, 16% in major depressive disorder, 15.5% in bipolar disorder type2, and 16% in panic disorder. Low BMI patients were in major depressive disorder and subjects without mood disorders.

Heidari-Beni *et al.*, (2021), conducted cross-sectional study to investigate relationship between obesity and mental health such as depression, anxiety and psychological distress among 4361 Iranian health-care staff as epidemiology study of psychological alimentary health and nutrition from 50 health care centres of Isfahan province using data collected an anthropometric assessment, and through hospital anxiety and depression scale. The results stated 37% men and 10% women were in overweight, and 9.3% men & 10% women as obesity. But prevalence of abdominal obesity among 18.4% men and 39.7% women. Among men, there was no statistically significant relation

between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male.

Paulitsch *et al.*, (2021), carried an exploratory study to examine the relationship between obesity and depression in which perception of body weight among 1238 participants as health of the Rio Grande population study. The measuring tool used in this study was the patient health questionnaire-9 (PHQ-9) for assessing mental health of the subjects, self-reported weight and height information for BMI, and Questionnaire for demographic details. The result revealed 23.7% of them were obese, 16.9% perceived themselves as 'fat' and 11.2% were in depression. Here, the researches categories result outcomes into 4 types based on reality and perception on obesity such as C1, C2, C3, and C4. Here C1 was combination of non-obese under no fat perception, c2 was non-obese with fatty perception, C3 obese with no fat perception, and c4 was obese with fatty perception. Among, these combination group, C2 in which non-obese individual perceived themselves as fatty have increase chance to get depression, as combination group C4. Thus, wrong perception about their own body image can lead to mental health issue and problem.

Pistis *et al.*, (2021), performed two separate cohorts study to understand role of obesity in major depressive disorder based on a mendelian randomization (MR). CoLaus / PsychoLaus was cohorts study carried with baseline data and two follow up assessments to examine health risk factors and mental disorder among 3350 participants in which 1461 cases and 1889 controls in Switzerland. MESDA/NTR was another cohorts study conducted in Netherlands to study depression and anxiety data base from Netherlands twin register with total sample size 4139 with 1182 cases and 2957 controls. The results stated there was direct casual correlation found between obesity and mental disorder. But BMI was potentially related with appetite which is not symptom of depression. Due to physiological nature of body function which is central to obesity during depressive

moments is appetite as alteration to inflammatory, metabolic, and other biological pathways resulting hyperphagia. Thus, biology behind such consequences needs further additional insight on these interpretations.

Seo *et al.*, (2021), carried an exploratory study to examine the relationship between metabolically with future depression using database, during 2009-2017 from National Health Insurance System, Korea. Total 3,586,492 adults individuals were categorised into four group as MHN (metabolically healthy non-obese), MHO (metabolically health obese), MUN (metabolically unhealthy non-obese) and MUO (metabolically unhealthy obese), and they followed till six to eight years for incidences of depression. The results revealed that MHN ration among gender was higher in women (Men 39.3% and 55.2%). But the depressive symptoms were high among metabolically unhealthy obese (MUO), in metabolically healthy obese (MHO) female subject were prone to depression than male.

Almandoz *et al.*, (2020), conducted a study to know impact of covid-19 pandemic on substance use, mental health and weight related to obesity were collected through a retrospective chart review from an academic obesity clinic. Using research electronic data Capture (RED-Cap) tools. The measures needed for survey were collected through validated tools namely behavioural risk factor surveillance system (BRFSS) during 1st June 2020 till 3rd November 2020. 83.3% of total 589 patients were female with mean age 53.6 years. Among total samples, around 48.4% of them reported substance use such as opioids (24.3%), sedentary (9.5%), marijuana (3.6%) and stimulants (1%). Person who used substance reported due to stockpiling more, challenge in healthy eating, sleep difficulty and anxiety. Thus, Covid-19 Pandemic have influences over mental health issues among obese irrespective with covid-19 infection.

Barnett, (2020), carried study to understand association between mental health and obesity in united stated. The data were collected from the centre of disease control and prevention (CDC) in Mississippi health department with united state department of health and human services. The findings revealed patient with successful weight loss have decrease prevalence of mental illness. Similarly, women with optimum weight have low psychiatric problem. The understanding the link within mental health and obesity helps us

to control our physical, social and mental health, also helps for cost effectiveness in utilising health care services.

Milano *et al.*, (2020), to understand relationship between depression and obesity through Biomarker such as inflammatory factors, biochemical variables etc. Usually, obesity have strong impact over body image and social stigma, which can cause depression, vice versa the depression alters one's behaviours through unhealthy lifestyle, increased alcohol and substance use, sedentary lifestyle practices, and unhealthy eating behaviours. The stressful or depression attacks among obese people under short period can be managed without physical outcome which is purely physiological and biochemical, and carried through immuno-inflammatory Chemo toxins (or) substance, when such stressful or depressive occurrence, subsided for longer period leads to allostatic altered immuno-inflammatory composition can lead to physical as well as psychiatric outcomes. Which is due to activation of cortico-adrenal axis and variation in intestinal microorganisms.

Amin *et al.*, (2020), conducted longitudinal study to examine body mass index on mental health with data from the National Longitudinal study of Adolescent Health and Health and Retirement Study for elderly adult details through evidence from genetic markers. The researchers tackled this by exploiting variation in polygenic scores (PGS). The impact of BMI on mental health carried through correlational Analysis with mental health scores, measured by Centre for epidemiologic studies depression scale (CES-D). The results revealed the effect of body mass index on mental health was small and insignificant for young adults while it was significant among elderly adults.

Romero-Pérez *et al.*, (2020), conducted an experimental study to know impact of physical exercise on body mass index as well as mental health such as anxiety and depression among 105 participants in which 54 were in experimental group (EG) and 51 were in control group (CG). The researcher collected measures details such as clinical history, psychological developmental history and demographic details with BMI measurement, and same details were collected after follow up session 20 weeks later. Experimental group carried physical activity program weekly two sessions with 50 min session for 20 weeks. All sessions consist of 5-min warm up, 40 min-core session and final

5-min relaxation. During experimental time, the control group asked to involve their two works as usual. The results of this study suggested physical activity gives them positive which enhance their emotional well-being, self-perception and self-concept. But it did not produce significant difference in weight, height BMI, and anxiety and depression level. Thus, regular physical activity impresses one's mental health and emotional well-being through positive thoughts.

Sarigiani *et al.*, (2020), performed cross-sectional study of body image among obese and non-obese women in online platforms using measuring tools such as Body mass index, centre for epidemiologic studies depression scale, multi-dimensional body-self relation questionnaire eating attitudes test, Interpersonal distrust subscale of the eating disorder inventory, Rosenberg self-esteem scale and with open ended questionnaire for body image experience and impact on development. Data analysis were carried using 'student t-test' to compare the obese and non-obese as quantitative analysis, and carried thematic analysis with coding as qualitative one. The findings revealed that obese women have significantly lower body image and low self-esteem with more depressive symptoms than non-obese. Similarly, women with more depressive symptoms have eating problem and poor body image perception than low depressive women.

Sharafi *et al.*, (2020), carried cross-sectional study with 732 overweight and obese patients using hospital anxiety and depression scale (HADS) questionnaire, body mass index (BMI) percentage of body fat (PBF) & total soft lean mass (SLM) which measured using AVIS 33 body composition Analyser. The findings revealed BMI and PBF were statistically very high among overweight and obese patients. Anxiety and depression scores have positive influences over body mass index, but not with PBF and SLM, and female have higher rate of anxiety than male. Thus, there was direct relationship between mental health and obesity.

Yu *et al.*, (2020), investigated to know the effectiveness of a school-based nutritional education program with physical exercise over cardio vascular and mental health among obese children. This experimental study in which two school were identified randomly from 30 eligible public school where obesity student screened from 21 classes

among these two schools, one school was considered as control group while other school as experimental group. In experimental group, nutrition education and physical activity program for period of 8 month and there was no extra intervention to control group other than routine works for the same periods. At the begins of the experiment, the measures such as anthropometric parameters, blood pressure measurement, fasting blood test, and psychological assessments like social anxiety scale for children (SASC) were carried using appropriate instruments and tools. The findings revealed there was statistically significant decrease in depression and fasting glucose level after intervention among experimental group. There was improvement in their well-being, social anxiety and shown decrease in diastole pressure. Thus, school-based nutrition program is highly effective in decreasing one's body weight as well as psychological distress.

Bjertnaes *et al.*, (2020), carried an exploratory study to examine association between obesity and mental health in term of gender-based disparities, as cross-sectional survey among 10th grade students in 2002 and 2017, using BMI, strengths and difficulties questionnaire (SDQ), with lifestyle and demographic details. The findings revealed generally those who have higher peer related problems were correlated with higher BMI. Among girls, in added with peer problems emotional symptoms were associated with high BMI, while boy it was related with conduct problems. Thus, mental health of girls was associated with internalizing especially with peer and emotional one has an increase of BMI, while boy it was associated with conduct problem.

Ghartappeh *et al.*, (2020), conducted a regression study to understand or predict relationship between self-esteem, mental health and sleep quality with quality of life among 419 obese & individuals as descriptive analytical study using Rosenberg, self-esteem scale, Goldberg general health, Pittsburgh sleep quality questionnaires and WHO quality of life questionnaire. The results revealed the quality of life have statistically significant association with self-esteem, mental health and sleep quality. Thus, the mental health of obese person played an influential role in the quality of life.

Gibson-smith *et al.*, (2020), conducted a longitudinal study to explore the possibility of depression due to childhood overweight and obesity from data based on BMI

data at early life and with measurement such as geriatric depression scale and lifetime major depression disorder. The findings suggested 11% of them had depressive symptom at late period and 4.4% had lifetime major depressive disorder. The childhood obesity has greater chance for mental health issues during later life.

Jenatabadi *et al.*, (2020), performed cross-sectional study to know relationship between BMI lifestyle, food intake, and mental health among postpartum women with obesity using measures such lifestyle factors as working hours, physical activity, smoking habits, and sleep hours, food intake, mental health and BMI. The results concluded among urban population lifestyle, food intake and mental health have statistically significant positive influence over body mass index while rural population lifestyle acted as negative influence, while other acted as positive association with body mass index.

Ahuja *et al.*, (2020), carried exploratory study from collaborative psychiatric epidemiology surveys (CPES) revealed obesity was strongly related with increased risk for depressive disorder among female, but not in male.

Lores *et al.*, (2020), conducted pilot trial of Cognitive behavioural therapy to people with depression and obesity stated CBT significant useful for depression, anxiety, self-esteem and body shape, but not with weight.

Emmer *et al.*, (2019), performed meta-analysis with 105 studies and 59, 172 participants to identify relation between weight stigma and mental health. In this review study adaptive coping strategies and perceived social support were considered as potential moderators. The finding concluded as body weight played a significant role as moderator with strong correlation in weight stigma and poorer mental health. Increase in body mass Index led to weight stigma and decrease in mental health.

Chan, *et al.*, (2019), carried a correlational study to find out relationship between weight-stigma, mental health and obesity, and also to differentiate these variables among overweight and non-overweight children, using weight bias internalization scale (WBIS), weight self-stigma questionnaire (WSSQ) and mental health condition by brief symptom rating scales. The results stated that there was no significant difference in mental health among overweight and non-overweight individuals. But overweight have high self-stigma

level than non-overweight children. High level self-stigma can lead to mental health problems.

Conceição *et al.*, (2019), conducted an exploratory study to examine difference in level of social support between pre and post-bariatric surgery, and to understand association among perceived social support, depression, disordered eating and weight outcomes, using measures from clinical interview, self-report measures from clinical interview, self-report measures such as multidimensional scale of perceived social support (MSPSS), repetitive eating questionnaire, eating disorder examination-questionnaire v17, three-factor eating questionnaire-revised 21, and depression anxiety stress scale (DASS-21). The results revealed high social support have negatively associated with depression, emotional eating and weight in pre and post-surgery group. Social support acted as moderator role in between various psychological variable only in post-surgery group. Thus, social support is highly recommended after bariatric surgery in order to prevent post-surgery weight gain.

Minkwitz *et al.*, (2019), conducted a study to explore association between depression, cognitive reactivity and obesity among 304 participants from the integrated research and treatment centre for adiposity diseases at Leipzig, with age group 18-70 years old through telephone interview followed by structural clinical interview and appropriate measuring tools such as Beck depression inventory, and Leiden index of depression sensitivity. The results revealed there was significant relationship between obesity and cognitive reactivity through rumination and control / perfectionism, only. But in depression all dimensions of cognitive reactivity such as hopelessness, acceptance, aggression, control/perfectionism, risk aversion and rumination were in statistically significant relationship with depression. Further, there was association between obesity and depression through rumination dimension of cognitive reactivity, it showed further increase in association when we considered waist circumference than BMI.

Peng *et al.*, (2019), conducted prospective study randomly among 1348 student in China to analyse different and association between overweight/obesity and mental health with symptom of depression and anxiety, using anthropometric measurements, Zung self-

rating anxiety scale. The results mentioned that among all participant only children with overweight/obesity were statistically significant with depression. But this was not statistically significant with non-overweight individuals.

Hoare *et al.*, (2019), carried an exploratory study in which data were collected through the Goulburn Valley Health Behaviours Monitoring Study, to know association between overweight/obesity and obesogenic risk behaviours with quality of life among Australian primary school children. The participants were asked to give their weight and height with demographic data, and to fill given tools such as paediatric quality of life inventory (PedsQol), school health action, planning and evaluation system (SHAPES). The results revealed there was statistically significant low quality of life among overweight/obese children. But, higher quality of life was found among all children who involved in recommended physical activity.

Zhou *et al.*, (2018), carried a study to identify the active mediator in mental health among obesity with respect to health-related quality of life, using 2015 National Health Survey (NHS) data, through collecting measures such as body mass index, self-reported disability or long-term health condition, using appropriate tools. The results revealed, when compared with disability free individuals, person with disability have mental health issues with behaviour problem, were highly proved to obesity, and were less likely doing physical activities.

Payne *et al.*, (2018), conducted an experimental study to find out the bi-directional relationship of weight loss with mental health and quality of life among obese adults, through MEASUR-UP (Measuring Eating, Activity, and Strength; Understanding Response-Using Protein) a randomised controlled trial during 2012 to 2014. The assessment was collected at three interval period as 0-, 3- and 6-months using tools such as the centre for epidemiologic studies depression scale (CES-D), profiles of mood states (POMS), modified Pittsburgh sleep quality index (PSQI), perceived stress scale (PSS), satisfaction with Life scale (SWLS) and short form Health Survey (SF-36) for quality of life. The results concluded that physical quality of life was improved significantly within 3 months. But depression symptoms minimise weight loss comparatively lower than non-

depressive person. Thus, there was significant bi-directional relationship with weight loss and mental health/quality of life.

Vittengl, (2018), performed a longitudinal study with 7108 US mid-life adults' revealed obesity and depression acted as bidirectional correlation between each other due to physical impairment, poor social function, and emotional eating behaviour.

Willage, (2017), carried on exploratory study to examine effect of weight over mental health using Genetic IVs, from National Longitudinal study of Adolescent to Adult data using the BMI Genetic Risk score, the Centre for Epidemiologic studies Depression scale (CES-D). The results found that there was statistically significant relationship in the effect of weight on suicidal ideation, but such association was not seen among counselling and depression, where social stigma acted as main mediator for suicidal ideation.

Contreras-Valdez *et al.*, (2016), conducted a correlation study to know relationship between body dissatisfaction, self-esteem and depression among obesity among preadolescents using Body-shape Questionnaire-16, the child self-esteem Test and Centre for Epidemiologic Studies Depression scale. The findings revealed that there was relationship between obesity and body dissatisfaction among female preadolescents. Similarly, obesity have association with self-esteem and depression.

Adams & Murcia, (2016), analysed data from Athens-Clark County community healthy needs assessment stated significant positive relationship between mental health and obesity.

Nichèle & Yen, (2016), investigated to know socio economic and lifestyle factor in obesity and mental health in data from survey of health and disability, conducted demographic factors played a key role in obesity and mental health.

AlQahtani *et al.*, (2015), performed a study to examine the association between mental health disorders and obesity among 389 University male student during period 2013-2014. Using Arabic version of Depression, Anxiety and stress scale (DASS) The results stated 22.1% of them were in overweight and 18.3% of them in obesity the prevalence of Depression, was 48.1%, anxiety was 58.9% and stress in 40.4% There were strong relationship between depression, anxiety and stress in obesity.

Reynolds *et al.*, (2015), conducted a study to know correlation between obesity and mental health outcomes among trauma patient between hospitalization to 3-month post-trauma period, and this longitudinal study were conducted between March 2012 and May 2014, using database from hospitals and asked patients to fill required Questionnaire such as Patient Health Questionnaire-8 (PHQ-8), Numeric Rating Scale for pain, the Alcohol use Disorder Identification Test Consumption (AUDIT-C) with Glasgow coma scale score & Injury severity score. The results mentioned among total sample size, 2% underweight, 30% in normal weight, 31% in overweight and 37% were in obese. Patient with obese have significant possibility to get depression while overweight have low chance to return in their job. But there was no significant difference in their mental health.

Chang & Yen, (2012), performed a longitudinal study with 1351 males, and 1165 female during 1999 to 2003, revealed prevalence of obesity was common among women. Most obese women likely to be depressed.

Lim *et al.*, (2011), conducted an exploratory study to know the relationship between obesity and mental health in which perceived social support acted as mediator role in controlling both. Using tools like Schwartz peer victimization scale, children's depression inventory-SF, and multidimensional scale of perceived social support scale. The results stated there was statistically significant relationship between obesity and mental health among female obese children than male children, in which peer victimization and perceived social support acted as mediation factors.

Carey *et al.*, (2010), carried a cross-sectional survey to explore prevalence of depression among BMI categories with 3361 participants in 12 Australian general practices, revealed 24% of depression in underweight, 11% in normal, 12% in overweight and 23% among participant and depression have U-shaped relationship with BMI.

Knoesen *et al.*, (2010), conducted an Australian community survey to explore association between obesity and mental health among 118 participants in age group between 19 to 75 years old with BMI above 30kg/m² using the SF-36 health survey, kessler psychological distress scale, social interaction anxiety scale, and multidimensional scale of perceived social support. The results revealed the obesity was not statistically significant

with mental health. The strongest influences of mental health among obese individuals were perceived physical health.

Xie *et al.*, (2005), conducted an exploratory study to examine associations between body mass index and psychological variables such as depression, perceived peer isolation and social support among 1655 Chinese adolescents using measures such as body weight and height, perceived peer isolation, perceived social support and depression. The results stated among girl and increase in body mass index increases their depressive symptoms and was more among who perceived peer isolation. But such association was not seen among high BMI boys. Usually perceived social support were buffering the effects off BMI on depression and perceived peer isolation.

Ozmen *et al.*, (2007), carried a study to investigate the causation of actual weight, perceived weight and body satisfaction over self-esteem and depression as cross-sectional study among 2101 adolescents in Turkey using Rosenberg self-esteem scale, children's depression inventory. The results mentioned that 9% of them were in overweight and only 1.1% were obese. Body dissatisfaction was statistically related with low self-esteem and depression, while perceived overweight associated with low self-esteem. There was no statistical relationship among actual overweight with low self-esteem and depression.

Myers & Rosen, (1999), invented a tool to examine obesity stigmatization and coping to associate psychological distress with obesity. The design of this study as two stages in which, first was generation of items by asking stigmatization situations of obese people and second was employed generated items to access validity and reliability. The results and content analysis revealed total 185 stigmatizing experiences and 382 coping responses were received which arranged as 11 stigma and 21 coping categories and 99 coping responses. This analysis revealed an increase frequency to stigmatization was correlated to higher psychological distress with mental health symptoms.

Renman *et al.*, (1999), conducted population-based study to analyse self-esteem, academic competence and behavioural problem, with obesity, using tools such as youth self-report, lifestyle Questionnaire. The results stated there were statistical significant difference in self-esteem, mental health and other psychological parameter between obese

and normal weight. But it showed significant difference in term of socioeconomic status among lower education than control group.

4.6 Research Gap

Overall, obesity is considered a chronic relapsing and progressive disease and a leading risk factor for global deaths. Furthermore, alarming trends of weight gain have also been documented for children and adolescents, undermining the present and future health status of the population. To highlight the related threat to public health, the World Health Organization (WHO) declared obesity a global epidemic, also stressing that in many cases it remains an under-recognized problem of the public health agenda. Apart from these issues, there is no single sole medicine to control or treat obesity. But there is possibility to do bariatric surgery to cure or reduce body weight. After surgery there is chance to regain weight unless they control energy balance in neutral or negative side. Even after surgery the weight gain are mainly due to behavioural issues in which there is increased energy intake and decrease energy expenditure. Beyond behavioural aspects in controlling energy balance in human body, the biological factors such as genetic and medical influence have role on it. Except monogenic or mendelian obesity, polygenic obesity and obesity due to medical cause can be controlled through behavioural modification in which genetic mapping and medical abnormalities can alter as consequences of negative energy balance.

It is also well research constant that has been researched over the years, while review the relevant literature it is found that lot of casual as well as social and psychological factors has been studied and reviewed in relation to this illness and have shown these psychosocial factors played major role in obesity management which have mentioned in literature related intervention on management of obesity. While summarizing the literature it is found that there was lot of researches has been carried worldwide. But, many of researches were with few variables either social support or mental health. Researches related to resilience and obesity, similarly self-esteem and obesity were limited. There is no single research seen with all these psychological variables as one research design. When compared to western world in India, these is very limited research has been conducted in India. Therefore, the main crux and expected outcome of the study would to fill the research

gap and provide solid theoretical background in the field of psychology research on obesity which helps in behavioural intervention and management of obesity. The present study will also address issue related with the selected variables and also find their relationship with the obesity. The researcher will also highlight the role of social support, resilience, self-esteem and mental health of obesity people. Further it also possible suggestion would be given by the researcher how to enhance one's social support, psychological resilience and self-esteem among people with obesity.

2.7 Significance of the Present Study

Since the last few decades' obesity is rapidly increased throughout the globe, even in India nearly 10% of population is living with this illness. People living obesity experiences both physical as well as psychological complications which directly affected their quality of life. Therefore, it is necessary to know their social as well as psychological well-being which is highly affected. Hence, the research in the present study aimed to find the level of social support, resilience, self-esteem and mental health among people living with obesity. The study will also highlight the role of social support, resilience, and self-esteem on mental health. Further the study will provide the solid theoretical background and source material for those who in future will carry the research in the field of obesity. It will also provide the sound foundation's for Policy makers, Doctors, Psychologists, Medical practitioners and other interested parties in the field of obesity and obesity management.

2.8 Summary

This chapter contains concise and brief facts and inputs from more than 120 research articles from last twenty years with more important on recent three years were listed under the heading literature review related to social support, resilience, self-esteem, and mental health. the title research gap has explained need and importance of theme related to present study with further insight to orientation for further research. The importance and timely necessary of present study were explained in detail in significance of the present study.

CHAPTER - 03

RESEARCH METHODOLOGY

In this chapter, the path in which the researches plan his research by formulating research problem and objectives to test hypothesis through result from the data collected in research period. Here, the researcher has selected both obese and non-obese individuals as sample to study various statistical study and relationship between psychological variables such as social support, resilience, self-esteem and mental health.

3.1 Objectives

1. To assess the level of social support, resilience, self-esteem and mental health among obese and non-obese people.
2. To find the difference in social support, resilience, and self-esteem on mental health among obese and non-obese people.
3. To examine relationship between social support, resilience, and self-esteem on mental health among obese and non-obese people.
4. To find the influence of social support, resilience, and self-esteem on mental health among obese and non-obese people.
5. To investigate the difference in social support, resilience, self-esteem, and mental health with respect to demographic variables.

3.2 Hypotheses

1. There is significant mean difference in social support, resilience, self-esteem and mental health among obese and non-obese people.
2. There is significant relationship between social support, resilience, self-esteem and mental health among obese and non-obese people.
3. There is significant positive influence of social support, resilience, self-esteem on mental health of obese and non-obese people.
4. There is significant mean difference in respondent's social support with respect to demographic variables (Gender, Age, Family type, Location, Socioeconomic status).

5. There is significant mean difference in respondent's resilience with respect to demographic variables (Gender, Age, Family type, Location, Socioeconomic status).
6. There is significant mean difference in respondent's self-esteem with respect to demographic variables (Gender, Age, Family type, Location, Socioeconomic status).
7. There is significant mean difference in respondent's mental health with respect to demographic variables (Gender, Age, Family type, Location, Socioeconomic status).

3.3 Research Design

The present study is an exploratory study and concentrates on the psychological aspects among obese and non-obese. As the researches discussed earlier, the energy balance system of one's physiological functioning of body mainly relay on behavioural consideration in respect to energy intake and energy expenditure. These behavioural consideration in turn depends on one's psychological parameter especially social support, resilience, self-esteem and mental health. Non-experimental research usually contains descriptive or correlational in nature by which research describes about situation or nature of variables in research environment, it also describes relationship between various psychological variables. Further in case of regression analysis, the study reveals impact or influence of one variable over another variables. The researchers can predict or understand influences over another, but cannot understand casual effects unless there is control group or dimensions. In non-experimental research, the validity of measurement plays major role due to bias caused by other variables what the researchers does not consider in the study.

3.3.1 Variables

In the present study, the researcher has taken psychological variables as social support, resilience, self-esteem and mental health. These variables have measured by appropriate tools and demographic variables used in this study are age, gender, family type, location and income status. Height, weight and body mass index are anthropometric measurement in this study. These anthropometric measurements are also considered variable.

3.3.2 Sampling

In the present study, the researchers selected overall sample as 600 in which 300 obese and 300 non-obese have taken from urban and rural areas of Cuddalore district in Tamil Nadu, India, through purposive sampling technique.

Subjects who met following criteria have taken as sample for this study,

- Above the age group of 15 years.
- Subjects hail from Cuddalore district in Tamil Nadu.
- Subjects only from Urban and rural areas.

The collected samples were divided into various sub-group based on demographic details such as gender, age, family type, location and income status as shown in the following figure tabular.

Table 3.1., Demographic variables in the study among obese (300)

Variable	Sub Category	N
Age	15 to 25 years	49
	26 to 35 years	92
	36 to 65 years	159
Gender	Male	84
	Female	216
Family Type	Joint	92
	Nuclear	208
Location	Urban	106
	Rural	194
Income Status	Less than 15,000 INR	223
	15,001 to 30,000 INR	50
	More than 30,001 INR	27

Figure 3.1., Graphical representation of table 3.1

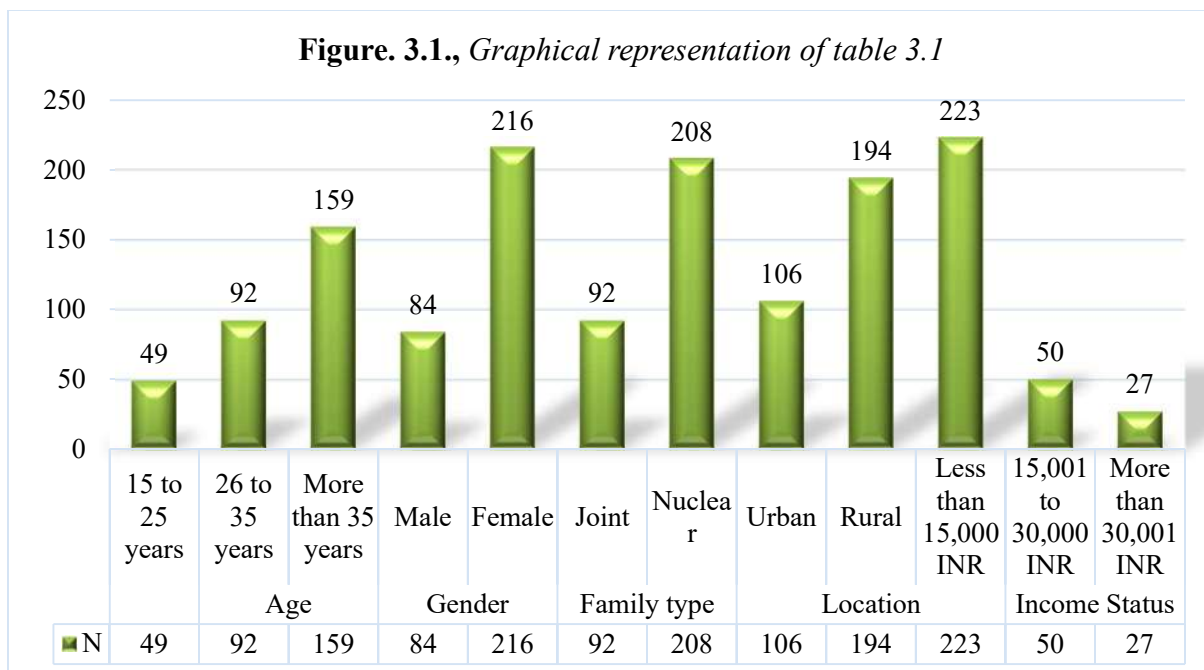
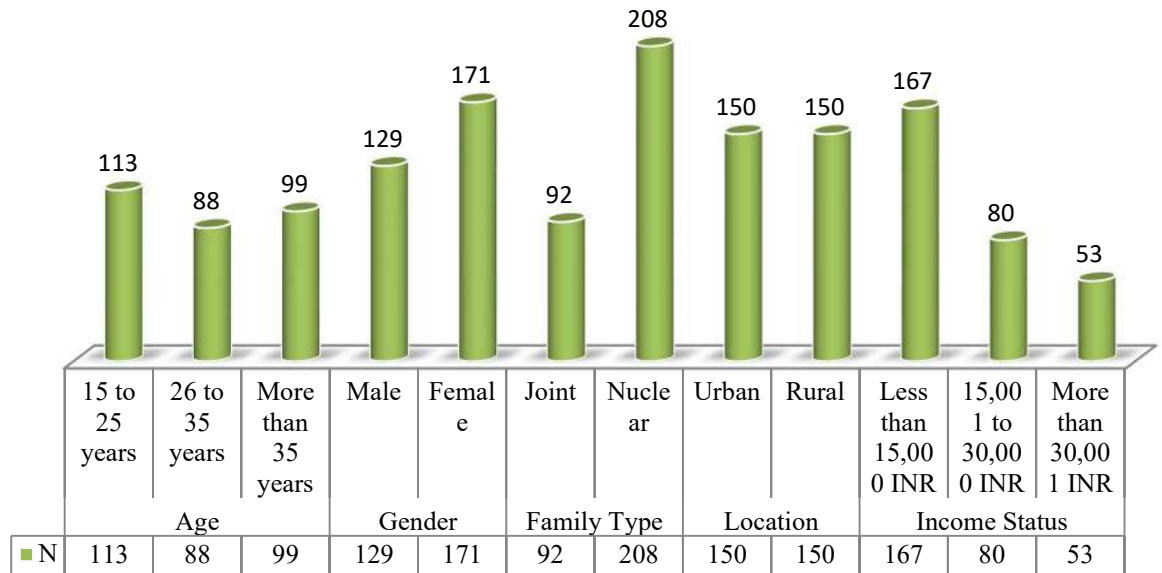


Table 3.2., Demographic variables in the study among non-obese (300)

Variable	Sub Category	N
Age	15 to 25 years	113
	26 to 35 years	88
	More than 35 years	99
Gender	Male	129
	Female	171
Family Type	Joint	92
	Nuclear	208
Location	Urban	150
	Rural	150
Income Status	Less than 15,000 INR	167
	15,001 to 30,000 INR	80
	More than 30,001 INR	53

Figure 3.2., Graphical representation of table 3.2



3.4 Measuring Tools

In the present study following tools would be used for the assessment process

1. Anthropometric measurements – height, weight and body mass index (BMI)
2. Multidimensional Scale of Perceived Social Support Scale (MDPSS)
3. Psychological Resilience Scale (PRS)
4. Rosenberg's Self-Esteem Scale (RSES)
5. The Mental Health Inventory (MHI-38)
6. Demographic sheet consists of respondent's personal demographic details.

3.4.1 Anthropometric Measurements

Anthropometric measurements are quantitative measurements of the body and non-invasive in nature. Anthropometry is defined as the study of the measurement of the human body with respect to bone, muscle, and fat tissue. In Greek, “anthropo” means “human” and “metron” means “measure” These measurements provide nutritional status of an

individual (Centers for Disease Control and Prevention, 2007). These measurements include height, weight, head circumference, body mass index (BMI), body circumferences and hip circumferences to measure adiposity. There are several indexes and ratio to measure body fatness. Body mass index (BMI) is the most well-known indicator of body fatness and it is calculated based on height and weight of an individual. It is used as a screening tool to identify whether the person is at a healthy weight or unhealthy weight. It is measured as weight in kilogram by height in centimetre squared. It was previously called as Quetelet's Index, after Adolphe Quetelets who developed this measure as calculator for body fatness. Many studies revealed body mass index have correlation with amount of body fatness (Freedman *et al.*, 2013; & Wohlfahrt-Veje *et al.*, 2014).

Body Mass Index is calculated by formula,

$$\text{BMI} = \frac{\text{Weight of an individual in kilogram}}{(\text{Height of an individual in centrimeter})^2}$$

(BMI=Kg/Cm²) World Health Organisation (WHO) recommended and classified body mass index as in Figure-3.2, in underweight, normal weight, overweight and obesity were mentioned. BMI which is equal or greater than 30 are termed as obesity. Similarly, BMI equal or greater than 25 till 29.99 are called as overweight.

Table-3.3, WHO classification of overweight and obesity

Body Mass Index (BMI)	WHO classification	Common terms
<18.5	Underweight	Thin
18.5–24.9	Healthy weight	Healthy
25.0–29.9	Overweight	Overweight
30.0–34.9	Obesity I	Obese
35.0–39.9	Obesity II	Obese
40 or greater	Obesity III	Morbidly or seriously obese

3.4.2 Multi-Dimensional Perceived Social Support scale (MDPSS)

Participant's social support will be measured by multidimensional scale of perceived social support (MDPSS) constructed by Zimet *et al.*, (1988). The scale consists of 12 items in seven likert scale from very strongly disagree to very strongly agree. All

these 12 items are equally divided into three substances namely significant other family and friend many studies related to healthy and clinical samples were used this scale to measures participant perceived social support (Wittenborn *et al.*, 2020). The items 1, 2, 5 and 10 are related to significant other, items 3, 4, 8 and 11 are family support, and items 6, 7, 9 and 12 are friend support. It has good validity and reliability score especially among non-prison population. The higher values in respect dimension revealed higher level of perceived social support commonly used tools to assess perceived social support, and were translated into 22 regional languages in which most of translated tools attained a Cronbach's alpha reliability scores as minimum 0.70 (Dambi *et al.*, 2018). The original tools which have created by Zimet *et al.*, (1988) denote measure of internal reliability to each subscale the significant other, family and friends were 0.91, 0.87, and 0.85 respectively. Many studies revealed the reliability of overall scale has above 0.85. The multidimensional perceived social support scale (MDPSS) has adequate Cronbach's co-efficient alpha throughout the world population irrespective of race, culture, and geographic location. Dahlem *et al.*, (1991), carried a confirmation study immediately after 1988 using 154 students from urban college, had Cronbach's co-efficient alphas for total scale as 0.91, for the significant other, family and friend subscales as 0.95, 0.90 and 0.95 respectively. Later, Canty-Mitchell in association with Zimet (2000), performed same study among 222 urban population with majority African-American adolescents, conducted to analyse psycho metric properties of MDPSS, stated Cronbach's co-efficient alpha for whole scale was 0.93 the significant other, family and friends was 0.91, 0.91 and 0.89. Cheng and Chan, (2004) carried confirmatory study which revealed relatively low Cronbach's co-efficient alpha as 0.69 in significant other subscale, but family and friend subscale had 0.78 and 0.76 respectively. Further, Bruwer *et al.*, (2008), carried to know psychometric properties among the South African youth from various race and background in which it had Cronbach's co-efficient alpha in range between 0.86 to 0.90 for subscales and 0.86 as overall scale. Tonsing in association with Zimet and Tse, (2012), conducted to study Urdu and Nepali version of MDPSS in Hongkong, revealed the Cronbach's alpha in Nepali version was 0.90 and Urdu version as 0.93. Similar, validating study were

conducted by Guan *et al.*, (2013), among medical and dental students in Malaysia stated that the Cronbach's co-efficient alpha was 0.924, while subscales such as the significant other, family and friends was 0.89, 0.89 and 0.90 respectively. Wittenborn *et al.*, (2020), carried study with major depressive disorder patient had Cronbach's α value among 12-items ranged between 0.92 and 0.93. Thus, many previous studies revealed multidimension perceived social support showed high reliability irrespective of all demographic situations.

3.4.2.1 Instructions and Scoring

The list of statement our relationship especially emotional with other. Please read each statement carefully, and answer the response how you feel about each statement. The sum of all the items gives total score. The items 1, 2, 5, & 10 for subscale the significant other support, similarly the items 3, 4, 8 & 11 for family support subscale, and the items 6, 7, 9, & 12 for friend support subscales.

3.4.3 The Psychological Resilience Scale (PRS)

Participant's psychological resilience were measured by psychological resilience scale generated by Khan & Bhat (2018) based on the scale which was developed by Wagnild & Young (1993). Actual scale by Wagnild and young had 25 items with seven-point likert scale. Similarly, Khan & Bhat (2018) designed scale with 25 items with 5-point likert type responses such as 'strongly disagree', 'disagree', 'uncertain', 'agree', and 'strongly agree'. This scale includes five dimensions self-perception, single mindedness, task orientation, organised and self-restraint.

- ✓ **Self-Perception:** One's own view about his/her self or mental or physical characters that includes the self.
- ✓ **Single Mindedness:** Being very determined, dedicated or thinking about only particular thing.
- ✓ **Task Orientation:** Focussing on and devoting to complete certain tasks in time.
- ✓ **Organised:** Planned or arranged based on particular system.
- ✓ **Self-Restraint:** Exercised to control over own impulses, emotions or desires.

These dimensions were represented in Psychological Resilience Scale as,

Table 3.4, the dimensions of resilience with items

Dimension	Items (Questions)	Total Items
1. Self-Perceptions	12,13,14,18,20 & 21	6
2. Single Mindedness	4,15,16,17 & 19	5
3.Task Orientation	1,2 & 3	3
4.Organized	8,9,10 & 11	4
5. Self-Restraint	5,6, & 7	3
Total Items		21

3.4.3.1 Psychometric Properties

The reliability of a scale determines the nature of standardization or the quality of scale in one stand. Actual scale by Wagnild & Young (1993) have Cronbach's alpha co-efficient in ranged between 0.72 and 0.94 based on various studies in different situations and regional circumferences. Khan & Bhat (2018) generated psychological resilience scale (PRS) for Indian context based on original Wagnild and Young (1993) have Cronbach's Alpha co-efficient as 0.88, and Composite reliability are in range from 0.63 to 0.74. The factorial validity of PRS is 53.15%, excellent and established the Cronbach's co-efficient alpha value for individual dimensions 0.76, 0.73, 0.63, 0.63 and 0.55 for self-perception, single Mindedness, Task Orientation, Organised and Self-Restraint respectively. The test-retest reliability of the same is 0.67 to 0.84.

3.4.3.2 Instruction and Scoring

This scale is designed for a psychological research purpose. The list of statement which are given below includes 5-options such strongly Disagree, Disagree, Uncertain, Agree and strongly Agree. There is no correct or wrong statement. Select (✓) only one option, which is most closure to your feelings. The total sum of all responses of 21 items gives total score which can vary from 21 to 105 the higher the score higher the psychological resilience & vice-versa. Each dimensions carry their overall score by adding respective items.

3.3.4 Rosenberg's Self-Esteem Scale

The self-esteem of an individual was measured by the self-esteem scale constructed and standardized by Rosenberg (1965) which contains ten items. This scale defined one's self-acceptance, or one's orientation toward themselves either positive or negative. All items in this scale have four options as 4-point Likert scale type ranged from strongly agree to strongly disagree. This scale has used in many research study approximately more than hundreds, and have translated too many regional languages. The scale was originally developed from 5,024 students in 10 randomly selected school during 1960's and it was name as a Guttman Scale.

3.3.4.1 Psychometric Properties

The Rosenberg's self-esteem scale showed high ratings especially in terms of reliability areas. The test-retest correlations revealed in ranged from 0.82 to 0.88, and Cronbach's alpha co-efficient values from various studies stated in ranged from 0.77 to 0.88. It even closely related with the Coppersmith self-esteem inventory

Actually, the Rosenberg's self-esteem scale was framed with the help of item response theory. Factor analysis stated this scale have a single common factor but, some past studies revealed the presence two separate factors such as self-confidence and self-depreciation.

Advantages of the Scale,

1. It is open source, can be used by the researches without permission.
2. Easy and quick to administer.
3. Widely used, even with brain injury situations.

Disadvantages of the Scale,

1. It will not change in response to intervention
2. It is not a diagnostic tool for any clinical and psychological problems
3. It will not tell anything about respondents other than what the researcher knows.

3.3.4.2 Instructions and Scoring

The list of statements which is given below deals with overall feelings about yourself. Please find correct option in each statement. Items 1,3,4,7, 10 are in normal

scoring. The option "strongly agree" considered as 1 point, agree" as 2 points, "disagree" as 3 points, and "strongly disagree" as 4 points. The items 2,5, 6,8, and 9 are in reverse scoring, where the option "strongly agree" considered as 4 points, " agree" as 3 points, "disagree" as 2 points, and "strongly disagree" as 1 point. The overall sum of all 10 items gives the value for self-esteem. The higher scores indicate higher self-esteem.

3.3.5 The Mental Health Inventory (MHI-38)

Participants' mental health is measured by MHI-38 developed by Veit & Ware, (1983). Initially, it was designed to measure one's psychological distress and well-being in the RAND Health insurance Experiments to assess mental health status of the patient. They developed MHI-38 along with SF-36 (Short Form-36) for population based general health surveys. This scale reflects one's positive aspects of mental health such as cheerfulness, interest and enjoyment in life, and negative aspects as anxiety and depression. This scale includes 38 items in 6-point Likert style response. It has six subscales such as anxiety, depression, behavioural control, positive affect, emotional ties and Life satisfaction.

- ✓ **Anxiety:** Is a feeling of fear, dread and uneasiness.
- ✓ **Depression:** Is a mood conduction of an individual in which one can have a feeling of sadness, loss or anger.
- ✓ **Loss of Behavioural / Emotional Control:** Is a state in which one should unable to control their emotions, their responses which may be disruptive or in appropriate within the situation.
- ✓ **General Positive Affect:** Is one's nature to experience positive emotions and communicate with other and even with Life's challenges in a positive way.
- ✓ **Emotional Ties:** Refers to a bundle of subjective feelings that come together to create a bond between two people.
- ✓ **Life Satisfaction:** Is a person's positive appraisal, judgement, or endorsement of her/his life overall.

The mental health inventory (MHI-38) also has two global scales psychological distress and psychological well-being apart from a global mental health index score.

- ✓ **Psychological Distress:** It is a non-specific symptom of stress, anxiety and depression. High level of psychological distress leads to mental health problem such as anxiety and depression.
- ✓ **Psychological well-being** refers to one's overall functioning in relation to his/her feelings.

3.3.5.1 Psychometric properties

The mental health inventory -38 were widely used mental health assessment in different countries where translations a validity studies have been carried, the results revealed high level of internal consistency in terms of reliability (Santos & Novo, 2019). Short version of MHI-38 is MHI-5, have a correlation in range from 0.95 to 0.93 each other.

3.3.5.2 Instructions and Scoring

Please read each question and select option statement that best describes about things happened to you for past month. There are no right or wrong response. All MHI-38 items, except item 9 and item 28 are in six-point Likert scale (range 1-6). The item 9 and item 28 are in Five-point scale (1-5). The scoring in MHI-38 is quite complicated due to presence of six subscale and the global scales in which recoded also included.

Table 3.5., *Item composition of the six MHI Subscales included in MHI-38.*

Subscale	Component items	Subscale directionality	Raw-score range
Anxiety	Items 3, 11, 13, 15, 25, 29, 32, 33 and 35	Higher scores = greater anxiety	9-54
Depression	items 9, 19, 30 and 36	Higher scores = greater depression	4-23
Loss of Behavioural / Emotional Control	Items 8, 14, 16, 18, 20, 21, 24, 27 and 28	Higher scores = greater loss of behavioural / emotional control	9-53
General Positive Affect	Items 4, 5, 6, 7, 12, 17, 26, 31, 34 and 37	Higher scores = greater positive affect	10-60
Emotional Ties	Items 10 and 23	Higher scores = stronger emotional ties	2-12
Life Satisfaction	Item 1	Higher scores = greater life satisfaction	1-6

Note: Three items (2, 22, 38) are not used to score the subscales

Scoring the sub-scales: Each subscale consists of items as shown in Table-3.5, the sum of the given items after coded & recorded corresponds to subscales score.

Table 3.6., Coding rules for MHI items used to score subscales.

Item Number	Code Value	Recoded Value
1,3,4,5,6,7,10,11,12,13,15,16,17,19,20,21,23,24,25,26,27,29,30,31,32,33,34,35,36,37	1	6
	2	5
	3	4
	4	3
	5	2
	6	1
8,14,18	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
9,28	1	5
	2	4
	3	3
	4	2
	5	1

Scoring the Global scales: The Psychological distress and psychological well-being are two global scales in MHI-38. Where psychological distress revealed negative states of mental health, while psychological well-being stated positive states of mental health. The item composition for global scales were showed in the following tables. The sum of respective item after coding / recording give value for global scores.

Table 3.7., Item composition of the MHI global scales.

Global mental health scale	Component items	Subscale directionality	Scale raw-score range
Psychological Distress	Items 2, 3, 8, 9, 11, 13, 14, 15, 16, 18, 19, 20, 21, 24, 25, 27, 28, 29,	Higher scores = greater Psychological Distress	24-142

	30, 32, 33, 35, 36 and 38.	
Psychological Well-being	Items 1, 4, 5, 6, 7, 10, 12, 17, 22, 23, 26, 31, 34 and 37	Higher scores = greater Psychological Well-being 14-84

Table 3.8., Coding rules for MHI items used to score the global scales

Item Number	Code value	Recoded value
<u>Rules used to score Psychological Distress:</u>		
	1	6
2,3,11,13,15,16,19,20,21,24,25,27,29,30,32,33,35,36, 38	2	5
	3	4
	4	3
	5	2
	6	1
8,14,18	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
9,28	1	5
	2	4
	3	3
	4	2
	5	1
<u>Rules used to score Psychological Well-being</u>	Code Value	Recoded value
	1	6
1,4,5,6,7,10,12,17,22,23,26,31,34 and 37	2	5
	3	4
	4	3
	5	2
	6	1

Scoring the Mental Health Index: It is single score based on all 38 items. The higher scores indicate better mental health, lower the scores reveals poorer mental health, and it

has range from 38 to 226. It follows coding rules as in following table, and sum of all 38 items after coding / recoding gives the mental health index score.

Table 3.9., Coding rules for MHI items used to score the Mental Health Index

Item Number	Code value	Recoded value
1,4,5,6,7,8,10,12,14,17,18,22,23,26,31,34,37	1	6
	2	5
	3	4
	4	3
	5	2
	6	1
2,3,11,13,15,16,19,20,21,24,25,27,29,30,32,33,35,36	1	1
	2	2
	3	3
	4	4
	5	5
	6	6
9,28	1	1
	2	2
	3	3
	4	4
	5	5

3.4.6 Demographic Sheet

The demographic details such as gender, age, family type, location and income status can be collected through demographic sheet. It is semi-structured closed type of questionnaire and consists of questions related demographic and personal information. The demographic details ‘age’ has three responses namely age group between 15 and 25 years old, between 26 and 35 years old, and between 36 and 65 years, gender contains responses as female and male, family type as joint and nuclear, location as urban and rural, and income status in short monthly income of family in Indian rupees as three response low income (less than 15,000), middle income (from 15,001 - 30,000) and high income (more than 30,001). This demographic sheet has filled based on information gathered from respondents along with other measurements.

3.5 Summary

The objectives, hypotheses, research design, sampling, and measuring tools are key preliminary aspects in research process. The chapter started with objectives of present study aimed to assess the level of social support, resilience, self-esteem, and mental health among obese and non-obese people, to examine their mean difference, to identify their relationships, to predict their influence on mental health among obese and non-obese. Further, aimed to know age, gender, family, location and income difference of these said variables. The title hypotheses of the study include seven different hypotheses based on objectives of this study. Type of study and sampling technique, about variables, and measuring tools were listed in detailed in this chapter.

CHAPTER-04

INTERPRETATIONS OF RESULTS

The aim of present study was to access the level of social support, resilience, self-esteem and mental health among obese and non-obese individuals. The study also aimed to find the relationship among social support, resilience and self-esteem, and mental health. Further, to investigate mean difference in social support, resilience, self-esteem and mental health with respect to demographic variables age, gender, family type, location, and income status. To achieve the objectives of the study the data were collected through standardized measuring tools from the sample of 600 respondents, equally distributed as 300 obese and 300 non-obese respondents. The test of normality has carried to know pattern of distributions. Further, the dataset was systematically categorized into groups and was statistically analysed by using appropriate statistical tools to check the mean difference and relationship between the variables. To check the normality of data Kolmogorov-Smirnova and Shapiro-Wilk test were used and for mean differences Mann-Whitney Test and Kruskal-Wallis Test were applied as the data was not normally distributed.

4.1 Data Analysis

4.1.1 Coding

It is important to code and pre-analyse the obtained data before to be carried in SPSS and other parametric test tools. The demographic variable has coded in numerical number as gender (Female =1 and Male =1), Age (15-25 Years =1, 26-35 years = 2, and 36 – 65 years = 3), family type (Joint =1 and Nuclear =2), location (Urban=1, and Rural=2) and income status (Low income – less than 15,000 INR = 1, Middle income - between 15,001 and 30,000 INR = 2, High income – more than 30,001 INR =3). The person with body mass index above 30 Kg/cm² as code 1 (obese) and below 29.9 kg/cm² as code 2 (non-obese). The coded dataset with datasets from psychological measuring tools were analysed to fit ideal assumptions based on the objectives and hypotheses formulated through appropriate statistical calculation.

4.1.2. Normality

The observations in the measured variables have to be distributed as normal distribution. In normal distribution, the skewness is zero or nearer to zero. Many statistical functions needed distribution to be normal or nearly normal. In statistics, normality tests help us to determine the distribution lies whether a data set in normal or non-normal distribution. In general, skewness is a measure of the asymmetry in the probability curve, and explains the pattern of distribution and direction of skew which can be positive or negative, or even undefined. The negative skewness denote dataset skewed in left side or left of mean, while positive indicate data that are skewed right. If datasets are symmetrical, then skewness is 0. The distributions are in highly skewed if skewness is less than -1 or greater than 1, and moderately skewed if it is between -1 and -0.5 or between 0.5 and 1. It is almost symmetric, if it is between -0.5 and 0.5. The Kurtosis value explains us the height and sharpness of the central peak with respect to standard normal distribution. It is 3 in standard normal distribution and termed as mesokurtic. If it is more than 3 as a thin bell with a high peak called as leptokurtic, while platykurtic as thick and broad peak has kurtosis less than 3. The normality test can be carried by dividing Skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. Test of normality like Kolmogorov-Smirnov test and Shapiro-Wilk test also help us to examine the pattern of distributions. Kolmogorov-Smirnov test is a test of normality especially as nonparametric test to examine whether datasets were in normal distribution. It compares given data with a known distribution and find the pattern of distribution. The SPSS interpretation of the Kolmogorov Smirnov test gives test statistics with a degree of freedom in order to test for normality. It means the given distribution is usually always the normal distribution when p value is above .05. If the p-value is below 0.05 in Kolmogorov-Smirnov test means the concept of normal distribution is rejected and it is statistically significant for non-normal distribution. Similarly, the Shapiro-Wilk test also does exactly the same work as the Kolmogorov-Smirnov test. Both measure the similarity between the given datasets with plane of normal distributions. In Shapiro-Wilk test, normally it

designed as in normal distribution pattern which means p value above .05 showed normal distribution.

Table 4.1., *Tests of Normality in social support, resilience, self-esteem and mental health with respect to overall study population (600)*

Variables	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Social Support	.228	600	.000	.875	600	.000
Resilience	.208	600	.000	.916	600	.000
Self-esteem	.112	600	.000	.977	600	.000
Mental Health	.087	600	.000	.968	600	.000

Table 4.1 described normality test carried in SPSS in relation to social support, psychological resilience, self-esteem and mental health among overall study population using Kolmogorov-Smirnov test and Shapiro-Wilk test. Prior to analysis datasets using Kolmogorov-Smirnov test and Shapiro-Wilk test, the researcher explores the datasets using SPSS version 26 revealed social support showed -1.703 skewness with standard error 0.141 and 2.651 kurtosis with standard error 0.281. Resilience, self-esteem and mental health showed skewness as -0.915, 0.669 and -1.208 respectively with standard error 0.141, and kurtosis mentioned as 1.008, 1.800 and 3.406 respectively with standard error 0.281. The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly we should calculate it by dividing skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. The calculated value for the skewness and kurtosis value of social support, psychological resilience, self-esteem and mental health were not be seen in range from -1.96 to +1.96 which determine the pattern of distribution in above mentioned psychological variable were be in non-normal. Similarly, normality test with Kolmogorov-Smirnova test and Shapiro-Wilk test using SPSS were carried showed level of significance less than .05 with social support, psychological resilience, self-esteem and mental health determined the

datasets were not in normally distributed, so we should follow non-parametric test for further analysis of these datasets.

Table 4.2., *Tests of Normality in social support with respect to demographic variables*

Demographic Variables		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Age	15 to 25 years	.125	162	.000	.915	162	.000
	26 to 35 years	.248	180	.000	.874	180	.000
	36 to 65 years	.284	258	.000	.840	258	.000
Gender	Male	.202	213	.000	.914	213	.000
	Female	.242	387	.000	.847	387	.000
Family Type	Joint	.229	184	.000	.854	184	.000
	Nuclear	.228	416	.000	.883	416	.000
Location	Urban	.147	256	.000	.918	256	.000
	Rural	.287	344	.000	.828	344	.000
Income Status	Less than 15,000	.297	390	.000	.805	390	.000
	15,001 to 30,000	.096	130	.005	.945	130	.000
	More than 30,001	.085	80	.200	.963	80	.021

Table 4.2 represents normality test carried in SPSS in relation to social support with respect to demographic variables such as age, gender, family type, location and income status among overall study population using Kolmogorov-Smirnov test and Shapiro-Wilk test. The researcher explores the datasets using SPSS version 26 revealed social support with respect to age have -.924 Skewness with standard error 0.191 and .115 kurtosis with standard error .379 among age group 15 to 25 years, -1.091 Skewness with standard error 0.181 and .429 kurtosis with standard error .360 among age group 26 to 35 years, and -1.315 Skewness with standard error 0.152 and 1.148 kurtosis with standard error .302 among age group above 35 years. The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly

we should calculate it by dividing skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. Social support with respect to gender have -.830 skewness with standard error 0.167 and -.114 kurtosis with standard error .332 among male and -1.346 skewness with standard error 0.124 and 1.230 kurtosis with standard error .247 among female. Likewise, social support with respect to family type have -1.403 skewness with standard error 0.179 and 1.704 kurtosis with standard error .356 among joint family type and -1.042 skewness with standard error .120, and .279 kurtosis with standard error .239 among nuclear family. Social support with respect to location have -.888 skewness with standard error 0.152 and .048 kurtosis with standard error .356 among urban people and -.888 skewness with standard error .152, and .048 kurtosis with standard error .303 among rural people. Social support dataset with respect to income status have -1.625 Skewness with standard error 0.124 and 2.427 kurtosis with standard error .247 among income below 15,000 INR, -.613 skewness with standard error .212 and -.498 kurtosis with standard error .422 among income between 15,001 and 30,000 INR, and -.371 skewness with standard error .269 and -.658 kurtosis with standard error .532 among income above 30,001 INR.

The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly we should calculate it by dividing skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. The calculated value for the skewness and kurtosis value of social support with respect to age were not be seen in range from -1.96 to +1.96 which determine the pattern of distribution in above mentioned psychological variable were be in non-normal. The normality test with Kolmogorov-Smirnova test and Shapiro-Wilk test using SPSS were carried showed level of significance less than .05 in social support with respect to demographic variable such as age, gender, family type, location and income status except social support dataset with respect to income status above 30,001 INR. These determined the datasets were not in normally distributed and further data analysis to be carried using non-parametric test.

Table 4.3., Tests of Normality in resilience with respect to demographic variables

Demographic Variables		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Age	15 to 25 years	.095	162	.001	.976	162	.006
	26 to 35 years	.230	180	.000	.909	180	.000
	36 to 65 years	.258	258	.000	.838	258	.000
Gender	Male	.176	213	.000	.922	213	.000
	Female	.233	387	.000	.911	387	.000
Family Type	Joint	.185	184	.000	.911	184	.000
	Nuclear	.218	416	.000	.915	416	.000
Location	Urban	.107	256	.000	.968	256	.000
	Rural	.281	344	.000	.856	344	.000
Income Status	Less than 15,000	.296	390	.000	.845	390	.000
	15,001 to 30,000	.077	130	.056	.983	130	.107
	More than 30,001	.089	80	.180	.975	80	.114

Table 4.3 represents normality test carried in SPSS in relation to resilience with respect to demographic variables such as age, gender, family type, location and income status among overall study population using Kolmogorov-Smirnov test and Shapiro-Wilk test. The researcher explores the datasets using SPSS version 26 revealed psychological resilience with respect to age have -.287 skewness with standard error 0.191 and -.584 kurtosis with standard error .379 among age group 15 to 25 years, -.804 Skewness with standard error 0.181 and .465 kurtosis with standard error .360 among age group 26 to 35 years, and -1.206 skewness with standard error 0.152 and 2.075 kurtosis with standard error .302 among age group above 35 years. Resilience with respect to gender have -.786 skewness with standard error 0.167 and .181 kurtosis with standard error .332 among male and -1.346 skewness with standard error 0.124 and .346 kurtosis with standard error .247 among female. Likewise, social support with respect to family type have -.840 skewness with standard error 0.179 and .711 kurtosis with standard error .356 among joint family

type and -.755 skewness with standard error .120, and .228 kurtosis with standard error .239 among nuclear family. Resilience with respect to location have -.460 skewness with standard error 0.152 and -.133 kurtosis with standard error .303 among urban people and -1.050 Skewness with standard error .131, and 1.144 kurtosis with standard error .262 among rural people. Resilience dataset with respect to income status have -1.101 skewness with standard error 0.124 and 1.731 kurtosis with standard error .247 among income below 15,000 INR, -.324 skewness with standard error .212 and -.171 kurtosis with standard error .422 among income between 15,001 and 30,000 INR, and -.274 skewness with standard error .269 and -.692 kurtosis with standard error .532 among income above 30,001 INR.

The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly we should calculate it by dividing skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. The calculated value for the Skewness and kurtosis value of social support with respect to age were not be seen in range from -1.96 to +1.96 which determine the pattern of distribution in psychological resilience were be in non-normal. The normality test with Kolmogorov-Smirnova test and Shapiro-Wilk test showed level of significance less than .05 in psychological resilience with respect to demographic variable such as age, gender, family type, location and income status except psychological resilience dataset with respect to income status between 15,001, and 30,000, and above 30,001 INR. These determined the datasets were not in normally distributed and further data analysis to be carried using non-parametric test.

Table 4.4., Tests of normality in self-esteem with respect to demographic variables

Demographic Variables		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Age	15 to 25 years	.101	162	.000	.976	162	.006
	26 to 35 years	.093	180	.001	.982	180	.020
	36 to 65 years	.116	258	.000	.978	258	.001
Gender	Male	.101	213	.000	.984	213	.016
	Female	.118	387	.000	.969	387	.000

Family Type	Joint	.113	184	.000	.972	184	.001
	Nuclear	.112	416	.000	.976	416	.000
Location	Urban	.097	256	.000	.980	256	.001
	Rural	.125	344	.000	.976	344	.000
Income Status	Less than 15,000	.129	390	.000	.969	390	.000
	15,001 to 30,000	.104	130	.002	.978	130	.031
	More than 30,001	.095	80	.072	.972	80	.076

Table 4.4 represents normality test carried in SPSS in relation to self-esteem with respect to demographic variables such as age, gender, family type, location and income status among overall study population using Kolmogorov-Smirnov test and Shapiro-Wilk test. The researcher explores the datasets using SPSS version 26 revealed self-esteem with respect to age have .309 skewness with standard error 0.191 and .001 kurtosis with standard error .379 among age group 15 to 25 years, .178 skewness with standard error 0.181 and .617 kurtosis with standard error .360 among age group 26 to 35 years, and .102 skewness with standard error 0.152 and .563 kurtosis with standard error .302 among age group above 35 years. Self-esteem with respect to gender have .189 skewness with standard error 0.167 and .227 kurtosis with standard error .332 among male and .435 skewness with standard error .124 and .957 kurtosis with standard error .247 among female. Likewise, self-esteem with respect to family type have .496 skewness with standard error 0.179 and .792 kurtosis with standard error .356 among joint family type and .280 skewness with standard error .120, and .588 kurtosis with standard error .239 among nuclear family. Self-esteem with respect to location have .227 skewness with standard error 0.152 and .210 kurtosis with standard error .303 among urban people and .403 skewness with standard error .131, and .454 kurtosis with standard error .262 among rural people. Self-esteem dataset with respect to income status have .448 skewness with standard error 0.124 and .773 kurtosis with standard error .247 among income below 15,000 INR, .306 skewness with standard error .212 and .324 kurtosis with standard error .422 among income between 15,001 and 30,000 INR, and .258 skewness with standard error .269 and -.563 kurtosis with standard error .532 among income above 30,001 INR.

The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly we should calculate it by dividing Skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. The calculated value for the skewness and kurtosis value of social support with respect to age were not be seen in range from -1.96 to +1.96 which determine the pattern of distribution in psychological resilience were be in non-normal. The normality test with Kolmogorov-Smirnova test and Shapiro-Wilk test using SPSS were carried showed level of significance less than .05 in self-esteem with respect to demographic variable such as age, gender, family type, location and income status except self-esteem dataset with respect to income status above 30,001 INR. These determined the datasets were not in normally distributed and further data analysis to be carried using non-parametric test.

Table 4.5., Tests of normality in mental health with respect to Demographic Variables

Demographic Variables		Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Age	15 to 25 years	.062	162	.200	.987	162	.150
	26 to 35 years	.089	180	.002	.964	180	.000
	36 to 65 years	.116	258	.000	.947	258	.000
Gender	Male	.081	213	.002	.981	213	.006
	Female	.104	387	.000	.957	387	.000
Family Type	Joint	.094	184	.000	.977	184	.003
	Nuclear	.093	416	.000	.964	416	.000
Location	Urban	.077	256	.001	.978	256	.001
	Rural	.099	344	.000	.952	344	.000
Income Status	Less than 15,000	.098	390	.000	.956	390	.000
	15,001 to 30,000	.091	130	.010	.973	130	.011
	More than 30,001	.065	80	.200	.981	80	.271

Table 4.5 represents normality test carried in SPSS in relation to mental health with respect to demographic variables such as age, gender, family type, location and income status among overall study population using Kolmogorov-Smirnov test and Shapiro-Wilk test. The researcher explores the datasets using SPSS version 26 revealed mental health with respect to age have -.095 skewness with standard error 0.191 and .565 kurtosis with standard error .379 among age group 15 to 25 years, -.242 skewness with standard error 0.181 and 1.834 kurtosis with standard error .360 among age group 26 to 35 years, and .056 skewness with standard error 0.152 and 1.798 kurtosis with standard error .302 among age group above 35 years. Mental health with respect to gender have .094 skewness with standard error .167 and .754 kurtosis with standard error .332 among male and -.312 Skewness with standard error .124 and 1.977 kurtosis with standard error .247 among female. Likewise, mental health with respect to family type have -.078 skewness with standard error 0.179 and 1.113 kurtosis with standard error .356 among joint family type and -.113 skewness with standard error .120, and 1.573 kurtosis with standard error .239 among nuclear family. Mental health with respect to location have -.307 skewness with standard error 0.152 and .617 kurtosis with standard error .303 among urban people and -.088 skewness with standard error .131, and 2.793 kurtosis with standard error .262 among rural people. Mental health dataset with respect to income status have .159 skewness with standard error 0.124 and 2.380 kurtosis with standard error .247 among income below 15,000 INR, -.434 skewness with standard error .212 and .5.3 kurtosis with standard error .422 among income between 15,001 and 30,000 INR, and -.366 skewness with standard error .269 and -.040 kurtosis with standard error .532 among income above 30,001 INR.

The skewness and kurtosis values should be very close to zero, but in real situations datasets are often skewed and kurtotic in nature. A small variation from zero may be considered as routine. As to know nature of distribution exactly we should calculate it by dividing skewness and kurtosis value by their standard error which would be somewhere between -1.96 and +1.96. The calculated value for the skewness and kurtosis value of social support with respect to age were not be seen in range from -1.96 to +1.96 which determine the pattern of distribution in psychological resilience were be in non-normal. The normality

test with Kolmogorov-Smirnova test and Shapiro-Wilk test using SPSS were carried showed level of significance less than .05 in mental health with respect to demographic variable such as age, gender, family type, location and income status except mental health dataset with respect to age group between 15 and 25 years, and income status above 30,001 INR. These determined the datasets were not in normally distributed and further data analysis to be carried using non-parametric test.

4.2. Descriptive Statistical Analysis

In this section, the researcher described about the distributions of sample with respective to demographic variables such as age, gender, family type, location and income status among obese and non-obese, and respective mean and standard deviation. The samples were collected was through purposive sampling technique and the frequency of distribution among obese and non-obese were not accurate and it was approximate proportion between obese and non-obese. The obese and non-obese data were equally collected among population, but it showed proportional variation between obese and non-obese population.

Table 4.6., Demographic variables in the study among obese (300) and non-obese (300)

Variable	Sub Category	Obese	Non-obese
Age	15 to 25 years	49	113
	26 to 35 years	92	88
	Above 35 years	159	99
Gender	Male	84	129
	Female	216	171
Family Type	Joint	92	92
	Nuclear	208	208
Location	Urban	106	150
	Rural	194	150
Income Status	Less than 15,000 INR	223	167
	15,001 to 30,000 INR	50	80
	More than 30,001 INR	27	53

Figure 4.1., Graphical representation of demographic variables of obese and Non-obese

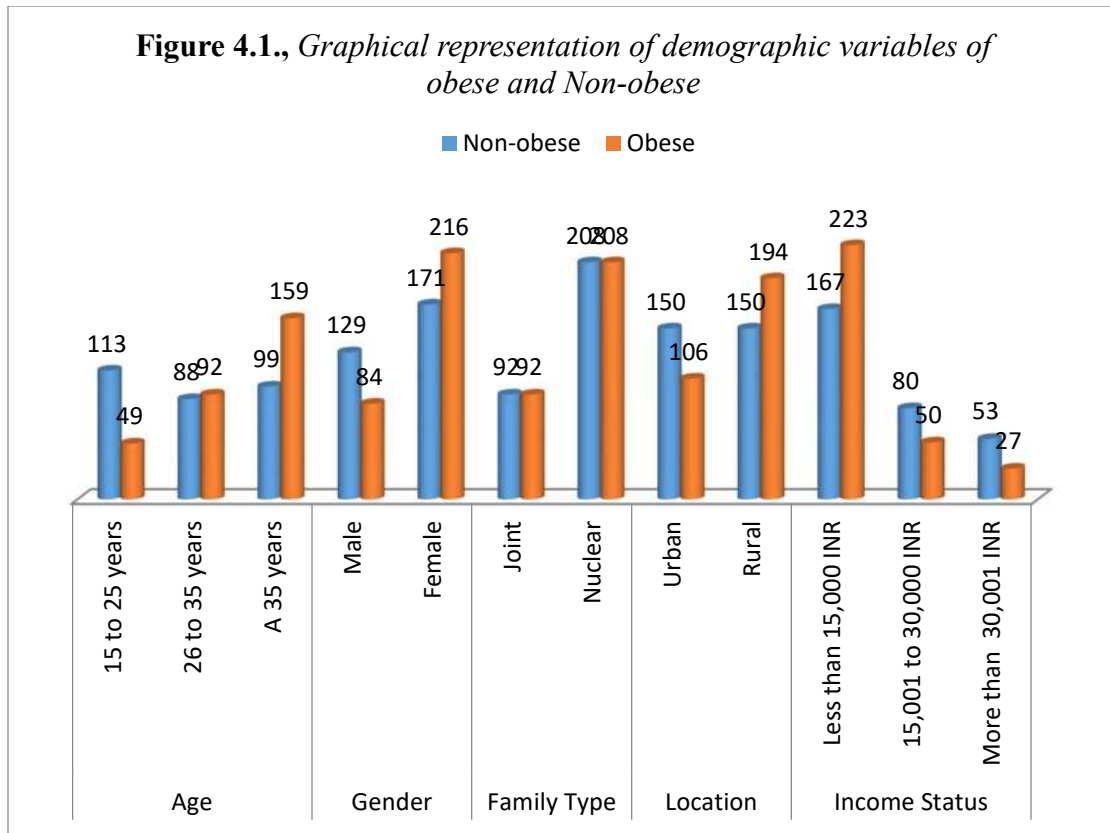


Table 4.7., Descriptive details with respect to age among obese (300) and non-obese (300)

Age Group	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
15 to 25	49	16	113	38
26 to 35	92	31	88	29
Above 35 years	159	53	99	33
Total	300	100	300	100

Figure. 4.2., *Graphical representation of distribution of obese with respect to age*

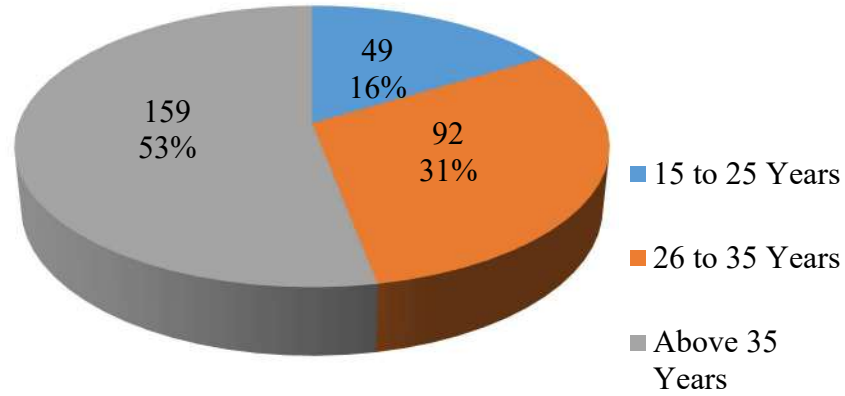


Figure 4.3., *Graphical representation of distribution of Non-obese with respect to age*

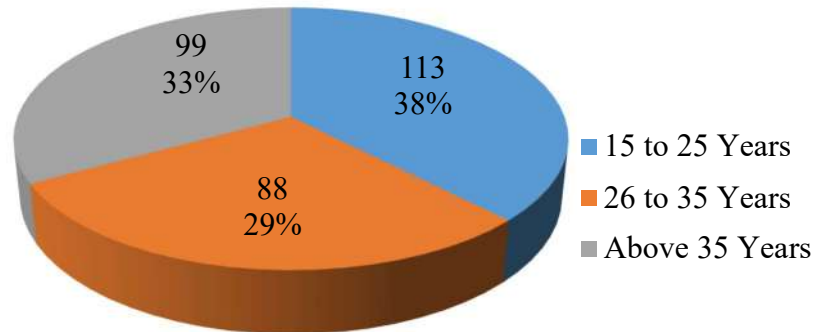


Table 4.7 and Figure 4.2 and 4.3 represented descriptive details related to frequency of obese and non-obese with respect to age group. The age group in between 15 and 25 years have 38% non-obese and only 16% obese population. Among 26 to 35 years age people there was 29% non-obese and 31% obese population, whereas samples with age group above 35 years have showed 33% non-obese and 53% obese. These interpretations revealed age group from 15 to 25 years have less obese percentage than non-obese. But, it was opposite among age group above 25 years where obese percentage was higher than non-obese. But middle age group with age between 25 and 35 years have more or less same percentages.

Table 4.8., *Descriptive details with respect to gender among obese (300) and non-obese (300)*

Gender	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
Male	84	28	129	43
Female	216	72	171	57
Total	300	100	300	100

Figure 4.4., *Graphical representation of distribution of obese with respect to gender*

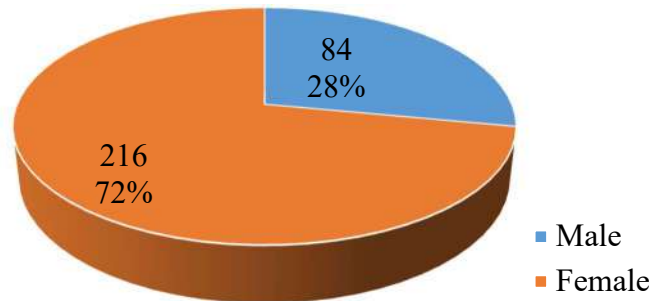


Figure 4.5., *Graphical representation of distribution of non-obese with respect to gender*

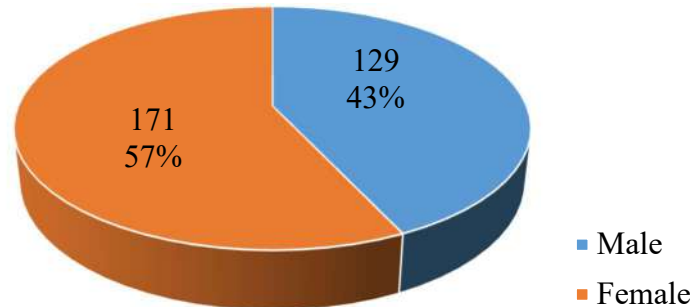


Table 4.8 and Figure 4.4 and 4.5 represented descriptive details related to frequency of obese and non-obese with respect to gender in which female population have 57 % non-obese and 72% obese, while male population have 43% non-obese and 28% obese. Obese percentage was more among female than male population.

Table 4.9., *Descriptive details with respect to family type among obese (300) and non-obese (300)*

Family type	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
Joint	92	31	92	31
Nuclear	208	69	208	69
Total	300	100	300	100

Figure. 4.6., *Graphical representation of distribution of obese with respect to family type*

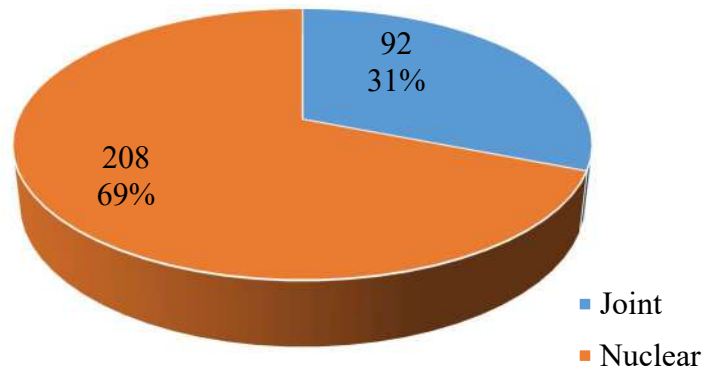


Figure 4.7., *Graphical representation of distribution of non-obese with respect to family type*

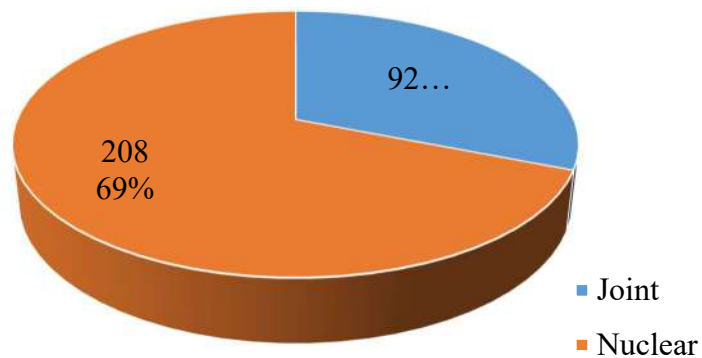


Table 4.9 and Figure 4.6 and 4.7 represented descriptive details related to frequency of obese and non-obese with respect to family type in which non-obese and obese have equal frequency of observation with respect to joint family as 31%, as well as with respect

to nuclear family 69%. Among family type irrespective of obese and non-obese, frequency of observation was higher in nuclear family type.

Table 4.10., *Descriptive details with respect to location among obese (300) and non-obese (300)*

Location	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
Urban	106	35	150	50
Rural	194	65	150	50
Total	300	100	300	100

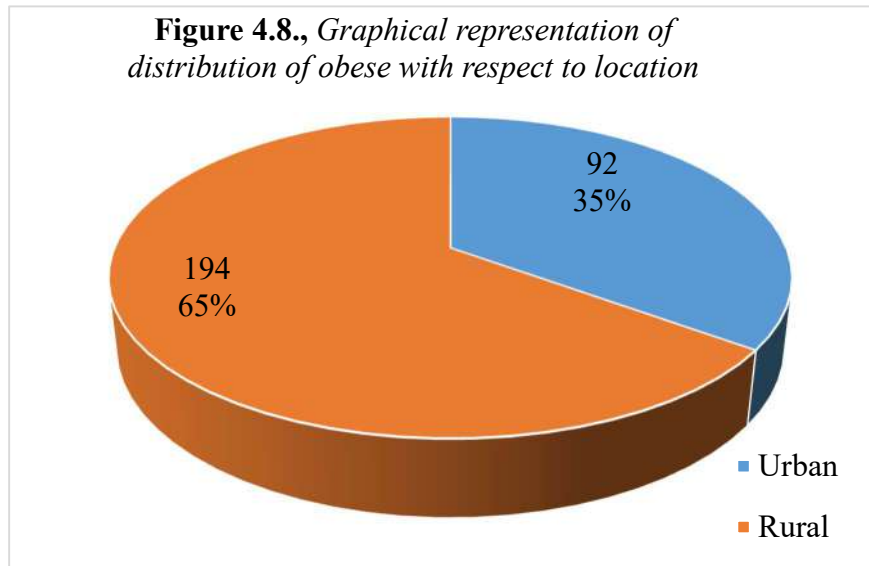


Figure 4.9., Graphical representation of distribution of non-obese with respect to location

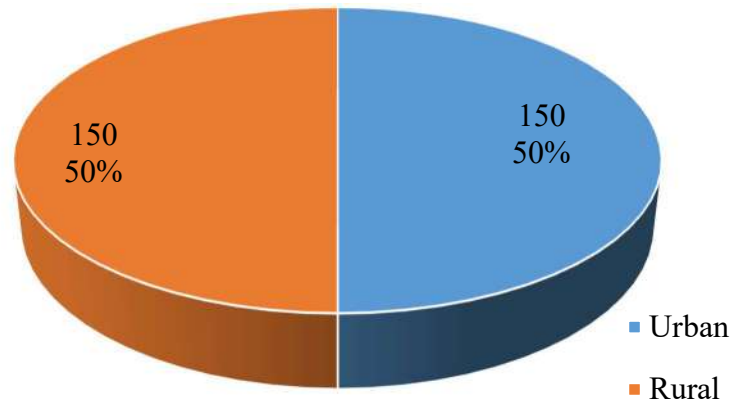


Table 4.9 and Figure 4.8 and 4.9 represented descriptive details related to frequency of obese and non-obese with respect to location in which urban and rural have equal frequency of observation in non-obese as 31%, whereas obese observations were more among rural population as 65% and urban as 35%. Among urbanized society frequency of non-obese was more than rural society.

Table 4.11., Descriptive details with respect to income status among obese (300) non-obese (300)

Income status	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
Below 15,001 INR	223	74	167	55
15,001 to 30,000 INR	50	17	80	27
Above 30,001 INR	27	9	53	18
Total	300	100	300	100

Figure. 4.10., *Graphical representation of distribution of obese with respect to income status*

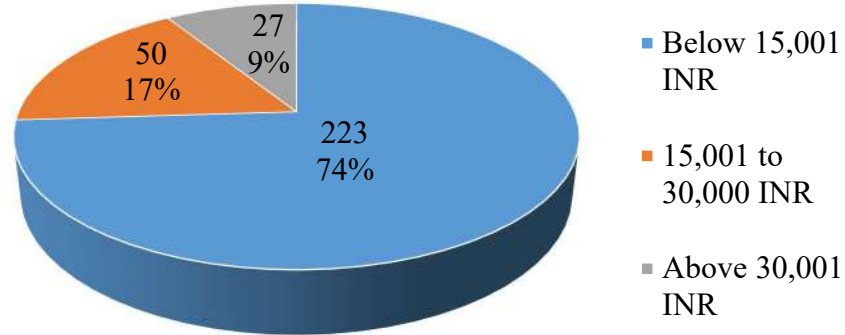


Figure 4.11., *Graphical representation of distribution of non-obese with respect to income status*

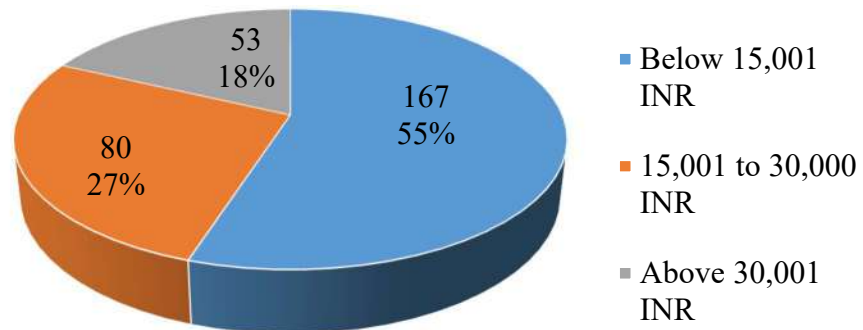


Table 4.11 and Figure 4.10 and 4.11 represented descriptive details related to frequency of obese and non-obese with respect to income status. The frequency of obese was more among low-income people than middle-income and high-income people, whereas non-obese have higher frequency among middle-income and high-income people.

4.2.1 Social Support

The pattern of distribution in social support datasets were not normally distributed as shown in normality test. Descriptive statistics details with respect to social support were categorized based on its grading as per the multidimensional perceived social support (MDPSS) scale as low, moderate and high social support. The low score in social support ranges from 12 to 33, moderate score ranges from 34 to 60, and high score ranges from 61 to 84. Social support has overall mean as 63.63 and standard deviation as 15.97, and it have

12 as minimum score and 84 as maximum score with range 72. Social support has -1.141 skewness with .100 as standard error and .611 kurtosis with .199 as standard error, these calculations were not be seen in range from -1.96 to +1.96 which tells dataset was not normally distributed.

Table 4.12., *Descriptive details in level of social support among obese (300) and non-obese (300)*

Social Support	Range	Obese		Non-obese	
		Frequency	Percentage	Frequency	Percentage
Low	12 – 33	17	6	29	10
Moderate	34 – 60	54	18	100	33
High	61 – 84	229	76	171	57
Total		300	100	300	100

Figure 4.12., *Graphical representation in level of social support among obese*

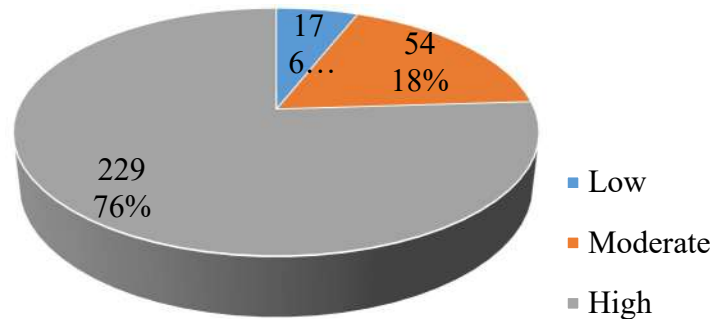


Figure 4.13., *Graphical representation in level of social support among non-obese*

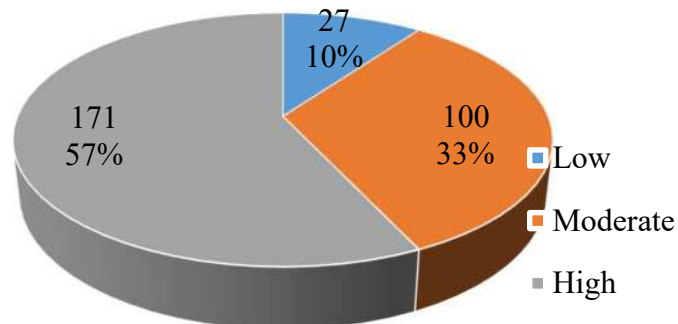


Table 4.12 and Figure 4.12 and 4.13 represented frequency of observation in level of social support in which 76% of obese people have scored high social support in compare to 57% of non-obese people which revealed high social support shift energy balance towards positive side to gain body weight. Low social support has seen among 10% of non-obese and 6% of obese. Similarly, 33% non-obese people have scored moderate social support in compare to 18% of obese people.

4.2.2 Resilience

The pattern of distribution in psychological resilience datasets were not normally distributed as shown in normality test. Descriptive statistics details with respect to psychological resilience were categorized based on its grading as per the Psychological Resilience scale which revealed on the basis of z-score. The z-score can be calculated to know definite mean difference for individual score and level of psychological resilience as extremely low, low, below average, average, above average, high and extremely high. It is calculated by a Formula,

$$Z = (x - M) / \sigma$$

Where, Z= standard score.

x = Observed value

M = mean of the sample

σ = standard deviation of the sample

The researcher has calculated z-scores from the observations and relation with overall mean and standard deviation. Based on raw score and z-score, the observed psychological resilience has categorized. The extremely low score in psychological resilience as below 49, low score ranges from 50 to 60, below average score ranges from 61 to 70, average scores range from 71 to 84, above average score ranges from 85 to 95, high score ranges from 96 to 105, and extremely high score as above 106. psychological resilience has overall mean as 77.27 and standard deviation as 14.02, and it have 33 as minimum score and 105 as maximum score with range 72. psychological resilience has -.780 skewness with .100 as standard error and .371 kurtosis with .199 as standard error,

these calculations were not be seen in range from -1.96 to +1.96 which tells dataset was not normally distributed.

Table 4.13., *Descriptive details in level of resilience among obese (300) and non-obese (300)*

Resilience	Raw Score Range	Z-Score Range	Obese		Non-obese	
			Frequency	%	Frequency	%
Extremely Low	< 49	-2.01& below	10	3	17	6
Low	50 - 60	-2.00 to -1.26	21	7	39	13
Below Average	61 - 70	-1.25 to -0.51	31	10	45	15
Average	71 - 84	-.050 to 0.50	190	63	141	47
Above average	85 - 95	0.51 to 1.25	27	9	37	12
High	96 - 105	1.26 to 2.00	21	7	21	7
Extremely High	> 106	2.00 & above	-	-	-	-
Total			300	100	300	100

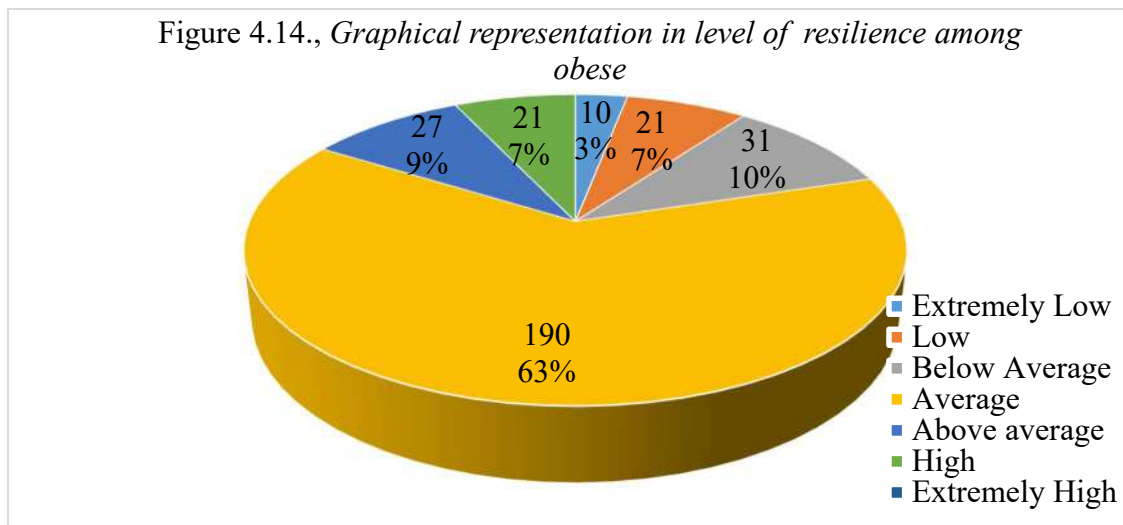


Figure 4.15., Graphical representation in level of resilience among non-obese

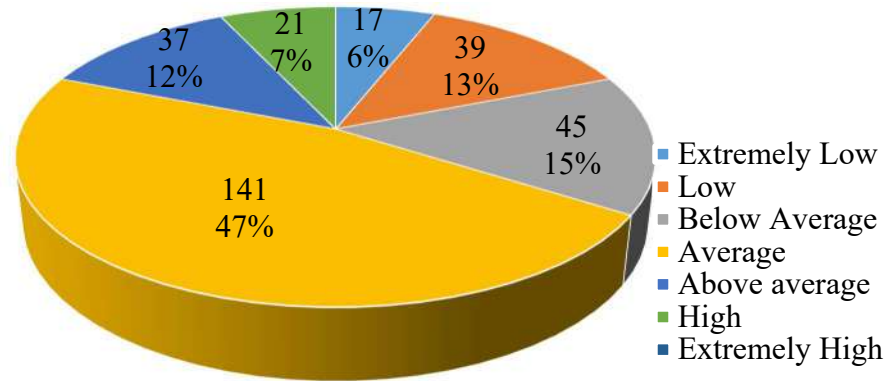


Table 4.13 and Figure 4.14 and 4.15 represented frequency of observation in level of psychological resilience in which 63% of obese people have scored average psychological resilience in compare to 47% of non-obese people which revealed obese people have comparatively more average psychological resilience than non-obese. The psychological resilience score with respect to obese 3% of them have extremely low, 7% as low, while non-obese it was double 6% extremely low and 13% low. High and extremely high level were almost same among obese and non-obese.

4.2.3 Self-esteem

The pattern of distribution in self-esteem datasets were not normally distributed as shown in normality test. Descriptive statistics details with respect to self-esteem were categorized based on its grading as per the Rosenberg self-esteem scale as very low, low, average and high self-esteem. The very low score in self-esteem ranges from 0 to 15, low score range as 16 to 25, average score ranges from 26 to 35, and high score ranges from 36 to 40. Self-esteem have overall mean as 21.63 and standard deviation as 3.67, and it have 12 as minimum score and 34 as maximum score with range 22. Self-esteem has .344 skewness with .100 as standard error and .630 kurtosis with .199 as standard error, these calculations were not be seen in range from -1.96 to +1.96 which tells dataset was not normally distributed.

Table 4.14., *Descriptive details in level of self-esteem among obese (300) and non-obese (300)*

Self-esteem	Range	Obese		Non-obese	
		Frequency	Percentage	Frequency	Percentage
Very Low	0 - 15	5	2	22	7
Low	16 - 25	267	89	217	73
Average	26 - 35	28	9	61	20
High	36 - 40	5	2	0	0
Total		300	100	300	100

Figure 4.16., *Graphical representation in level of self-esteem among obese*

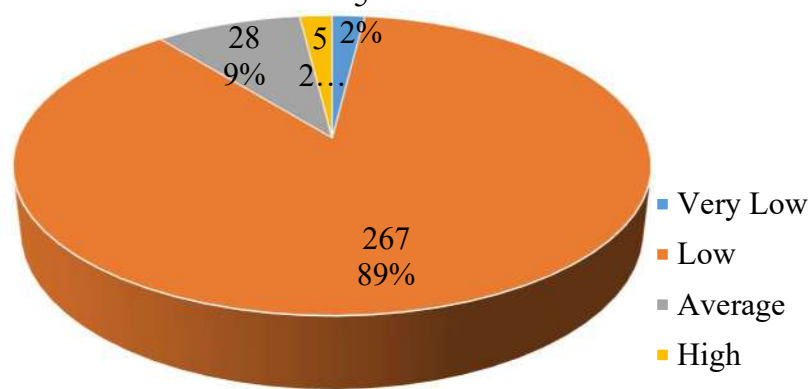


Figure 4.17., *Graphical representation in level of self-esteem among non-obese*

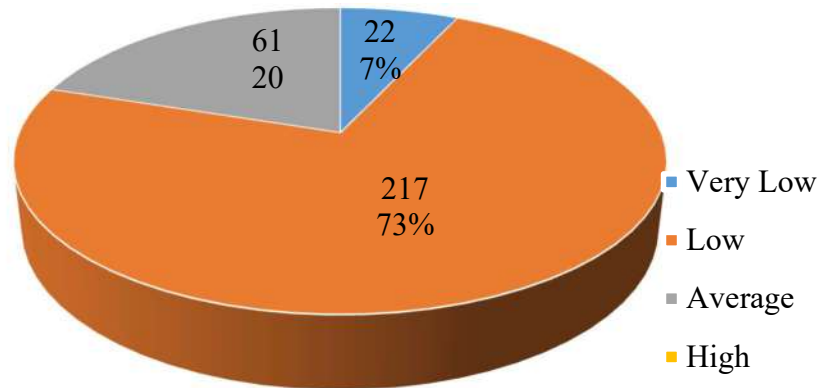


Table 4.14 and Figure 4.16 and 4.17 represented frequency of observation in level of self-esteem in which 89% of obese people have scored low social support in compare to 73% of non-obese people which revealed obese individual under estimate about themselves

more than non-obese. 5% of obese have scored high self-esteem while there were no high self-esteem people among non-obese. Very low self-esteem has seen among 2% of obese which was tripled as 7% in non-obese. 20% of non-obese have scored average self-esteem while it was 9% among obese people.

4.2.4 Mental Health

The pattern of distribution in mental health datasets were not normally distributed as shown in normality test. Descriptive statistics details with respect to mental health were categorized based on its grading as per the Mental Health Inventory (MHI38) and manipulated on the basis of z-score. The z-score can be calculated to know definite mean difference for individual score and level of psychological resilience as extremely low, low, below average, average, above average, high and extremely high. It is calculated by a Formula,

$$Z = (\bar{x} - M)/\sigma$$

Where, Z= standard score.

$\bar{x}$ = Observed value

M = mean of the sample

σ = standard deviation of the sample

The researcher has calculated z-scores from the observations and relation with overall mean and standard deviation. Based on raw score and z-score, the observed mental health has categorized. The extremely low score in mental health as from 38 to 100, low score ranges from 101 to 114, below average score ranges from 115 to 129, average scores range from 130 to 149, above average score ranges from 150 to 164, high score ranges from 165 to 179, and extremely high score as above 180. mental health has overall mean as 139.61 and standard deviation as 20.13, and it have 57 as minimum score and 203 as maximum score with range 146. mental health has -.122 skewness with .100 as standard error and 1.473 kurtosis with .199 as standard error, these calculations were not be seen in range from -1.96 to +1.96 which tells dataset was not normally distributed.

Table 4.15., *Descriptive details in level of mental health among obese (300) and non-obese (300)*

<i>Mental Health</i>	<i>Raw Score Range</i>	<i>Z-Score Range</i>	<i>Obese</i>		<i>Non-obese</i>	
			<i>Frequency</i>	<i>%</i>	<i>Frequency</i>	<i>%</i>
Extremely Low	38 - 100	-2.01& below	9	3	12	4
Low	101 - 114	-2.00 to -1.26	14	5	13	4
Below Average	115 - 129	-1.25 to -0.51	46	15	44	15
Average	130 - 149	-.050 to 0.50	196	65	120	40
Above average	150 - 164	0.51 to 1.25	29	10	54	18
High	165 - 179	1.26 to 2.00	6	2	32	11
Extremely High	180 & above	2.00 & above	0	0	25	8
Total			300	100	300	100

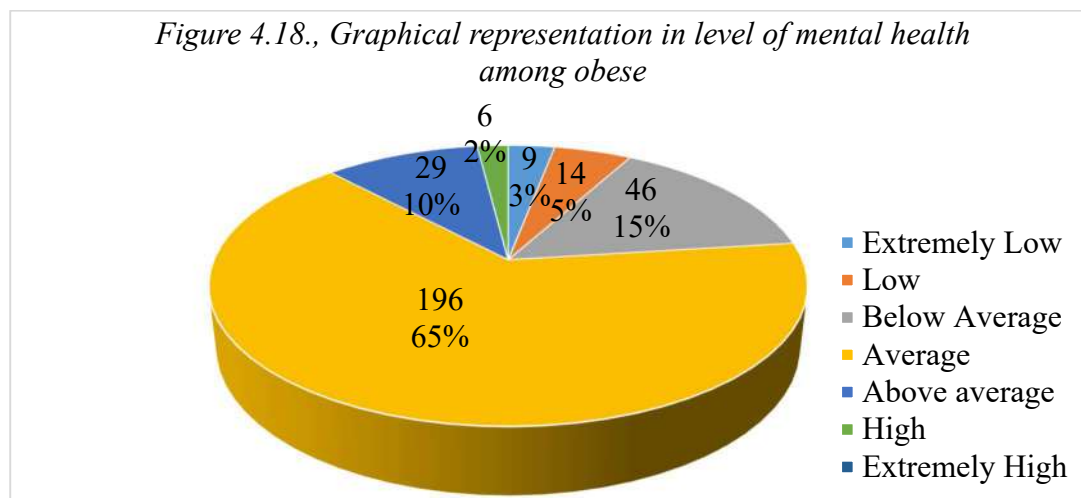


Figure 4.19., Graphical representation in level of mental health among non-obese

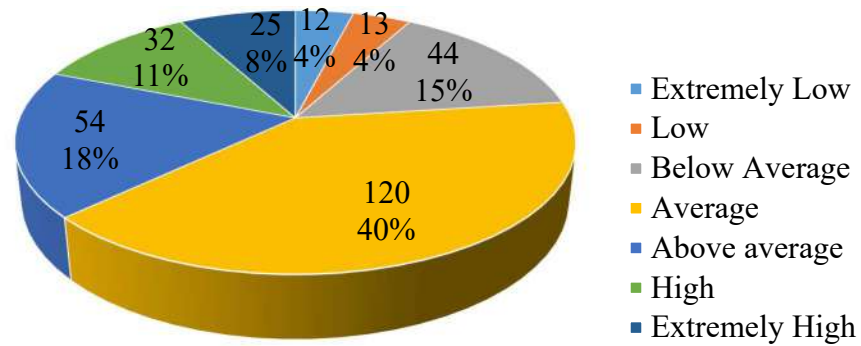


Table 4.15 and Figure 4.18 and 4.19 represented frequency of observation in level of mental health in which 65% of obese people have scored average mental health in compare to 40% of non-obese people which revealed obese population have comparatively more average level of mental health than non-obese. But above average, high and extremely high level of mental health were more in non-obese than obese population. Non-obese have 18% above average level, 11% high and 8% extremely high level of mental health in compare to 10% above average and 2% high level in obese population. While below average, low and extremely low level of mental health were almost equal in both non-obese and obese population. Non-obese and obese have 15% of below average level of mental health with each other. Similarly low level of mental health in non-obese were 4%, and obese were 5%, and extremely low level in non-obese as 4% and obese as 3%.

4.3 Mean and standard deviation

Table 4.16., Mean and standard deviation of body mass index, social support, resilience, self-esteem and mental health.

Variables	Obese (300)		Non-obese (300)	
	Mean	Std. Deviation	Mean	Std. Deviation
Body Mass Index	33.45	2.85	23.78	3.71
Social Support	66.26	14.26	61.01	16.89
Resilience	79.74	12.81	74.80	14.75
Self-Esteem	21.45	2.92	21.82	4.28
Mental Health	135.6	15.56	143.61	23.19

Table 4.16 represents mean and standard deviation of body mass index, social support, resilience, self-esteem and mental health among obese and non-obese. The mean of obese is 33.45 which lies in class I obesity and has standard deviation as 2.85, the mean of non-obese is 23.78 which lies under normal weight and standard deviation is 3.71. The social support and resilience have higher mean among obese as 66.26 and 79.74 than non-obese as 61.01 and 74.80 respectively with standard deviation 14.26 and 12.81 in obese and 16.89 and 14.75 respectively. Self-esteem has almost same mean in obese as 21.45 and non-obese as 21.82 with standard deviation 2.92 and 4.28 respectively. In mental health, non-obese scored better mean as 143.61 than obese as 135.6 with 23.19 and 15.56 standard deviation respectively.

4.4 Testing of the Hypotheses

Table 4.17., List of hypotheses and statistical technique used to test them

<i>No</i>	<i>Hypotheses</i>	<i>Statistical Technique</i>
1	There is significant mean difference found in social support, resilience, social support, resilience, self-esteem, and mental health among obese and non-obese people.	Mann-Whitney Test
2	There is significant relationship found between social support, resilience, self-esteem and mental health among obese and non-obese.	Spearman rank order correlation analysis
3	There is significant positive influence of social support, resilience, self-esteem on mental health of obese and non-obese.	Linear regression analysis
4	There is significant mean difference found in respondent's social support with respect to demographic variables (gender, age, family type, location and income status) among obese and non-obese.	Mann-Whitney Test & Kruskal-Wallis Test

- 5 There is significant mean difference found in Mann-Whitney Test & respondent's resilience with respect to Kruskal-Wallis Test demographic variables (gender, age, family type, location and income status) among obese and non-obese.
 - 6 There is significant mean difference found in Mann-Whitney Test & respondent's self-esteem with respect to Kruskal-Wallis Test demographic variables (gender, age, family type, location & income status) among obese and non-obese.
 - 7 There is significant mean difference found in Mann-Whitney Test & respondent's mental health with respect to Kruskal-Wallis Test demographic variables (gender, age, family type, location & income status) among obese and non-obese.
-

4.4.1 Hypothesis-01 (H1)

“There is significant mean difference found in social support, resilience, self-esteem and mental health among obese and non-obese people”.

Mean difference defines difference in mean value between two groups, two variable or between pre-test and post-test. In clinical or applied point of view, it gives an idea about difference in the average score between two groups, or between two variables. In this study, the test of normality showed distributions were in non-normal patterns. Here, the mean difference with datasets in non-normal pattern of distribution have been carried using Mann-Whitney test a non-parametric test for mean difference between two variables. This test is working based on a ranked list of the observations within two groups. The lowest observation in the group is ranked as 1 and the next one as 2, similarly it is going up to the largest observation as 600 which is total sample size in the study. If any observation in given distribution have same value, it is denoted as same rank as an average of the available

rank. For example, if five observations have in the 12th rank as smallest one in the ranking order, it is not ranked as 12th, 13th, 14th, 15th and 16th rank. All such observations are denoted as 14th rank, $(12+13+14+15+16)/5 = 14$. The difference in social support score between obese and non-obese were measured by comparing the sum of the ranks with obese and non-obese groups.

Table 4.18., *Mean difference in social support with respect to obese and non-obese by using Mann-Whitney Test*

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Obese	300	328.02	98406.50	Mann-Whitney U	36743.500	.001
Non-obese	300	272.98	81893.50	Wilcoxon W	81893.500	
Total	600			Z	-3.940	

Table 4.18 revealed mean difference in social support with respect to 300 obese and 300 non-obese using Mann-Whitney test which showed the statistics details necessary for identifying difference in social support score between obese and non-obese groups. The obese group have 300 observations whose mean rank is 328.02 and total sum of ranks is 98406.50, while non-obese group have 300 observations with mean rank is 272.98 and total sum of ranks is 81893.50. Obese group has a larger mean rank than non-obese group. The resultant score in social support have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to obese gives $U_1 = 98406.5 - 300 \times (300 + 1) / 2 = 53,256.5$ and with respect to non-obese $U_2 = 81893.5 - 300 \times (300 + 1) / 2 = 36,746.5$. Among U_1 and U_2 , Mann-Whitney U is 36,746.5 as shown in the table 4.23 which was lower value of U_1 and U_2 . Thus, a Mann-Whitney test indicated that the social support was statistically significant higher value among obese with $N=300$, Median = 72, and mean rank = 328.02 than non-obese $N=300$, Median = 65, and mean rank = 272.98 with Mann-Whitney U = 36743.5, Wilcoxon W = 81893.50, Z = -3.940 $p = .001$. Therefore, the findings of the study among obese

and non-obese support the hypothesis “There is significant mean difference found in social support among obese and non-obese people”. These findings go in line with Vartanian & Silverstein., (2013); Iguacel *et al.*, (2020); Shenk *et al.*, (2021); Christakis & Fowler, (2007); Yourell & Doty, (2021).

Table 4.19., *Mean difference in resilience with respect to obese and non-obese by using Mann-Whitney Test*

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Resilience</i>	<i>Asymp. Sig. (2-tailed)</i>
Obese	300	332.91	99873.00	Mann-Whitney U	35277.000	.001
Non-obese	300	268.09	80427.00	Wilcoxon W	35277.000	
Total	600			Z	-4.678	

Table 4.19 revealed mean difference in psychological resilience with respect to 300 obese and 300 non-obese using Mann-Whitney test which showed the statistics details necessary for identifying difference in psychological resilience score between obese and non-obese groups. The obese group have 300 observations whose mean rank in psychological resilience is 332.91 and total sum of ranks is 99873.00, while non-obese group have 300 observations with mean rank in psychological resilience is 268.09 and total sum of ranks is 80427.00. Obese group has a larger mean rank than non-obese group. The resultant score in social support have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to obese gives $U1 = 99873.00 - 300 \times (300 + 1) / 2 = 54,723.00$ and with respect to non-obese $U2 = 80427.00 - 300 \times (300 + 1) / 2 = 35,277.00$. Among U1 and U2, Mann-Whitney U is 35277.000 as shown in the table 4.24 which was lower value of U1 and U2. Thus, A Mann-Whitney test indicated that the psychological resilience has statistically significant higher value among obese with N=300, Median = 84, and mean rank = 332.91 than non-obese N=300, Median = 78.5, and mean rank = 268.09 with Mann-Whitney U = 35277.00, Wilcoxon W = 35277.00, Z = -4.678 p = .001. The overall mean and standard deviation of

psychological resilience is 77.27 and 14.02 respectively with overall median as 84. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference found in psychological resilience among obese and non-obese people”. These findings go in line with Secer & Yildizhan, (2020); Johnson, (2018); Lutz *et al.*, (2016); Brogan *et al.*, (2012); Ligeza *et al.*, (2022); Wu *et al.*, (2020); Williamson *et al.*, (2021); Foster & Weinstein, (2018); Loi & Cheskin, (2019).

Table 4.20., Mean difference in self-esteem with respect to obese and non-obese by using Mann-Whitney Test

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Self-esteem</i>	<i>Asymp. Sig. (2-tailed)</i>
Obese	300	291.49	87447.50	Mann-Whitney U	42297.500	.201
Non-obese	300	309.51	92852.50	Wilcoxon W	87447.500	
Total	600			Z	-1.279	

Table 4.20 revealed mean difference in self-esteem with respect to 300 obese and 300 non-obese using Mann-Whitney test which showed the statistics details necessary for identifying difference in self-esteem score between obese and non-obese groups. The obese group have 300 observations whose mean rank in self-esteem is 291.49 and total sum of ranks is 87447.50, while non-obese group have 300 observations with mean rank in self-esteem is 309.51 and total sum of ranks is 92852.50. Obese group has a larger mean rank than non-obese group. The resultant score in self-esteem have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to obese gives $U1 = 87447.50 - 300 \times (300 + 1) / 2 = 42,297.50$ and with respect to non-obese $U2 = 92852.50 - 300 \times (300 + 1) / 2 = 47,702.5$. Among U1 and U2, Mann-Whitney U is 42,297.50 as shown in the table 4.24 which was lower value of U1 and U2. A Mann-Whitney test indicated that the self-esteem has statistically no significant higher value between obese and non-obese due to p value above .05. Here, obese people with N=300, Median = 21, and mean rank = 291.49 and non-obese with N=300, Median = 22, and mean rank = 309.51 with Mann-Whitney U = 42297.500,

Wilcoxon $W = 87447.500$, $Z = -1.279$ $p = .201$. The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference found in self-esteem among obese and non-obese people”. These findings go in line towards significance with Ercan & Özcebe, (2020); Almenara *et al.*, (2017); Aggarwal, (2019).

Table 4.21., *Mean difference in mental health with respect to obese and non-obese by using Mann-Whitney Test*

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Mental Health</i>	<i>Asymp. Sig.(2-tailed)</i>
Obese	300	270.18	81053.50	Mann-Whitney U Wilcoxon W Z	35903.500	
Non-obese	300	330.82	99246.50		81053.500	.001
Total	600				-4.286	

Table 4.21 revealed mean difference in mental health with respect to 300 obese and 300 non-obese using Mann-Whitney test which showed the statistics details necessary for identifying difference in mental health score between obese and non-obese groups. The obese group have 300 observations whose mean rank in mental health is 270.18 and total sum of ranks is 81053.50, while non-obese group have 300 observations with mean rank in mental health is 330.82 and total sum of ranks is 99246.50. Non-obese group has a larger mean rank than obese group. The resultant score in social support have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to obese gives $U1 = 81053.50 - 300 \times (300 + 1) / 2 = 35,903.00$ and with respect to non-obese $U2 = 99246.50 - 300 \times (300 + 1) / 2 = 54,096.50$. Among $U1$ and $U2$, Mann-Whitney U is 35277.000 as shown in the table 4.26 which was lower value of $U1$ and $U2$. Thus, A Mann-Whitney test indicated that the mental health have statistically significant higher value among non-obese with $N=300$, Median = 141.5, and mean rank = 330.82 than non-obese $N=300$, Median = 137.00, and mean rank = 270.18

with Mann-Whitney $U = 35903.500$, Wilcoxon $W = 81053.500$, $Z = -4.286$ $p = .001$. The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference found in mental health among obese and non-obese people”. These findings go in line with Knoesen *et al.*, (2010); Sarigiani *et al.*, (2020); Sharafi *et al.*, (2020); Ahuja *et al.*, (2020); Chang & Yen, (2012); Lim *et al.*, (2011); Xie *et al.*, (2005).

4.4.2 Hypothesis-02 (H2)

“There is significant relationship between social support, resilience, self-esteem and mental health among obese and non-obese people”

Correlation co-efficient determines the quality of the relationship between two variables and it have range from -1 to +1. When it is +1 represents that the two variables are perfectly related in a positive way, as -1 states that two variables are in a negative, while a correlation coefficient is represented as zero indicates that there is no linear relationship between the two variables. When correlation co-efficient is closer to zero, represent weak association either positive or negative. If it is closer to +1 indicates strong positive relationship and closer to -1 represents strong negative relationship between two variables. Finding the relationship between two variables is not enough to know only strength and association. Beyond this, the researcher has to get statistically significant in their relationship. Hence, the testing for significance gives us the solution. Calculating correlation co-efficient using SPSS latest version gives the results with statistical significance. The level of significance (p value) is less than .05, if it is more than .05 or above .05 means a lack of significant relationship between two variables usually sample size should be sufficiently large enough to get significant relationship even in small correlation co-efficient. Since the data structure mentioned in this study are in non-normal distribution, the suitable correlation analysis carried to find out the relationships among social support, psychological resilience, self-esteem and mental health is Spearman’s rank correlation which measures the strength and direction of relationship between two ranked variables (Pindikura *et al.*, 2022; Schober *et al.*, 2018; & Beversdorf & Sa, 2011).

Table 4.22., *Correlation analysis of social support, resilience, self-esteem and mental health among obese (300) population using Spearman's rank correlation.*

	<i>Social Support</i>	<i>Resilience</i>	<i>Self-esteem</i>	<i>Mental Health</i>
Social Support	1	.586**	-.236**	.227**
Resilience		1	-.200**	.265**
Self-esteem			1	-.090**
Mental Health				1

Table 4.21 represented correlation analysis between psychological variables such as social support, psychological resilience, self-esteem and mental health among 300 obese population. A Spearman correlation coefficient was carried using SPSS latest version 26 to know significant relationship between social support, psychological resilience, self-esteem and mental health. The Finding shows positive relationship between social support and psychological resilience, correlation coefficient $\sigma = .586$, $p < .001$. Here, the correlation co-efficient value for social support and psychological resilience is .586 with significance at level .001, revealed positive and strong relationship between them. Similarly, there was positive correlation between social support and mental health, $\sigma = .227$, at the level .001. There was negative correlation between social support and self-esteem, $\sigma = -.236$, at the level .001. The finding revealed that the social support has significant moderate positive relationship with resilience and mental health, and have significant negative moderate relationship with self-esteem. Likewise, there was negative correlation between psychological resilience and self-esteem, $\sigma = -.200$, at the level .001. Resilience has positive correlation with mental health and social support, $\sigma = .265$, at the level .001. The findings with respect to psychological resilience showed significant moderate positive relationship with social support and mental health, and have significant moderate relationship with self-esteem. There was negative correlation between self-esteem and mental health, $\sigma = -.090$, at the level .001. The findings with respect to self-

esteem revealed significant moderate negative relationship with social support, psychological resilience and mental health. Thus, the findings with respect to mental health showed significant moderate positive relationship with social support and psychological resilience. Mental health has significant moderate negative relationship with self-esteem as same as social support and psychological resilience with self-esteem.

Table 4.23., *Correlation analysis of social support, resilience, self-esteem and mental health among non-obese (300) population using Spearman's rank correlation.*

	<i>Social Support</i>	<i>Resilience</i>	<i>Self-esteem</i>	<i>Mental Health</i>
Social Support	1	.514**	-.447**	.442**
Resilience		1	-.419**	.353**
Self-esteem			1	-.417**
Mental Health				1

Table 4.23 represented correlation analysis between social support, psychological resilience, self-esteem and mental health among 300 non-obese population. A Spearman's rank correlation coefficient was carried using SPSS latest version 26 to know significant relationship between social support, psychological resilience, self-esteem and mental health. The Finding shows positive relationship between social support and psychological resilience with correlation coefficient $\sigma = .514$, at the level .001. Here, the correlation coefficient value for social support and resilience is .514 with significance at level .001, revealed positive and strong relationship between them. There was positive correlation between social support and mental health, $\sigma = .442$, at the level .001. There was negative correlation between social support and self-esteem, $\sigma = -.447$, at the level .001. The finding revealed the social support have significant moderate positive relationship with psychological resilience and mental health, and have significant negative moderate relationship with self-esteem. Likewise, there was negative correlation between psychological resilience and self-esteem, $\sigma = -.419$, at the level .001. Psychological resilience has positive correlation with mental health, $\sigma = .353$, at the level .001. The

findings with respect to resilience showed significant moderate positive relationship with social support and mental health, and have significant moderate relationship with self-esteem. There was negative correlation between self-esteem and mental health, $\sigma = -.417$, at the level .000. The findings with respect to self-esteem revealed significant moderate negative relationship with social support, resilience and mental health. Thus, the findings with respect to mental health showed significant moderate positive relationship with social support and psychological resilience, and have significant moderate negative relationship with self-esteem as same as social support and psychological resilience. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant relationship between Social support, Resilience, Self-esteem and Mental health among obese and non-obese”. These findings go in line with Yourell & Doty., (2021); McGarrity *et al.*, (2022); Rollins *et al.*, (2022); Li *et al.*, (2021); Ball *et al.*, (2012); Babiss *et al.*, (2009); Kaminsky & Dewey, (2014); Martyn-Nemeth *et al.*, (2009); Franklin *et al.*, (2006); Walker, (1997); Xie *et al.*, (2005); Guevara-Valtier *et al.*, (2021); Yoshida *et al.*, (2020); Huang *et al.*, (2020); Herzer *et al.*, (2011); Foster & Weinstein., (2018); Secer & Yildizhan, (2020); Brogan *et al.*, (2012); Williamson *et al.*, (2021); Toukhsati *et al.*, (2017); Hwang *et al.*, (2016); Jomeena & Martin, (2005); Moksnes & Reidunsdatter, (2019); Almenara *et al.*, (2017); Durso *et al.*, (2016); Prabhu & D'Cunha, (2019).

4.4.3 Hypothesis-03 (H3)

“There is significant positive influence of social support, resilience, and self-esteem on mental health of obese and non-obese people”.

The influence of the social support, resilience, self-esteem on mental health was statistically stated through regression analysis. The values of the criterion variables can be calculated from the observed values of the predictor variables Similarly, the factors which influence the outcome can be determined using regression analysis. Hypothesis three (H3) mentioned in this study stated that “there is significant positive influence of social support, resilience, and self-esteem on mental health of obese and non-obese people”. Linear regression model helps to explore influence of predictor variables on criterion variables. Teran Hidalgo *et al.*, (2018) suggested an appropriate model fit for nonparametric

regression models is with linear smoother form. Further, Li *et al.*, (2012), and Pek *et al.*, (2018) were justified and recommended use of linear regression model among non-normal data structures. The formula and calculation for multiple linear regression is $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$. Where Y is criterion variable (mental health), while X_1 , X_2 , and X_3 are predictor variables (social support, psychological resilience and self-esteem respectively), β_0 is intercept constant, $\beta_1, \beta_2, \beta_3$ are slope of regression line. This linear regression model explains the criterion variable mental health with a straight line as stated in equation. Here, $\beta_0, \beta_1, \beta_2$, and β_3 values help to estimate relationship between criterion variable mental health with predictor variables such as social support, psychological resilience and self-esteem through statistical methods. The straight regression line helps us to predict the value of criterion variable mental health from predictor variables such as social support, psychological resilience and self-esteem. The observed values of social support, psychological resilience and self-esteem can estimate the predicted value of mental health through obtained equation from statistical method. The slope of regression line such as β_1, β_2 , and β_3 give the regression co-efficient value for predictor variables social support, psychological resilience and self-esteem which provide contribution of respective predictor variables on mental health which is criterion variable. If predictor variable is in continuous measure as seen in any scale, then the obtained regression coefficient reveals the change in criterion variable per unit of change in the predictor variables. The units of measurement of predictor variables have essential role for interpretation of the regression co-efficient corresponding predictor variables. The regression co-efficient also explains about the strength and direction among predictor variables as well as criterion variable. Usually regression co-efficient (r) can be +1 to -1. If $r = \pm 1$, it reveals perfect linear, monotone and strong relationship even r is closer to +1 or -1. Here, +1 reveals positive relationship and -1 states negative relationship. If $r = 0$, then the relationship is nil which means no linear or monotone. If r is less than zero ($r < 0$), the relationship is negative or inverse relationship. If it is greater than zero ($r > 0$), then it is in positive relationship.

Table 4.24., *Regression analysis shows the influence of social support, resilience and self-esteem on Mental Health among obese (300) populations.*

Predictor Variable	Criterion Variable	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Social Support	Mental Health	.397	.158	.155	14.308	.425	.057	.40	7.48	.001
Resilience		.422	.178	.173	14.159	.210	.078	.17	2.70	.007
Self-esteem		.434	.189	.180	14.091	-.598	.304	-.11	-1.96	.050

Table 4.24 showed linear regression analysis among 300 obese using SPSS latest version in which predictor variables social support predicted mental health, $p = .000$, $R = .397$, $R^2 = .158$, adjusted $R^2 = .155$. The regression co-efficient ($B = .425$) stated the regression co-efficient for predictor variable social support on criterion variable mental health. It reveals positive influence on mental health as the value is greater than zero. The statistical significance p value is .001 which is below .05 explains social support have significant positive influence on mental health which means an increase in one social support on average will increase mental health with .425 points. The value R^2 in table 4.18 is .158 which is the co-efficient of determination. This means that social support has 15.8% contribution for the determination of criterion variable mental health, the remaining 84.2% may be contributed by other factors or other predictor variables which is not explained here. The R^2 value also explains validity of regression calculation as better and quite accepted. Another predictor variable psychological resilience also has statistically significant influence over criterion variable mental health, $p = .000$, $R = .422$, $R^2 = .178$, adjusted $R^2 = .173$. The regression co-efficient B value for psychological resilience is .210 which means the predictor variable psychological resilience have positive influence on the criterion variable mental health. These denoted an increase in one psychological resilience on average will positively influence the criterion variable mental health by .210 points. The R^2 value is .178 which is the co-efficient of determination value for predictor variable

psychological resilience mean predictor variable psychological resilience have 17.8% contribution over criterion variable mental health. While the rest 82.2% contributions of mental health were unexplained. The R^2 value also revealed predictor variable psychological resilience acted a valid role in regression equation with mental health.

Likewise, the predictor variable self-esteem in regression equation among 300 obese people have showed the regression co-efficient value (B) as $-.598$ which means the regression co-efficient is less than zero, reveals it is in negative relationship with mental health. Thus, predictor variable self-esteem has statistically significant negative influence on criterion variable mental health, $p = .000$, $R = .434$, $R^2 = .189$, adjusted $R^2 = .180$. It is concluded as the regression co-efficient ($B = -.598$) represented that an increase in one self-esteem on average will negatively impact the criterion variable mental health by .598 points. The R^2 value in this regression model is .189. The predictor variable self-esteem determines 18.9 % contributions over the determination of mental health which showed negative influence on it. The rest 81.1% determination is not explained and may be influenced by other factors or predictor variables.

Table 4.25., *Regression analysis shows the influence of social support, resilience and self-esteem on mental health among non-obese (300) populations.*

Predictor Variable	Criterion Variable	R	R^2	Adjusted R^2	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Social Support		.486	.236	.234	20.301	.667	.069	.49	9.59	.001
Resilience	Mental Health	.539	.291	.286	19.590	.426	.089	.27	4.79	.001
Self-esteem		.574	.330	.323	19.082	-1.24	.302	-.23	-4.13	.001

Table 4.25 represented multiple linear regression analysis among 300 non-obese using SPSS latest version in which predictor variables social support predicted mental health, $p = .000$, $R = .486$, $R^2 = .236$, adjusted $R^2 = .234$. The regression co-efficient ($B = .667$) for predictor variable social support on criterion variable mental health revealed

positive influence on mental health as the value is greater than zero. The statistical significance p value is .001 which is below .05 stated an increase in one social support on average will positively influence on mental health with .667 points. The value R^2 is .236 which is the co-efficient of determination. The predictor variable social support determined 23.6% contribution for the determination of criterion variable mental health, the remaining 76.4% may be contributed by other factors or other predictor variables. The R^2 value also explains validity of regression calculation as better and quite accepted. Second predictor variable psychological resilience among 300 non-obese people also have statistically significant influence over criterion variable mental health, $p = .001$, $R = .539$, $R^2 = .291$, adjusted $R^2 = .286$. The regression co-efficient B value for psychological resilience is .426 which means the predictor variable psychological resilience have positive influence on the criterion variable mental health which explained as an increase in one psychological resilience on average will positively influence the criterion variable mental health by .426 points. The R^2 value is .291 which is the co-efficient of determination value for predictor variable psychological resilience have 29.1% contribution over criterion variable mental health. While the rest 70.9% contributions of mental health were unexplained. The R^2 value also revealed predictor variable resilience acted a valid role in regression equation with mental health.

Another predictor variable self-esteem in regression equation among 300 non-obese people have showed the regression co-efficient value (B) as -1.24 which means the regression co-efficient is less than zero, reveals it is in negative relationship with mental health. Thus, predictor variable self-esteem has statistically significant negative influence on criterion variable mental health, $p = .001$, $R = .574$, $R^2 = .330$, adjusted $R^2 = .323$. The finding revealed that the regression co-efficient ($B = -.598$) explained as an increase in one self-esteem on average will negatively impact the criterion variable mental health by 1.24 points. The R^2 value in this regression model is .330. The predictor variable self-esteem determines 33 % contributions over the determination of mental health which showed negative influence on it. The rest 67% determination is not explained and may be influenced by other factors or predictor variables. Therefore, the findings of the study

support the hypothesis “there is significant positive influence of social support and resilience on mental health of obese and non-obese people”. On the basis of above findings, it is revealed that majority of studies showed that social support has positive influences over mental health. Both the findings in obese as well non-obese population with respect to influence of social support, resilience, and self-esteem on mental health go side by side with previous studies, in positive influence of social support on mental health as per Yoshida *et al.*, (2020); Guevara-Valtier *et al.*, (2021); Xie *et al.*, (2005); Herzer *et al.*, (2011), and in positive influence of psychological resilience on mental health as per Secer & Yildizhan, (2020); Brogan *et al.*, (2012); Williamson *et al.*, (2021); Foster & Weinstein., (2018); Toukhsati *et al.*, (2017); Ball *et al.*, (2011). But the study does not support the hypothesis with respect to predictor variable self-esteem (“there is significant positive influence of self-esteem on mental health of obese and non-obese people”). It stated that majority of studies showed that self-esteem have negative influences over mental health and the findings go side by side with Moksnes & Reidunsdatter, (2019); Almenara *et al.*, (2017); Hwang *et al.*, (2016); Durso *et al.*, (2016); Jomeena & Martin, (2005); Prabhu & D'Cunha, (2019).

4.4.4 Hypothesis-04 (H4)

“There is significant mean difference in respondent's social support with respect to demographic variables (age, gender, family type, location and income status) among obese and non-obese”.

The normality test for social support with respect to demographic variables age, gender, family type, location and income status among obese and non-obese using Kolmogorov-Smirnova test and Shapiro-Wilk test showed the p value were below .05 except demographic variable income status more than 30,001 INR in social support. Thus, the distributions were in non-normal in all categories of age group, gender type, family type, location and income status. The statistical test for mean difference within non-normal dataset for between two or more groups are Mann-Whitney test for two variables, Kruskal-Wallis test for more than two variables. These two tests are rank-based non-parametric test in which statistically significant differences between two or more groups of an independent

variable with respect to continuous or ordinal dependent variable such as social support, psychological resilience, self-esteem and mental health can be analysed.

Table 4.26., *Mean difference in social support with respect to age by using Kruskal-Wallis Test*

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig.(2-tailed)</i>
15 to 25 years	162	268.24				
26 to 35 years	180	305.22	63.63	15.98	8,432	.015
36 to 65 years	258	317.46				
Total	600					

Table 4.26 showed mean difference in social support with respect to age using Kruskal-Wallis test. This test showed that there was a statistically significant difference in social support score between the different age groups with 162 samples from age 15 to 25 years old, 180 samples from age 26 to 35 years old and above 35 years old Kruskal Wallis $H(2) = 8.432$, $p = 0.015$, with a mean rank social support score of 268.24 for 15 to 25 years, 305.22 for 26 to 35 years and 317.46 for above 35 years. Comparatively age group above 35 years have higher social support mean rank than age group 26 to 35 years and age group 25 to 25years. The overall mean and standard deviation of social support is 63.63 and 15.98 respectively. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's social support with respect to age among obese and non-obese”. These findings go in line with Sherbourne *et al.*, (1992); Tyler & Hoyt, (2000); Wojszel & Politynska, (2021); Van Droogenbroeck *et al.*, (2018); Shovestul *et al.*, (2020); Cai *et al.*, (2020); Alcañiz & Solé-Auró, (2018).

Table 4.27., Mean difference in social support with respect to gender by using Mann-Whitney Test

Gender	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	213	271.48	57824.50	Mann-Whitney U	35033.500	.002
Female	387	316.47	122475.50	Wilcoxon W	57824.500	
Total	600			Z	-3.083	

Table 4.27 revealed mean difference in social support with respect to 213 male and 387 female using Mann-Whitney test which showed the statistics details necessary for identifying difference in social support score between obese and non-obese groups. Mean rank among 213 males in social support is 271.48 and total sum of ranks is 57824.50, Mean rank and total sum of ranks among 387 female is 316.47 and 122475.50 respectively. Female group has a larger mean rank than male. The resultant score in social support have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to obese gives $U1 = 57824.50 - 213 \times (213 + 1) / 2 = 35,033.50$ and with respect to non-obese $U2 = 122475.50 - 387 \times (387 + 1) / 2 = 47,397.50$. Among U1 and U2, Mann-Whitney U is 35,033.50 as shown in the table 4.35 which was lower value of U1 and U2. Thus, a Mann-Whitney test indicated that the social support level among female with N = 387, Median = 72 and Mean rank = 316.47, have statistically significant higher value than male with N= 213, Median = 67, and mean rank = 271.48, Mann-Whitney U is 35033.50, Wilcoxon W is 57824.500, Z = -3.083, p = .002 in which female have significantly higher mean (mean rank = 316.47) than male (mean rank = 271.48). The mean and standard deviation of social support among overall population is 63.63 and 15.98 respectively. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's social support with respect to gender among obese and non-obese”. These findings go in line with Neil-Sztramko *et al.*, (2020); Alsubaie *et al.*, (2019); Takizawa *et*

al., (2006); Matud *et al.*, (2019); Miller *et al.*, (2018); Tifferet (2020); Abdollahi *et al.*, (2018).

Table 4.28, *Mean difference in social support with respect to family type by using Mann-Whitney Test*

<i>Family Type</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Joint	184	308.04	56679.00	Mann-Whitney U	36885.00	
Nuclear	416	297.17	123621.00	Wilcoxon W	123621.00	.473
Total	600			Z	-.718	

Table 4.28 stated the mean difference in social support with respect to 184 persons from joint and 416 persons from nuclear family using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of social support among joint family is 308.04 and 56679.00, while nuclear family have 297.17 as mean rank and 123621.00 as the sum of ranks for social support. These measurements showed people from joint family have higher social support than people from nuclear family, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between joint and nuclear family. The formula to get Mann-Whitney U was the sum of rankings $- N \times (N+1)/2$, where N is number of observations. Here, U1 for male was calculated as $U1 = 56679.50 - 184 \times (184 + 1) / 2 = 39659.50$ and U2 for female was as $U2 = 123621.00 - 416 \times (416 + 1) / 2 = 36885.00$. Among U1 and U2, lower value gives Mann-Whitney U which 36885.00 as shown in the table 4.36. Here, the Mann-Whitney test stated that the social support level among nuclear with N = 416, Median = 72 and Mean rank = 297.17 have statistically insignificant mean difference with joint family N= 184, Median = 72, and mean rank = 308.04, Mann-Whitney U is 36885.00, Wilcoxon W is 123621.00, Z = -.718, p = .473 in which joint family type have higher mean (mean rank = 308.04) than nuclear family type (mean rank = 297.17). Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's social support with respect to family type among obese and non-obese”. These findings go towards significance with

DiMatteo, (2004); Miller and Dimatteo, (2013); Taylor *et al.*, (1986); Spitze & Logan, (1990); Shanas (1979); Hernández-Padilla *et al.*, (2020); French *et al.*, (2018).

Table 4.29., *Mean difference in social support with respect to location by using Mann-Whitney Test*

<i>Location</i>	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Urban	256	286.22	73272.00	Mann-Whitney U	40376.00	.078
Rural	344	311.13	107028.00	Wilcoxon W	73272.00	
Total	600			Z	-1.764	

Table 4.29 stated the mean difference in social support with respect to 256 persons from urban population and 344 persons from rural population using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of social support among urban people are 286.22 and 73272.00, and among rural people are 311.13 and 107028.00 respectively. These measurements showed people from rural have higher social support than people from urban, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between urban and rural people. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for male was calculated as $U1 = 73272.00 - 256 \times (256 + 1) / 2 = 40,376.00$ and U2 for female was as $U2 = 107028.00 - 344 \times (344 + 1) / 2 = 47,688.00$. Among U1 and U2, lower value gives Mann-Whitney U which 40376.00 as shown in the table 4.30. Here, the Mann-Whitney test stated that the social support level among rural people with N = 344, Median = 72 and Mean rank = 311.13 have statistically insignificant mean difference with urban people N= 256, Median = 67, and mean rank = 286.22, Mann-Whitney U is 40376.00, Wilcoxon W is 73272.00, Z = -1.764, p = .078 in which rural people have higher mean (mean rank = 311.13) than urban people (mean rank = 286.22). Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's social support with respect to location among obese and non-obese”. These findings go

towards significance with Gökçearslana *et al.*, (2018); Li *et al.*, (2017); Labrague *et al.*, (2017).

Table 4.30., *Mean difference in social support with respect to income status by using Kruskal-Wallis Test*

Income status in INR	N	Mean Rank	Mean	Standard Deviation	Kruskal- Wallis H	Asymp. Sig. (2-tailed)
Less than 15,000	390	331.20				
15,001 to 30,000	130	248.37	63.63	15.98	36.150	.001
More than 30,001	80	235.56				
Total	600					

Table 4.30 showed mean difference in social support with respect to income status using Kruskal-Wallis test. This test showed that there was a statistically significant difference in social support score between the different income groups with 390 samples from income below 15,000, 130 samples from 15,001 to 30,000 and 80 from income above 30,001. Kruskal Wallis H = 36.150, p = .001, with a mean rank social support score of 331.20 for income below 15,000, 248.37 for income between 15,001 and 30,000 and 235.56 for income above 30,001. Comparatively people with income below 15,000 have higher social support mean rank than income range from 15,001 to 30,000 and income above 30,001. The overall mean and standard deviation of social support is 63.63 and 15.98 respectively. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's social support with respect to income status among obese and non-obese”. These findings go in line with Carlson *et al.*, (2019); Ashley *et al.*, (2020); Feld *et al.*, (2020); Sánchez-Moreno *et al.*, (2021); Min-Kyoung *et al.*, (2003).

4.4.5 Hypothesis-05 (H5)

“There is significant mean difference in respondent's resilience with respect to demographic variables (age, gender, family type, location and income status)”.

The normality test for psychological resilience with respect to demographic variables such as age, gender, family type, location and income status among obese and non-obese using Kolmogorov-Smirnova test and Shapiro-Wilk test showed the p value were below .05 except demographic variable income status between 15,001 and 30,000, and income status above 30,001 INR in psychological resilience which showed the distribution were not in normal distributions. The statistical test to examine mean difference with non-normal distributed dataset were Mann-Whitney test for between two groups and Kruskal-Wallis Test for more than two groups. These two tests are rank-based non-parametric test in which statistically significant differences between two or more groups of an independent variable with respect to continuous or ordinal dependent variable can be analysed.

Table 4.31., *Mean difference in resilience with respect to age by using Kruskal-Wallis Test*

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig. (2-tailed)</i>
15 to 25 years	162	228.98				
26 to 35 years	180	310.19	77.27	14.02	42.412	.001
35 to 65 years	258	338.65				
Total	600					

Table 4.31 showed mean difference in resilience with respect to age using Kruskal-Wallis test. This test showed that there was a statistically significant difference in psychological resilience score between the different age groups with 162 samples from age 15 to 25 years old, 180 samples from age 26 to 35 years old and 258 samples from age above 35 years old Kruskal Wallis $H = 42.412$, $p = .001$, with a mean rank in psychological resilience score as 228.98 for 15 to 25 years with median 73, as 310.19 for 26 to 35 years with median 84, and as 338.65 for above 35 years with median 84. Comparatively age group above 35 years have higher psychological resilience mean rank than age group 26 to 35 years and age group 25 to 25years. The overall mean and standard deviation of psychological resilience is 77.27 and 14.02 respectively with overall median as 84.

Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's psychological resilience with respect to age among obese and non-obese”. These findings go in line with Yazdi-Ravandi *et al.*, (2012); Svence & Majors, (2015); Hayman *et al.*, (2016); Pearman *et al.*, (2020); Linnemann *et al.*, (2020).

Table 4.32., *Mean difference in resilience with respect to gender by using Mann-Whitney Test*

<i>Gender</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Resilience</i>	<i>Asymp. Sig. (2-tailed)</i>
Male	213	293.87	62594.00	Mann-Whitney U	39803.00	.478
Female	387	304.15	117706.00	Wilcoxon W	62594.00	
Total	600			Z	-.710	

Table 4.32 revealed mean difference in resilience with respect to 213 male and 387 female using Mann-Whitney test which showed the statistics details necessary for identifying difference in psychological resilience score between male and female populations. Mean rank among 213 males in psychological resilience is 293.87 and total sum of ranks is 62594.00, Mean rank and total sum of ranks among 387 female is 304.15 and 117706.00 respectively. Female group has a larger mean rank than male. The resultant score in psychological resilience have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to male gives $U1 = 62594.00 - 213 \times (213 + 1) / 2 = 39803.00$ and with respect to female $U2 = 117706.00 - 387 \times (387 + 1) / 2 = 42,628.00$. Among U1 and U2, Mann-Whitney U is 39803.00as shown in the table 4.33 which has lower value of U1 and U2. But, p-value showed statistically insignificance due to above .05 level of significance. Thus, a Mann-Whitney test indicated that the psychological resilience level among female with N = 387, Median = 84 and Mean rank = 304.15, have no statistically significant higher value than male with N= 213, Median = 83, and mean rank = 293.87, Mann-Whitney U is 39803.00,

Wilcoxon W is 62594.00, Z = -.710, p = .478 in which female have higher mean (mean rank = 304.15) than male (mean rank = 293.87). The mean and standard deviation of psychological resilience among overall population is 63.63 and 15.98 respectively with overall median as 84. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's psychological resilience with respect to gender among obese and non-obese”. These findings go towards significance with Jordan (2018); Chisty *et al.*, (2022); Portnoy *et al.*, (2018); Iimura and Taku, (2017).

Table 4.33., *Mean difference in resilience with respect to family type by using Mann-Whitney Test*

<i>Family type</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Resilience</i>	<i>Asymp. Sig. (2-tailed)</i>
Joint	184	287.58	52915.00	Mann-Whitney U	35895.000	.215
Nuclear	416	306.21	127385.00	Wilcoxon W	52915.000	
Total	600			Z	-1.240	

Table 4.33 stated the mean difference in resilience with respect to 184 persons from joint and 416 persons from nuclear family using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of psychological resilience among joint family is 287.58 and 52915.00, while nuclear family have 306.21 as mean rank and 127385.00 as the sum of ranks for psychological resilience. These measurements showed people from joint family have higher psychological resilience than people from nuclear family, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between joint and nuclear family. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for joint family is calculated as $U1 = 52915.00 - 184 \times (184 + 1) / 2 = 35895.00$ and U2 for nuclear family is calculated as $U2 = 127385.00 - 416 \times (416 + 1) / 2 = 40,649.00$. Among U1 and U2, lower value gives

Mann-Whitney U which 36885.00 as shown in the table 4.34. Here, the Mann-Whitney test stated that the psychological resilience level among nuclear with N = 416, Median = 84 and Mean rank = 306.21 have statistically insignificant mean difference with joint family N= 184, Median = 82.5, and mean rank = 287.58, Mann-Whitney U is 35895.00, Wilcoxon W is 52915.000, Z = -1.240, p = .215 in which nuclear family type have higher mean (mean rank = 306.21) than joint family type (mean rank = 287.58). Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's psychological resilience with respect to family type among obese and non-obese”. These findings go towards significance with Hawley & DeHaan, 1996; Dong *et al.*, 2020; Graber *et al.*, 2015; Li *et al.*, 2018; Ihaya *et al.*, 2010; Chang *et al.*, 2021.

Table 4.34., *Mean difference in resilience with respect to location by using Mann-Whitney Test*

Location	N	Mean Rank	Sum of Ranks	Test	Resilience	Asymp. Sig. (2-tailed)
Urban	256	263.47	67448.00	Mann-Whitney U	34552.000	.001
Rural	344	328.06	112852.00	Wilcoxon W	67448.000	
Total	600			Z	-4.611	

Table 4.34 stated the mean difference in resilience with respect to 256 persons from urban population and 344 persons from rural population using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of psychological resilience among urban people are 263.47 and 67448.00, and among rural people are 328.06 and 112852.00 respectively. These measurements showed people from rural have higher psychological resilience than people from urban, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between urban and rural people. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for urban people is calculated as $U1 = 67448.00 - 256 \times (256 + 1) / 2 = 34552.00$ and U2 for rural

people is calculated as $U_2 = 112852.00 - 344 \times (344 + 1) / 2 = 53,512.00$. Among U_1 and U_2 , lower value gives Mann-Whitney U which 34552.00 as shown in the table 4.35. Here, the Mann-Whitney test stated that the psychological resilience level among rural people with $N = 344$, median = 84 and mean rank = 328.06 have statistically significant mean difference with urban people $N = 256$, median = 78, and mean rank = 263.47, Mann-Whitney U is 40376.00, Wilcoxon W is 67448.00, $Z = -4.611$, $p = .001$ in which rural people have significantly higher mean (mean rank = 328.06) than urban people (mean rank = 263.47). The overall mean and standard deviation of psychological resilience is 77.27 and 14.02 respectively with overall median as 84. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's psychological resilience with respect to location among obese and non-obese”. These findings go in line with Wells (2010); Chen *et al.*, (2021); Kimhi *et al.*, (2020).

Table 4.35., *Mean difference in resilience with respect to income status by using Kruskal-Wallis Test*

<i>Income status in INR</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal- Wallis H</i>	<i>Asymp. Sig. (2-tailed)</i>
Less than 15,000	390	343.21				
15,001 to 30,000	130	216.35	77.27	14.02	70.868	.001
More than 30,001	80	229.03				
Total	600					

Table 4.35 showed mean difference in resilience with respect to income status using Kruskal-Wallis test. This test showed that there was a statistically significant difference in psychological resilience score between the different income groups with 390 samples from income below 15,000, 130 samples from 15,001 to 30,000 and 80 from income above 30,001. Kruskal Wallis $H = 70.868$, $p = .001$, with a mean rank in psychological resilience score as 343.21 for income below 15,000, as 216.35 for income between 15,001 and 30,000, and as 229.03 for income above 30,001. Comparatively people with income below 15,000

have higher psychological resilience mean rank than income range from 15,001 to 30,000 and income above 30,001. The overall mean and standard deviation of psychological resilience is 77.27 and 14.02 respectively with overall median as 84. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's psychological resilience with respect to income among obese and non-obese”. These findings go in line with Bonanno *et al.*, (2007); Kimhi *et al.*, (2020); Gruebner *et al.*, (2015).

4.4.6 Hypothesis-06 (H6)

“There is significant mean difference in respondent's self-esteem with respect to demographic variables (Age, Gender, Family type, Location, and Income status) among obese and non-obese”.

The normality test for self-esteem with respect to demographic variables such as age, gender, family type, location and income status among obese and non-obese using Kolmogorov-Smirnova test and Shapiro-Wilk test showed the p value were below .05 except demographic variable income status above 30,001 INR in self-esteem which showed the distribution were not in normal distributions. The statistical test to examine mean difference with non-normal distributed dataset were Mann-Whitney test for between two groups and Kruskal-Wallis Test for more than two groups. These two tests are rank-based non-parametric test in which statistically significant differences between two or more groups of an independent variable with respect to continuous or ordinal dependent variable can be analysed.

Table 4.36., *Mean difference in self-esteem with respect to age by using Kruskal-Wallis Test*

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig.(2-tailed)
15 to 25 years	162	330.13				
26 to 35 years	180	310.83	21.63	3.67	11.198	.004
35 to 65 years	258	274.69				
Total	600					

Table 4.36 showed mean difference in self-esteem with respect to age using Kruskal-Wallis test. This test showed that there was a statistically significant difference in self-esteem score between the different age groups with 162 samples from age 15 to 25 years old, 180 samples from age 26 to 35 years old and 258 samples from age above 35 years old Kruskal Wallis $H = 11.198$, $p = .004$, with a mean rank in self-esteem score as 330.13 for 15 to 25 years with median 22, as 310.83 for 26 to 35 years with median 21, and as 274.69 for above 35 years with median 21. Comparatively age group 15 to 25 years have higher self-esteem mean rank than age group 26 to 35 years and age group above 35 years. The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's self-esteem with respect to age among obese and non-obese”. These findings go in line with Erol & Orth, (2011); O'Malley & Bachman, (1983); McMullina & Cairney, (2004); Orth & Robins, (2014); Robins *et al.*, (2002); Khadri *et al.*, (2020); Dias *et al.*, (2002)

Table 4.37., Mean difference in self-esteem with respect to gender by using Mann-Whitney Test

<i>Gender</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>self-esteem</i>	<i>Asymp. Sig. (2-tailed)</i>
Male	213	313.54	66785.00	Mann-Whitney U	38437.000	.169
Female	387	293.32	113515.00	Wilcoxon W	113515.000	
Total	600			Z	-1.374	

Table 4.37 revealed mean difference in self-esteem with respect to 213 male and 387 female using Mann-Whitney test which showed the statistics details necessary for identifying difference in self-esteem score between male and female populations. Mean rank among 213 males in self-esteem is 313.54 and total sum of ranks is 66785.00, Mean rank and total sum of ranks among 387 female is 293.32 and 113515.00 respectively. Female group has a larger mean rank than male. The resultant score in self-esteem have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of

observations. While applying this formula with respect to male gives $U1 = 66785.00 - 213 \times (213 + 1) / 2 = 43,994$ and with respect to female $U2 = 113515.00 - 387 \times (387 + 1) / 2 = 38,437.00$. Among $U1$ and $U2$, Mann-Whitney U is 39803.00 as shown in the table 4.33 which has lower value of $U1$ and $U2$. But, p -value showed statistically insignificance due to above .05 level of significance. Thus, a Mann-Whitney test indicated that the self-esteem level among female with $N = 387$, Median = 21 and Mean rank = 293.32, have no statistically significant higher value than male with $N = 213$, Median = 21, and mean rank = 313.54, Mann-Whitney U is 38437.00, Wilcoxon W is 113515.00, $Z = -1.374$, $p = .169$ in which male have insignificantly higher mean (mean rank = 313.54) than female (mean rank = 293.32). The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's self-esteem with respect to gender among obese and non-obese”. These findings go towards significance with Erol & Orth, (2011); McMullina & Cairney, (2004); Mageea and Upenieks, (2019); Bang et al., (2020), Orth et al., (2010); Bleidorn et al., (2016); Kearney-Cooke (1999).

Table 4.38., *Mean difference in self-esteem with respect to family type by using Mann-Whitney Test*

<i>Family type</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>self-esteem</i>	<i>Asymp. Sig. (2-tailed)</i>
Joint	184	296.58	54571.50	Mann-Whitney U	37551.50	.712
Nuclear	416	302.23	125728.50	Wilcoxon W	54571.50	
Total	600			Z	-.370	

Table 4.38 stated the mean difference in self-esteem with respect to 184 persons from joint and 416 persons from nuclear family using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of self-esteem among joint family is 296.58 and 54571.50, while nuclear family have 302.23 as mean rank and 125728.50 as the sum of ranks for self-esteem. These measurements showed people from

joint family have higher self-esteem than people from nuclear family, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between joint and nuclear family. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for joint family is calculated as $U1 = 54571.50 - 184 \times (184 + 1) / 2 = 37,551.5$ and U2 for nuclear family is calculated as $U2 = 125728.50 - 416 \times (416 + 1) / 2 = 38,992.5$. Among U1 and U2, lower value gives Mann-Whitney U which 37,551.5 as shown in the table 4.39. Here, the Mann-Whitney test stated that the self-esteem level among nuclear with N = 416, Median = 21 and Mean rank = 302.23 have statistically insignificant mean difference with joint family N= 184, Median = 21, and mean rank = 296.58, Mann-Whitney U is 37551.50, Wilcoxon W is 54571.50, Z = -.370, p = .712 in which nuclear family type have higher mean (mean rank = 302.23) than joint family type (mean rank = 296.58). The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's self-esteem with respect to family type among obese and non-obese”. These findings go towards significance with Cooper *et al.*, (1983); Partridge & Tamara, (1987); Clark & Barber, (1994); Abu-saad, (1999); Nagar *et al.*, (2008); Martínez & García, (2007); Martinez *et al.*, (2020); Queiroz *et al.*, (2020); Wilburn & Smith, (2009).

Table 4.39., *Mean difference in self-esteem with respect to location by using Mann-Whitney Test*

<i>Location</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>self-esteem</i>	<i>Asymp. Sig. (2-tailed)</i>
Urban	256	310.18	79405.50	Mann-Whitney U	41554.50	.236
Rural	344	293.30	100894.50	Wilcoxon W	100894.50	
Total	600			Z	-1.185	

Table 4.39 stated the mean difference in self-esteem with respect to 256 persons from urban population and 344 persons from rural population using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of self-esteem among urban people are 310.18 and 79405.50, and among rural people are 293.30 and 100894.50 respectively. These measurements showed people from rural have higher self-esteem than people from urban, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between urban and rural people. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for urban people is calculated as $U1 = 79405.50 - 256 \times (256 + 1) / 2 = 46,509.50$ and U2 for rural people is calculated as $U2 = 100894.50 - 344 \times (344 + 1) / 2 = 41,554.50$. Among U1 and U2, lower value gives Mann-Whitney U which 34552.00 as shown in the table 4.40. Here, the Mann-Whitney test stated that the self-esteem level among rural people with N = 344, Median = 21 and Mean rank = 293.30 have statistically no significant mean difference with urban people N= 256, Median = 21, and mean rank = 310.18, Mann-Whitney U is 41,554.50, Wilcoxon W is 100894.50, Z = -1.185, p = .236 in which urban people have insignificantly higher mean (mean rank = 310.18) than rural people (mean rank = 293.30). The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's self-esteem with respect to location among obese and non-obese”. These findings go towards significance with Wilburn & Smith, (2009); Abu-saad, (1999); Dias et al., (2002); Hoersting & Jenkins, (2010).

Table 4.40., *Mean difference in self-esteem with respect to income status by using Kruskal-Wallis Test*

<i>Income status in INR</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal- Wallis H</i>	<i>Asymp. Sig. (2-tailed)</i>
Less than 15,000	390	295.57				
15,001 to 30,000	130	331.82	21.63	3.67	6.540	.038
More than 30,001	80	273.66				
Total	600					

Table 4.40 showed mean difference in self-esteem with respect to income status using Kruskal-Wallis test. This test showed that there was a statistically significant difference in self-esteem score between the different income groups with 390 samples from income below 15,000, 130 samples from 15,001 to 30,000 and 80 from income above 30,001. Kruskal Wallis $H = 6.540$, $p = .038$, with a mean rank in self-esteem score as 295.57 for income below 15,000, as 331.82 for income between 15,001 and 30,000, and as 273.66 for income above 30,001. Comparatively people with income between 15,001 and 30,000 have higher self-esteem mean rank than income range below 15,000 and income above 30,001. The overall mean and standard deviation of self-esteem is 21.63 and 3.67 respectively with overall median as 21. Therefore, the findings of the study support the hypothesis “there is significant mean difference in respondent's self-esteem with respect to demographic variables such age and income status among obese and non-obese”. But the study does not support the hypothesis “there is significant mean difference in respondent's self-esteem with respect to demographic variables such as gender, family type and location among obese and non-obese”. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's self-esteem with respect to income status among obese and non-obese”. These findings go in line with McMullina & Cairney, (2004); Robins *et al.*, (2002); Ryszewska-Łabędzka *et al.*, (2022).

4.4.7 Hypothesis-07 (H7)

“There is significant mean difference in respondent's mental health with respect to demographic variables (Age, Gender, Family type, Location and income status) among obese and non-obese”.

The normality test for mental health with respect to demographic variables such as age, gender, family type, location and income status among obese and non-obese using Kolmogorov-Smirnova test and Shapiro-Wilk test showed the p value were below .05 except demographic variable age group 15 to 25 years, and income status above 30,001 INR in mental health which showed the distribution were not in normal distributions. The statistical test to examine mean difference with non-normal distributed dataset were Mann-Whitney test for between two groups and Kruskal-Wallis Test for more than two groups. These two tests are rank-based non-parametric test in which statistically significant differences between two or more groups of an independent variable with respect to continuous or ordinal dependent variable can be analysed.

Table 4.41., *Mean difference in mental health with respect to age by using Kruskal-Wallis Test*

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig.(2-tailed)</i>
15 to 25 years	162	301.49				
26 to 35 years	180	285.69	139.61	20.13	2.129	.345
35 to 65 years	258	310.21				
Total	600					

Table 4.41 showed mean difference in mental health with respect to age using Kruskal-Wallis test. This test showed that there was a statistically significant difference in mental health score between the different age groups with 162 samples from age 15 to 25 years old, 180 samples from age 26 to 35 years old and 258 samples from age above 35 years old Kruskal Wallis $H = 2.129$, $p = .345$, with a mean rank in mental health score as 301.49 for 15 to 25 years with median 138, as 285.69 for 26 to 35 years with median 137,

and as 310.21 for above 35 years with median 139. Comparatively age group above 35 years have higher mental health mean rank than age group 15 to 25 years and age group 26 to 35 years. The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's mental health with respect to age among obese and non-obese”. These findings go towards significance with Farrer *et al.*, (2008); de Girolamo *et al.*, (2012); Kessler *et al.*, (2007); Li *et al.*, (2021); Becker *et al.*, (2018); Sojli *et al.*, 2021; Williamson *et al.*, (2017); Rossell *et al.*, (2021); Seidler *et al.*, (2020); Ueda *et al.*, (2020).

Table 4.42., Mean difference in mental health with respect to gender by using Mann-Whitney Test

Gender	N	Mean Rank	Sum of Ranks	Test	Mental health	Asymp. Sig. (2-tailed)
Male	213	307.09	65409.50	Mann-Whitney U	39812.50	.490
Female	387	296.87	114890.50	Wilcoxon W	114890.50	
Total	600			Z	-.691	

Table 4.42 revealed mean difference in mental health with respect to 213 male and 387 female using Mann-Whitney test which showed the statistics details necessary for identifying difference in mental health score between male and female populations. Mean rank among 213 males in mental health is 307.09 and total sum of ranks is 65409.50, Mean rank and total sum of ranks among 387 female is 296.87 and 114890.50 respectively. Male group has a larger mean rank than female. The resultant score in mental health have obtained from the sum of the rankings and in comparison, with score calculated from two groups. The formula is, the sum of rankings – $N \times (N+1)/2$, where N is number of observations. While applying this formula with respect to male gives $U1 = 65409.50 - 213 \times (213 + 1) / 2 = 42,618.50$ and with respect to female $U2 = 114890.50 - 387 \times (387 + 1) / 2 = 39,812.00$. Among U1 and U2, Mann-Whitney U is 39803.00 as shown in the table 4.33 which has lower value of U1 and U2. But, p-value showed statistically insignificance

due to above .05 level of significance. Thus, a Mann-Whitney test indicated that the mental health level among female with N = 387, Median = 139 and Mean rank = 296.87, have no statistically significant higher value than male with N= 213, Median = 139, and mean rank = 307.09, Mann-Whitney U is 39,812.00, Wilcoxon W is 114890.50, Z = -.691, p =.490. The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's mental health with respect to gender among obese and non-obese”. These findings go towards significance with Kiely *et al.*, (2019); Liu *et al.*, (2020); Dhejne *et al.*, (2016); Scott, (1998); Hawton *et al.*, (2002); Parker & Roy., (2001); Linzer *et al.*, (1996); Rosenfield & Mouzon, (2013); Rossell *et al.*, (2021); Seidler *et al.*, (2020).

Table 4.43., Mean difference in mental health with respect to family type by using Mann-Whitney Test

<i>Family Type</i>	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Mental health</i>	<i>Asymp. Sig. (2-tailed)</i>
Joint	184	320.45	58963.00	Mann-Whitney U	34601.000	
Nuclear	416	291.68	121337.00	Wilcoxon W	121337.000	.061
Total	600			Z	-1.875	

Table 4.43 stated the mean difference in mental health with respect to 184 persons from joint and 416 persons from nuclear family using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of mental health among joint family is 320.45 and 58963.00, while nuclear family have 291.68 mean rank and 121337.00 as the sum of ranks for mental health. These measurements showed people from joint family have higher mental health than people from nuclear family, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between joint and nuclear family. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U1 for joint family is calculated as $U1 = 58963.00 - 184 \times (184 + 1) /$

2 = 41,943.00 and U_2 for nuclear family is calculated as $U_2 = 121337.00 - 416 \times (416 + 1) / 2 = 34,601.00$. Among U_1 and U_2 , lower value gives Mann-Whitney U which 36885.00 as shown in the table 4.34. Here, the Mann-Whitney test stated that the mental health level among nuclear with $N = 416$, Median = 140 and Mean rank = 291.68 have statistically insignificant mean difference with joint family $N = 184$, Median = 138, and mean rank = 320.45, Mann-Whitney U is 34,601.00, Wilcoxon W is 121337.00, $Z = -1.875$, $p = .061$ in which joint family type have higher mean (mean rank = 320.45) than nuclear family type (mean rank = 291.68). The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's mental health with respect to family type among obese and non-obese”. These findings go towards significance with Schrodtt & Afifi, 2007; Riggs & Jacobvitz, 2002; Sonuga-Barke & Mistry, 2000; Kellam *et al.*, 1977.

Table 4.44., Mean difference in mental health with respect to location by using Mann-Whitney Test

Location	N	Mean Rank	Sum of Ranks	Test	mental health	Asymp. Sig. (2-tailed)
Urban	256	329.02	84228.00	Mann-Whitney U	36732.000	.001
Rural	344	279.28	96072.00	Wilcoxon W	96072.000	
Total	600			Z	-3.477	

Table 4.44 stated the mean difference in mental health with respect to 256 persons from urban population and 344 persons from rural population using Mann-Whitney test as the datasets were in non-normal distributions. Mean rank and sum of ranks of mental health among urban people are 329.02 and 84228.00, and among rural people are 279.28 and 112852.00 respectively. These measurements showed people from rural have higher mental health than people from urban, but level of statistical significance have showed p value was above .05 which means there is no significant statistical mean difference between urban and rural people. The formula to get Mann-Whitney U was the sum of rankings – $N \times (N+1)/2$, where N is number of observations. Here, U_1 for urban people is

calculated as $U1 = 84228.00 - 256 \times (256 + 1) / 2 = 51,332.00$ and $U2$ for rural people is calculated as $U2 = 96072.00 - 344 \times (344 + 1) / 2 = 36,732.00$. Among $U1$ and $U2$, lower value gives Mann-Whitney U which 34552.00 as shown in the table 4.35. Here, the Mann-Whitney test stated that the mental health level among rural people with $N = 344$, Median = 137 and mean rank = 279.28 have statistically significant mean difference with urban people $N = 256$, median = 142, and mean rank = 329.02, Mann-Whitney U is 36732.00, Wilcoxon W is 96072.00, $Z = -3.477$, $p = .001$ in which urban people have significantly higher mean (mean rank = 329.02) than rural people (mean rank = 279.28). The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese support the hypothesis “There is significant mean difference in respondent's mental health with respect to location among obese and non-obese”. These findings go in line with Lin *et al.*, (2008); Masoumeh *et al.*, (2021); Gaither (2020); Seidler *et al.*, (2020); Pierce *et al.*, (2021).

Table 4.45., Mean difference in mental health with respect to income status by using Kruskal-Wallis Test

<i>Income status in INR</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal- Wallis H</i>	<i>Asymp. Sig. (2- tailed)</i>
Less than 15,000	390	288.31				
15,001 to 30,000	130	319.17	139.61	20.13	5.692	.050
More than 30,001	80	329.59				
Total	600					

Table 4.45 showed mean difference in mental health with respect to income status using Kruskal-Wallis test. This test showed that there was a statistically significant difference in mental health score between the different income groups with 390 samples from income below 15,000, 130 samples from 15,001 to 30,000 and 80 from income above 30,001. Kruskal Wallis $H = 70.868$, $p = .050$, with a mean rank in mental health score as 288.31 for income below 15,000 with median 138, as 319.17 for income between 15,001

and 30,000 with median 142, and as 329.59 for income above 30,001 with median 142.50. Comparatively people with income above 30,001 have higher mental health mean rank than income range below 15,000 and range from 15,001 to 30,000. The overall mean and standard deviation of mental health is 139.61 and 20.13 respectively with overall median as 139. Therefore, the findings of the study among obese and non-obese do not support the hypothesis “There is significant mean difference in respondent's mental health with respect to age among obese and non-obese”. These findings go towards significance with Lin *et al.*, (2008); Farrer *et al.*, (2016); Rivenbark *et al.*, (2019); Reiss *et al.*, (2019); Naser *et al.*, (2020); Kamalulil & Panatik, (2021); Donnelly & Farina, (2020).

4.5 Summary

In this chapter data analysis with interpretation and graphical representation is given in detail. Data sets were explored to check pattern of distribution by using Kolmogorov-Smirnov test and Shapiro-Wilk test. Mann-Whitney Test and Kruskal-Wallis tests were used to check the mean difference between obese and non-obese in social support, resilience, self-esteem and mental health with respect to demographic variables (age, gender, family type, location and income status). The relationships among said variables were carried by using Spearman's rank correlation, and linear regression analysis were used to find the influence of social support, resilience and self-esteem on mental health among obese and non-obese respectively.

CHAPTER-5

DISCUSSION AND CONCLUSION

Body Mass index (BMI) is an anthropometric variable which measured from the height and the weight of an individual, helps us to distinguish obese and non-obese population. WHO classification on BMI, divided one's BMI as obese with body mass index above 30 kg/cm^2 , and non-obese with body mass index below 29.9 kg/cm^2 . The non-obese categories include overweight ($25\text{-}29.9 \text{ kg/cm}^2$), normal weight ($18.5\text{-}24.9 \text{ kg/cm}^2$) and underweight (less than 18.5 kg/cm^2) (Hankey & Whelan, 2018). Selected sample size in this study is 600 overall population which has 300 obese and 300 non-obese people. Our body weight is maintained through establishing an equilibrium between energy intake and energy expenditure. If one's behavioural interaction with respect to food intake or energy intake and energy expenditure occurs might shift energy balance towards positive or negative energy balance which either favours weight gain or weight loss (Hill et al., 2010). Overweight septum in BMI is a range in between normal weight and obese where there is more possibilities of shifting energy balance towards positive due to behavioural change favour increase in body weight and obesity. Similarly intentional behavioural activities in obesity prevention program related to food habits and physical activity create negative energy balance which enhance weight loss (Institute of Medicine (US) Subcommittee on Military Weight Management, 2019). The behavioural performance related to energy balance either food behaviour or physical activity plays an essential role in maintaining body weight either in obese or non-obese state (Chaput et al., 2011). Likewise, cognitive in association with behavioural and affective dimensions control mental health irrespective of their body mass index (Ahadzadeh et al., 2018). Here's the researcher has selected social support, psychological resilience and self-esteem and mental health of an individual as psychological variables. Obesity and mental health issue are two important aspects in overall health of an individual. Obesity has medical and psychological consequences as the researcher discussed earlier. Similarly mental health issue also prone to cause physical illness, such as obesity or other metabolic diseases (De Hert et al., 2011). Thus, abnormal mental health might enhance obesity and obesity may leads to mental health issues (Sarwer

& Polonsky, 2016). The researcher formulated seven hypotheses based on psychological variables such as social support, psychological resilience, self-esteem and mental health, and demographic variables such as age, gender, family type, location and income status with respect to obese and non-obese. The results and interpretations related to hypotheses were discussed and tabulated in previous chapter revealed lot of information and facts related to social support, psychological resilience, self-esteem and mental health among obese and non-obese people which give input for policy maker or researchers with respect to energy balance. Let us discuss it further in light of literature available based on the result interpretations and objectives.

5.1 Demographic features of obesity

Obesity is the one of most trending topics in health especially in western world (Sarafino & Smith, 2011; Kopelman et al., 2010; and WHO Global InfoBase Data (2007). Now India gets slowly remarkable high risk of obesity due to present nature of behavioural pattern of people (Luhar et al., 2020). Prior to discuss psychological parameter with respect to behavioural intervention in controlling energy balance, we shall see the prevalence of obesity based on the data collected in this study in light of literature reviews and previous study in obesity. Among obesity datasets 53% of obese people were from age above 35 years old. Previous studies showed there was as increases in incidence of obesity with age among men population (Samouda et al., 2018; and Luhar et al., 2020). Niyantrita Madhumeha Bharata (Control of Diabetes in India) 2017 study revealed prevalence rate of obesity increases more among people age above 40 years than below 40 (Venkatrao et al., 2020). Present study also stated obesity in age group 15 to 25 years as 16%, in age group 25 to 35 years as 31%, and above 35 years as 53%, it showed as age increases prevalence of obesity gets doubled. In contrast, non-obese study population was 38%, 29%, and 33% with age groups as 15 to 25 years, 25 to 35 years and above 35 years respectively. Prevalence of non-obese in particular study population based on age group is almost more or less same percentages. But the obese population is increasing with age and it is highest at age group above 35 years.

Many previous studies on obesity revealed prevalence of obesity was significantly higher in women than men (Lemamsha et al., 2019; Ferreira et al., 2019; Lartey et al., 2019; Al-Raddadi et al., 2019; Djalalinia et al., 2020; Adeloye et al., 2021; Dwivedi et al., 2019 and Andoy-Galvan et al., 2020). Similar nature of significance also noticed in the present study which stated 76% of female obesity have seen in compared with only 28% of male obesity. Niyantrita Madhumeha Bharata (Control of Diabetes in India) 2017 datasets also stated prevalence rate of obesity was more among women than (Venkatrao et al., 2021). The researcher has noticed one study in which male obesity was higher than female obesity and the study explained as boys with age group from 18 to 25 years have showed higher obesity prevalence than corresponding age group girls (Thomas & Geethadevi., 2019).

In the present study 69% of obese is from nuclear family type, while 31% of obese is from joint family type. Many previous studies in India have supported the present study as prevalence of obesity was more among nuclear family than joint family (Singh et al., 2014; Laxmaiah et al., 2006; Kumar et al., 2011; and Gupta et al., 2013). But most of such study have performed among adolescent populations. Present study also showed the prevalence of obesity is high in rural population than urban population as 65% of obesity is from rural background and 35% of them from urban. Previous study stated obesity prevalence was highest in the most rural areas, but older adults in urban areas have higher risk for obesity than rural areas (Cohen et al., 2018). Another study revealed Prevalence of obesity relatively more in rural areas than urban (Luhar et al., 2020). But, one latest study carried in Nigeria showed the prevalence of obesity was high among urban people than rural people (Adeloye et al., 2021)

Empirical analysis using 40 years datasets from 147 countries stated adult obesity rate was high among high income countries followed by upper middle-income countries. There was a change in prevalence of obesity between low-income countries and high-income countries. Male obesity was high in high income countries while female obesity was high in low-income countries. Female obesity was higher in South Asia, Sub-Saharan Africa, Middle East & North Africa and Latin America & Caribbean. In general, prevalence rate of adult obesity was getting slowly more in low-income countries than high

income countries (Talukdar et al., 2020). Present study which has carried in India revealed 74% of obesity is from low-income people whose income status is below 15,000 INR, 17% from middle income people whose income status is between 15,001 and 30,000 INR, and only 9% of obesity is from high income people whose income status is above 30,001 INR. A study revealed obesity was more abundant among low socioeconomic status in developed countries (Wang & Beydoun., 2007). Still, it is in debates regarding prevalence of obesity affects more either low-income people or high-income people. A review study stated among low-income countries the prevalence of obesity was more in high socioeconomic status, but such pattern of prevalence was mixed among middle income countries. Women obesity was more common when it shifts high income to low-income status (Dinsa et al., 2012).

5.2 Psychological Parameters with respect to Obesity

Social support, psychological resilience, self-esteem and mental health are important psychological constructs which has unique psychological properties. Social support relates to the psychological and material resources given through a social network either family, friends or significant person in order to help individuals cope with stress (Lincoln, 2000). Psychological resilience refers one's ability to adapt or withstand their mental uncertainty, challenges, and adversity (American Psychological Association, 2012). Self-esteem defines the overall opinion about themselves - how they feel about their abilities and limitations (Stangor, 2014). High social support provides buffering action against the negative effect of stress and enhance mental health (Ozbay et al., 2007). High psychological resilience have positive relationship with positive coping style (Stangor, 2014). Person with healthy self-esteem experience good feeling about themselves and see themselves as deserving person (Craig, 2020). How these three psychological parameters affect one's mental health explains us lot of information related mental health among obese and non-obese. Mental health explains one's cognitive, behavioural and emotional well-being and it tells how people think, feel and behave and it broadly affects our daily routines, relationships and physical health (Galderisi et al., 2015).

5.2.1 Social Support

Social support acting as buffering factor in challenging situations and in health-related issues (Åslund et al., 2014). The role of social support on mental health depends on contextual factors like coping strategies, stressful events, mental health based on income status (Kocot & Goodman., 2003). Social support plays moderate role in mediation between perceived uncontrollability and mental health (Liu et al 2021). The essence and importance of social support gets more popular in world communities after covid-19 situation which is a medical emergency declared by World Health Organisation around 2020. The researcher have discussed in details earlier about social support and obesity in this study, now let us discuss social support with respect to obese and on mental health of obese and non-obese based on results obtained in this study in light of latest literatures. Present study showed 76% of obese people have scored high social support in compared with 57% of non-obese people. Obese populations have 6% of low social support and 18% of moderate social support which is comparatively less than non-obese populations which has 10% of low social support and 33% of moderate social support. However, many research studies revealed high social support shift energy balance towards negative and reduce body weight. Social support has positive relationship with health promoting behaviour among women in abdominal obesity (Cho et al., 2013). Parental social support increase awareness towards physical activity and maintained body weight (Troost et al., 2003). High interpersonal support significantly related with health-promoting behaviours (Cho et al., 2013). Perceived social support have significant positive association with behaviour related weight regulation especially moderate to heavy physical activity among normal weight girl (Brunet et al., 2014). National Health and Nutrition Examination survey (2003-2008) stated women with low social support triggers food insecurity towards perceived experience of obesity (Ashe & Lapane, 2018). Perceived social support have significant relationship with weight reduction even after bariatric surgery through physical activity and minimizing binge eating behaviours (Mackey et al., 2017). Low social support from closest person significantly increases body mass index among men, at same time emotional support have negative relationship with body mass index in men (Tymoszuk et

al., 2018). Low social support acts as risk factor for obesity due to unhealthy lifestyle practices among university student (Ersoy, 2020). Parenting with low or no social support favours obesity especially in women, but does not in men (Yoshida et al., 2020). Social support perceived from friend and co-worker have correlation with healthy eating behaviour, while social support from family have association with physical activity (Wang et al., 2014). Social support from classmate have positive relationship with health related quality of life (Herzer et al., 2011). Low family support positively enhance risk for obesity in female than male among African American (Assari & Caldwell, 2017).

Increased presence of high perceived social support among obese than non-obese populations have shown in this study. This finding have supported through previous studies as high social status positively associated with obesity (Vartanian & Silverstein, 2013), social vulnerabilities such as easy food access, over parental care due to high social support seems to increase their energy intake and decrease energy expenditure lead to obesity (Iguacel et al., 2020), support network have positive relationship with overweight (Shenk et al., 2021) and social network in obesigenic environment likely to spread obesity through social ties (Christakis & Fowler., 2007). Further the latest study revealed that high social support especially parental support lowers experiencing weight related bullying victimization, this protective effect were high among obese youth than non-obese youth (Yourell & Doty., 2021).

5.2.2 Resilience

Resilience acts as protective role within one's psychological construct through adjustment in response to environmental hazard that predisposes to any psychological burdens (Luthar et al., 2000). The environment hazards particular to obesity or body image may be community-level factors such as socioeconomic status, high satisfaction with sedentary lifestyle and public transportation, and ease accessibility to junk food, family-level factors like birth weight, family diet plan, parental behavior awareness, and pampered parenting, and individual-level factors bullying, teasing, distress and psychological appraisal (Yoon & Kwon, 2014). Actually, high psychological resilient person has the ability to cope cognitively as well emotionally with a crisis or stressful situations (Tugade

& Fredrickson, 2004). High psychosocial weight-resilience factor acted as significant role in preventive strategy for obese (Brogan et al., 2012). Present study revealed 63% of obese is in average level of psychological resilience in compared with 47% of non-obese. Non-obese people have scored more percentage in low and extremely low level of psychological resilience than obese. Both obese and non-obese people have same percentage in high psychological resilience score. These interpretation on level of psychological resilience among obese and non-obese stated there is no difference in high level, but more number of obese people are in average level of psychological resilience than non-obese people. While lower level of psychological resilience comparatively less in obese than non-obese. There were no direct sufficient research support on psychological resilience level among obese and non-obese, but many previous studies indirectly supported present study as the psychological resilience were significantly higher level among normal weight student than thin student (Secer & Yildizhan., 2020), body size dissatisfaction with cardio-metabolic resilience to obesity led to further obesity and risk factor for many chronic diseases (Johnson., 2018), high resilience group were older and have high mean in Healthy Index scores than low resilience group (Lutz et al., 2016), and high psychosocial weight-resilience factor acted as significant role is preventive strategy for obese even residing in obesogenic environment (Brogan et al., 2012). High psychological resilience negatively related with perceived stress (Ligeza et al., 2022), positively correlated with positive coping style (Wu et al., 2020) and directly associated with health-related behaviour. Irrespective of obese or non-obese psychological resilience enhance physical as well as mental health. High resilience associated with appropriate weight reduction strategies help to prevent obesity. Psychological resilience acted as mediating role in controlling or diminishing dietary energy intake (Williamson et al., 2021). Resilience particularly emotional have preventive role in controlling child obesity irrespective of any income stratum (Foster and Weinstein. 2018). Personal resilience strategies like 'shift-and-persist' mindsets positively reframe individually towards maintaining an optimistic outlook about the future. Here, the word 'shift' means cognitive restructuring, positive thinking, and emotion regulation and 'Persist' represents optimism and purpose. The resilience training

and family meals with high family support strategies are high valuable implementation in the prevention and/or intervention against obesity (Loi and Cheskin., 2019).

5.2.3 Self-Esteem

The sense of personal value and self-worth represents one's self-esteem. Healthy self-esteem has crucial role in our motivation, mental well-being and quality of life, it means appropriate self-esteem is always best for us in order to maintain ourselves in healthy ways (Stangor, 2014). Having either high or low self-esteem creates problem to us in all dimensions of health such as physical, social and mental health (Mann, 2004). Self-esteem played as affective mediating role in relationship between weights related self-devaluation and disordered eating behaviours (Almenara et al., 2017). Weight bias internationalization scale positively related to body image, depression and stress, and negatively associated with self-esteem (Durso et al., 2016). Present study stated most of people either obese or non-obese are in low self-esteem, comparatively obese people have scored higher percentage of low self-esteem as 89% of obese were in low self-esteem level than 73% of non-obese. Further it revealed non-obese people (20%) have higher percentage of average self-esteem than obese people (9%). Many previous studies supported presence of low self-esteem among obese populations (Ercan and Özcebe 2020; Franklin et al. 2006; Wang and Veugelers 2008; Unlu et al. 2019; Aggarwal 2019; Al-Ahmari et al. 2017; Almenara et al. 2017; and Griffiths et al. 2010). Obesity was significantly associated with low-self-esteem even without physical or emotional bullying (Ercan and Özcebe 2020). Low self-esteem and fear of negative appearance evaluation acted as significant influence over weight stigma and disordered eating among obese women (Almenara et al.2017). Among non-obese people, normal weight has healthy self-esteem than underweight and overweight. Past study stated normal weight women have high self-esteem compared then overweight and obese women, and the mean differences between the groups were statistically significant. Thus, it has bidirectional correlation between body mass index and self-esteem., and showed mild to moderate significant negative relationship. Thus, greater body size affects self-esteem, similarly physical activity increases one's self-esteem, and

shifts energy balance towards negative aspects through physical activity and self-esteem (Aggarwal 2019).

5.2.4 Mental Health

Mental health is an essential and integral part of health. There is no proper health without mental health. Whether the person is either obese or non-obese, the optimum health and well-being depend on his or her mental health as WHO stated “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. It consists of emotional, psychological and social well-being and also defined alternatively as the cognitive, behavioural and emotional well-being. Mental health is controlled by wide ranges of socioeconomic, biological and environmental factors (Centers for Disease Control and Prevention, 2018). Many studies revealed there was greater association between mental health and body mass index which may be obese or non-obese. Body mass index have strong positive effect over mental health disorder and this association have varied findings among different age and gender (McCrea et al., 2012). The strongest influences of mental health among obese individuals were perceived to have better physical health (Knoesen et al. 2010). Mental health of offenders or body weight victims depends on perceived social support, resilience and self-acceptance (Huang et al., 2020). Peer victimized and social support are two different social phenomena in society and have significant contribution with mental health of obese individuals. (Lim et al., 2011). Present study stated difference level of variation in mental health among obese and non-obese. Obese as well as non-obese people have almost same level of mental health especially below average level, which mean below average, low and extremely level of mental health among obese as 15%, 5% and 3% respectively, while non-obese as 15%, 4% and 4% respectively. But it shows greater variation in average, above average, high and extremely high level of mental health among obese and non-obese. There is no obese individual in extremely high level of mental health, non-obese people showed 8% of them in extremely high level of mental health. Again, in high level of mental health, obese have solidly 2% of them, non-obese have scored 11% which is around five times more than obese. Obese people have less percentage in above average level of mental health as 10%,

while non-obese it is 18%. Thus, the majority of non-obese people have scored higher mental health above average line than non-obese. Obese people have 65% in average level of mental health and non-obese as 40%.

In summary, both obese and non-obese have scored equal percentage in mental health with respect to above average line as 77% in which obese scored 65% in average and only 12% above average line like above average and high level of mental health. But, non-obese have scored 40% in average level and 37% in above average line such as above average, high and extremely high. These interpretations revealed obese people have lesser mental health comparatively than non-obese people. Many previous studies stated there were strong relationship between depression, anxiety and stress in obesity (AlQahtani et al. 2015). Patient with obese have significant possibility to get depression while overweight have low chance to return in their job. But there was no significant difference in their mental health (Reynolds *et al.* 2015). The results revealed the obesity was not statistically significant with mental health. The strongest influences of mental health among obese individuals were perceived to have better physical health (Knoesen *et al.*, 2010). Further, it is revealed that among obese, female affected much with mental health illness such as anxiety, depression, and emotional disturbance than male. Many previous studies have supported as obese women have significantly lower body image and low self-esteem with more depressive symptoms than non-obese (Sarigiani et al. 2020), Female have higher rate of anxiety than male (Sharafi et al. 2020), obesity was strongly related with increased risk for depressive disorder among female, but not in male (Ahuja et al. 2020), prevalence of obesity was common among women. Most obese women likely to be depressed (Chang and Yen 2012), there was statistically significant relationship between obesity and mental health among female obese children than male children (Lim et al. 2011), and among girl and increase in body mass index increases their depressive symptoms and was more among who perceived peer isolation. But such association was not seen among high BMI boys (Xie et al. 2005). Another study stated among men, there was no statistically significant relation between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression.

Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). Among men, there was no statistically significant relation between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). The prevalence of mental health also varies with presence of metabolic disease among obese and non-obese which have stated in a study as mental health among metabolically healthy non-obese were higher in women than men (Men 39.3% and women 55.2%). But the depressive symptoms was high among metabolically unhealthy obese (MUO), in metabolically healthy obese (MHO) female subject were prone to depression than male. (Seo et al. 2021).

5.3 Objectives of present study

The results and interpretations have discussed and tabulated in previous chapter based on formulated hypotheses from the objectives of the present study. Already, the descriptive statistical details related to demographic details such as age, gender, family type, location and income status and psychological parameters like social support, psychological resilience, self-esteem and mental health with respect to obese and non-obese have been discussed with supported literature reviews of previous studies. Now, the researcher is discussing about the objectives of the present study in light of literature from previous studies.

5.3.1 Objective-1: To assess the level of social support, Resilience, self-esteem and mental health among obese and non-obese people.

The descriptive aspects of this objective have been described in detail in previous and present chapter. The level of social support and self-esteem are determined by scoring

indexes revealed in the given respective manual, while psychological resilience and mental health are by calculating z-score interpretation as stated in the manual of particular tool. Present study showed 76% of obese people have scored high social support in compared with 57% of non-obese people. Obese populations have 6% of low social support and 18% of moderate social support which is comparatively less than non-obese populations which has 10% of low social support and 33% of moderate social support. This finding have supported through previous studies as high social status positively associated with obesity (Vartanian & Silverstein, 2013), social vulnerabilities such as easy food access, over parental care due to high social support seems to increase their energy intake and decrease energy expenditure lead to obesity (Iguacel et al., 2020), support network have positive relationship with overweight (Shenk et al., 2021) and social network in obesigenic environment likely to spread obesity through social ties (Christakis and Fowler., 2007). Further the latest study revealed that high social support especially parental support lowers experiencing weight related bullying victimization, this protective effect were high among obese youth than non-obese youth (Yourell and Doty., 2021). However, many research studies revealed high social support shift energy balance towards negative and reduce body weight. Social support has positive relationship with health promoting behaviour among women in abdominal obesity Cho et al (2013). Parental social support increase awareness towards physical activity and maintained body weight (Trost et al., 2001). High interpersonal support significantly related with health-promoting behaviours (Cho et al., 2013). Perceived social support have significant positive association with behaviour related weight regulation especially moderate to heavy physical activity among normal weight girl (Brunet et al (2014).

Resilience acts as protective role within one's psychological construct through adjustment in response to environmental hazard that predisposes to any psychological burdens. The findings related to psychological resilience among obese and non-obese revealed 63% of obese is in average level of psychological resilience in compared with 47% of non-obese. Non-obese people have scored more percentage in low and extremely low level of psychological resilience than obese. Both obese and non-obese people have

same percentage in high psychological resilience score. These interpretation on level of psychological resilience among obese and non-obese stated there is no difference in high level, but a greater number of obese people are in average level of psychological resilience than non-obese people. While lower level of psychological resilience comparatively less in obese than non-obese. There were no direct sufficient research support on psychological resilience level among obese and non-obese, but many previous studies indirectly supported present study as the psychological resilience were significantly higher level among normal weight student than thin student (Secer and Yildizhan., 2020), body size dissatisfaction with cardio-metabolic resilience to obesity led to further obesity and risk factor for many chronic diseases (Johnson., 2018), high resilience group were older and have high mean in Healthy Index scores than low resilience group (Lutz et al., 2016), and high psychosocial weight-resilience factor acted as significant role is preventive strategy for obese even residing in obesogenic environment (Brogan et al., 2012). High psychological resilience negatively related with perceived stress (Ligeza et al., 2022), positively correlated with positive coping style (Wu et al., 2020) and directly associated with health-related behaviour. Irrespective of obese or non-obese psychological resilience enhance physical as well as mental health. High resilience associated with appropriate weight reduction strategies help to prevent obesity. Personal resilience strategies like 'shift-and-persist' mindsets positively reframe individually towards maintaining an optimistic outlook about the future. Here, the word 'shift' means cognitive restructuring, positive thinking, and emotion regulation and 'Persist' represents optimism and purpose. The resilience training and family meals with high family support strategies are high valuable implementation in the prevention and/or intervention against obesity (Loi and Cheskin., 2019).

Present study also stated that most of people either obese or non-obese are in low self-esteem, comparatively obese people have scored higher percentage of low self-esteem as 89% of obese were in low self-esteem level than 73% of non-obese. Further it revealed non-obese people (20%) have higher percentage of average self-esteem than obese people (9%). Many previous studies supported presence of low self-esteem among obese

populations (Ercan and Özcebe 2020; Franklin et al. 2006; Wang and Veugelers 2008; Unlu et al. 2019; Aggarwal 2019; Al-Ahmari et al. 2017; Almenara et al. 2017; and Griffiths et al. 2010). Obesity was significantly associated with low-self-esteem even without physical or emotional bullying (Ercan and Özcebe 2020). Low self-esteem and fear of negative appearance evaluation acted as significant influence over weight stigma and disordered eating among obese women (Almenara et al. 2017). Among non-obese people, normal weight have healthy self-esteem than underweight and overweight. Past study stated normal weight women have high self-esteem compared then overweight and obese women, and the mean differences between the groups were statistically significant. Thus, it has bidirectional correlation between body mass index and self-esteem., and showed mild to moderate significant negative relationship. Thus, greater body size affects self-esteem, similarly physical activity increases one's self-esteem, and shifts energy balance towards negative aspects through physical activity and self-esteem (Aggarwal 2019).

There is no proper health without mental health and is controlled by wide ranges of socioeconomic, biological and environmental factors. Many studies revealed there was greater association between mental health and body mass index which may be obese or non-obese. Present study stated difference level of variation in mental health among obese and non-obese. Obese as well as non-obese people have almost same level of mental health especially below average level, which mean below average, low and extremely level of mental health among obese as 15%, 5% and 3% respectively, while non-obese as 15%, 4% and 4% respectively. But it shows greater variation in average, above average, high and extremely high level of mental health among obese and non-obese. There is no obese individual in extremely high level of mental health, non-obese people showed 8% of them in extremely high level of mental health. Again, in high level of mental health, obese have solidly 2% of them, non-obese have scored 11% which is around five times more than obese. Obese people have less percentage in above average level of mental health as 10%, while non-obese it is 18%. Thus, the majority of non-obese people have scored higher mental health above average line than non-obese. Obese people have 65% in average level of mental health and non-obese as 40%.

Further, both obese and non-obese have scored equal percentage in mental health with respect to its level as 77% in obese (65% in average and 12% above average) and in non-obese 77% (40% in average and 37% in above average). These interpretations revealed obese people have lesser mental health comparatively than non-obese people. Many previous studies stated there were strong relationship between depression, anxiety and stress in obesity (AlQahtani et al. 2015). Patient with obese have significant possibility to get depression while overweight have low chance to return in their job. But there was no significant difference in their mental health (Reynolds et al. 2015). The results revealed the obesity was not statistically significant with mental health. The strongest influences of mental health among obese individuals were perceived physical health (Knoesen et al. 2010). Further, it is revealed that among obese, female affected much with mental health illness such as anxiety, depression, and emotional disturbance than male. Many previous studies has supported as obese women have significantly lower body image and low self-esteem with more depressive symptoms than non-obese (Sarigiani et al. 2020), Female have higher rate of anxiety than male (Sharafi et al. 2020), obesity was strongly related with increased risk for depressive disorder among female, but not in male (Ahuja et al. 2020), prevalence of obesity was common among women. Most obese women likely to be depressed (Chang and Yen 2012), there was statistically significant relationship between obesity and mental health among female obese children than male children (Lim et al. 2011), and among girl and increase in body mass index increases their depressive symptoms and was more among who perceived peer isolation. But such association was not seen among high BMI boys (Xie et al. 2005). Another study stated among men, there was no statistically significant relation between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). Among men, there was no statistically significant relation between general obesity with mental health

issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). The prevalence of mental health also varies with presence of metabolic disease among obese and non-obese which have stated in a study as mental health among metabolically healthy non-obese were higher in women than men (Men 39.3% and women 55.2%). But the depressive symptoms were high among metabolically unhealthy obese (MUO), in metabolically healthy obese (MHO) female subject were prone to depression than male. (Seo et al. 2021).

5.3.2 Objective-2: To find the difference in social support, Resilience, Self-esteem and mental health among obese and non-obese people.

The absolute difference in social support, psychological resilience, self-esteem and mental health between obese and non-obese people gives an idea of how much difference there is between the averages of particular variable in obese group and non-obese groups. Since the data distributions in this study is not normally distributed, it is carried using non-parametric test. Present study stated there is statistically significant mean difference in social support between obese and non-obese (z statistic = -3.940, $p = .000$) in which obese people have high mean (mean rank = 328.02) than non-obese people (mean rank = 272.98). This finding is supported in line with previous studies as high social status positively associated with obesity (Vartanian & Silverstein., 2013), social vulnerabilities such as easy food access, over parental care due to high social support seems to increase their energy intake and decrease energy expenditure lead to obesity (Iguacel et al., 2020), support network have positive relationship with overweight (Shenk et al., 2021) and social network in obesigenic environment likely to spread obesity through social ties (Christakis and Fowler., 2007). Further the latest study revealed that high social support especially parental support lowers experiencing weight related bullying victimization, this protective effect were high among obese youth than non-obese youth (Yourell & Doty., 2021).

The finding also stated there is statistically significant mean difference in psychological resilience between obese and non-obese (z statistic = -4.678, $p = .000$) in which obese people have high mean (mean rank = 332.91) than non-obese people (mean rank = 268.09). This finding is supported in line with previous studies as indirectly supported present study as the psychological resilience were significantly higher level among higher BMI than thin student (Secer & Yildizhan., 2020), body size dissatisfaction with cardio-metabolic resilience to obesity led to further obesity and risk factor for many chronic diseases (Johnson., 2018), high resilience group were older and have high mean in Healthy Index scores than low resilience group (Lutz et al., 2016), and high psychosocial weight-resilience factor acted as significant role is preventive strategy for obese even residing in obesigenic environment (Brogan et al., 2012). High psychological resilience negatively related with perceived stress (Ligeza et al., 2022), positively correlated with positive coping style (Wu et al., 2020) and directly associated with health-related behaviour. Irrespective of obese or non-obese psychological resilience enhance physical as well as mental health. High resilience associated with appropriate weight reduction strategies help to prevent obesity. Psychological resilience acted as mediating role in controlling or diminishing dietary energy intake (Williamson et al., 2021). Resilience particularly emotional have preventive role in controlling child obesity irrespective of any income stratum (Foster & Weinstein., 2018). Personal resilience strategies like 'shift-and-persist' mindsets positively reframe individually towards maintaining an optimistic outlook about the future. Here, the word 'shift' means cognitive restructuring, positive thinking, and emotion regulation and 'Persist' represents optimism and purpose. The resilience training and family meals with high family support strategies are high valuable implementation in the prevention and/or intervention against obesity (Loi & Cheskin., 2019).

There is no statistically significant mean difference in self-esteem between obese and non-obese (z statistic = -1.279, $p = .201$), obese people have low mean (mean rank = 291.49) than non-obese people (mean rank = 309.51). This finding is supported in line with previous studies even though it is in statistical insignificance as Obesity was significantly

associated with low-self-esteem even without physical or emotional bullying (Ercan & Özcebe 2020). Low self-esteem and fear of negative appearance evaluation acted as significant influence over weight stigma and disordered eating among obese women (Almenara et al.2017). Among non-obese people, normal weight have healthy self-esteem than underweight and overweight. Past study stated normal weight women have high self-esteem compared then overweight and obese women, and the mean differences between the groups were statistically significant. Thus, it has bidirectional correlation between body mass index and self-esteem., and showed mild to moderate significant negative relationship. Thus, greater body size affects self-esteem, similarly physical activity increases one's self-esteem, and shifts energy balance towards negative aspects through physical activity and self-esteem (Aggarwal 2019).

The finding also stated there is statistically significant mean difference in mental health between obese and non-obese (z statistic = -4.286, $p = .000$) in which obese people have low mean (mean rank = 270.18) than non-obese people (mean rank = 330.82). This finding is supported in line with previous studies as patient with obese have significant possibility to get depression while overweight have low chance to return in their job. But there was no significant difference in their mental health (Reynolds et al. 2015). The results revealed the obesity was not statistically significant with mental health. The strongest influences of mental health among obese individuals were perceived physical health (Knoesen et al. 2010). Further, it is revealed that among obese, female affected much with mental health illness such as anxiety, depression, and emotional disturbance than male. Many previous studies has supported as obese women have significantly lower body image and low self-esteem with more depressive symptoms than non-obese (Sarigiani et al. 2020), Female have higher rate of anxiety than male (Sharafi et al. 2020), obesity was strongly related with increased risk for depressive disorder among female, but not in male (Ahuja et al. 2020), prevalence of obesity was common among women. Most obese women likely to be depressed (Chang & Yen 2012), there was statistically significant relationship between obesity and mental health among female obese children than male children (Lim et al. 2011), and among girl and increase in body mass index increases their depressive

symptoms and was more among who perceived peer isolation. But such association was not seen among high BMI boys (Xie et al. 2005). Another study stated among men, there was no statistically significant relation between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). Among men, there was no statistically significant relation between general obesity with mental health issue such as depression, anxiety and stress. But men with abdominal obesity have negative relationship with depression. Among women population, the obesity has positive relationship with depression and anxiety. Similarly abdominal obesity has positive relationship with depression. Abdominal obesity has positive association with anxiety among adult females but was not with adult male (Heidari-Beni et al. 2021). The prevalence of mental health also varies with presence of metabolic disease among obese and non-obese which have stated in a study as mental health among metabolically healthy non-obese were higher in women than men (Men 39.3% and women 55.2%). But the depressive symptoms were high among metabolically unhealthy obese (MUO), in metabolically healthy obese (MHO) female subject were prone to depression than male. (Seo et al. 2021).

5.3.3 Objective-3: To examine relationship between social support, resilience, self-esteem and Mental health among obese and non-obese.

This objective is studied using correlation analysis which revealed all psychological variables such as social support, psychological resilience, self-esteem and mental health have showed significant relationships with each other irrespective obese and non-obese. The research outputs with respect to obese and non-obese showed that there is significant similar or little higher positive correlation between social support and psychological resilience among obese with Spearman's correlation coefficient $\sigma = .586$, $p = .001$ and non-obese with Spearman's correlation coefficient $\sigma = .514$, $p = .001$. This findings go in line

with the research done by previous studies as parental support have better protective effect in weight-based bullying and victimization (Yourell and Doty., 2021), Resilience with greater social support and lesser social stress have better control over binge eating and weight based quality of life (McGarrity et al., 2022), family support and child behavioural resilience have better positive effect in severe obese categories (Rollins et al., 2022), low resilience and poor social support were correlated to get involved in food addictions (Li et al., 2021), and women resilient to obesity were to be younger, highly supported, educated, unmarried and have high income (Ball et al., 2012). In General, many previous studies revealed social support have positive correlation with psychological resilience irrespective of body mass index, as social support enhance psychological resilience to distress or illness through moderation in genetic and environmental vulnerabilities (Ozbay et al., 2007), system level-resilience (Social support) have bidirectional relationship with individual resilience were revealed in a study with the trauma-exposed individual (Sippel et al., 2015), social support acted as positive buffering action in relationship between resilience and mental health (Li et al., 2021), psychological resilience had significant positive relationship with social support among secondary school student (Achour and Nor, 2014), social support and resilience had positive influence between each other among undergraduate social work students (Wilks and Spivey, 2010), family support and resilience had negative association with menopausal symptoms scores (Zhao et al., 2019), resilience with social support from co-workers enhance work engagement (Cao and Chen, 2019), resilience have positive association with social support and enhance mental health of victim people during covid-19 pandemic (Skalski et al., 2021), among Incarcerate men social support and resilience had positive relationship with their mental health (Wolff and Sánchez, 2019), resilient nurses with high social support had lower anxiety especially in covid-19 times (Labrague and Santos, 2020), social support and resilience had direct and indirect relationship with stress reappraisal (Pejčić et al., 2018), social support and resilience had positive relationship between them and have mediating effect of self-efficacy among Syrian refugees (Pak et al., 2022), and there was significant positive relationship between resilience and social support among university students (Tas 2019).

Similarly, there is significant negative relationship between social support and self-esteem among obese with Spearman's correlation coefficient $\sigma = -.236$, $p = .001$ and non-obese with Spearman rank correlation coefficient $\sigma = -.447$, $p = .001$. It revealed non-obese people have greater negative relationship between social support and self-esteem than obese people. Usually, obese people under estimate their own body image, an increase in perceived social support decrease self-esteem in higher proportion among non-obese than obese. This findings is in line with previous research studies as there was comparatively diminished social support and self-esteem have greater association with depression and suicidal ideation among obese people than non-obese (Babiss et al., 2009), high body mass index was correlated with low self-esteem and poor social support particularly in adolescent girl (Kaminsky & Dewey, 2014), Avoidant coping with low self-esteem have unhealthy eating behaviour (Martyn-Nemeth et al., 2009), obese children have significant low perceived competence and global self-worth than non-obese (Franklin et al., 2006), and obese women in low self-esteem with moderate social support had greater chance for depression than person with high self-esteem (Walker 1997). In overall, many studies revealed that social support showed significant negative correlation with self-esteem as increase in group size will decrease social self-esteem (Bertucci et al., 2010), there was greater chances of getting behavioural issues when there was imbalance between social support and self-esteem (DuBois et al., 2002), social support were negatively associated with self-esteem among HIV-positive people (Yan et al., 2019), an increase in low self-esteem rate among women will increase discrimination among them (Cénat et al., 2022), Mental health is positively associated with social support and it is negatively correlated with self-esteem (Chang and Che, 2018), and there was greater chances to get depressed among low self-esteem due to high parental support (Wang et al, 2019). Further in controversy, many research studies showed social support have positive relationship with self-esteem (Zhou and Zhen, 2017; Kazi 2022; Boyle et al., 2018; Chen and jiang, 2022; Molero Jurado et al., 2019; Shahali et al., 2017; Xia and Yang, 2019; Ikiza and cakar, 2010; Goodwin et al., 2001; DuBois et al., 2002; Freng et al., 2018; Karaca et al., 2019; and Li et al., 2018).

Similarly, there is significant negative relationship between resilience and self-esteem among obese with Spearman's correlation coefficient $\sigma = -.200$, $p = .001$ in lesser degree than non-obese with Spearman rank correlation coefficient $\sigma = -.419$, $p = .001$. It revealed non-obese people have greater negative relationship between resilience and self-esteem than obese people. The findings go in line with previous studies as prevalence of less number of low level of resilience in relation to more number of low to moderate self-esteem among transgender individuals (Akhtar and Bilour, 2019), self-esteem have correlation with higher psychological resilience especially among male (Harvey and Boynton, 2021), psychological resilience acted as protecting factor against excessive negative self-esteem in post-mastectomy women in their body image (Izydorczyk et al., 2018), and high job autonomy with high organisation based self-esteem were associated with low in trait resilience (Gardner 2019). In other side, many other studies supported positive correlation between resilience and self-esteem, as psychological resilience were positively correlated with self-esteem (Zhao and Zhou, 2020, Arslan 2015; Kapikiran and Acun-kapikiran, 2016; Baguri et al., 2022; Martinez-Ramon et al., 2022; Caqueo-Urizar et al., 2022; and Ferna'ndez-Castillo et al 2022) which may be due to high prevalence of low self-esteem among study population in association with covid-19 pandemic situations.

The findings in this study with respect to relationship of social support with mental health among obese and non-obese revealed social support have better positive correlation with mental health in non-obese Spearman's correlation coefficient $\sigma = .442$, $p = .001$ than obese with Spearman's correlation coefficient $\sigma = .227$, $p = .001$. This finding go in line with the research done in previous research studies as social support acted as buffering agent in minimizing mental health and body mass index (Xie et al., 2005), there was significant positive relationship between social network support and mental health with healthy food behaviour which can impact on body weight (Guevara-Valtier et al., 2021), the level of social support with acculturation revealed higher obesity rate (Yoshida et al., 2020), and mental health of offenders or body weight victims depends on perceived social support, resilience and self-acceptance (Huang et al., 2020). Among obese youth, support perceived from close friends and parents have higher social support than from classmates

and schoolmates will enhance mental health (Herzer et al., 2011). In general, Social support has positive correlation with mental health as in previous studies like marital or intimate support acted as key determinants of mental health (Balaji et al., 2007), social support is associated with overall wellbeing of cancer patients (Applebaum et al., 2014), the relationship between social support and mental health are multifarious (Bjørlykhaug et al., 2021), Emotional support have significant relationship with depressive symptoms especially with women (Fiori and Denckla., 2012), perceived social support acted as protective factors for mental health (Huang et al., 2020), low social support have highly associated with high depression and anxiety (Jones et al., 2021; Muñoz-Bermejo et al., 2020; and Klineberg et al., 2006), Social support have strong relationship with mental health, quality of life, subjective cognitive function, and less fatigue (Kever et al., 2021), social support have moderation relationship with perceived uncontrollability and mental health symptoms (Liu et al 2021), and there was significant relationship found between mental health, perceived lack of support, and perceived social support from friends and family (Noret, Hunter and Rasmussen., 2019).

Similarly, psychological resilience has better positive correlation with mental health in non-obese Spearman's correlation coefficient $\sigma = .353$, $p = .001$ and obese Spearman's correlation coefficient $\sigma = .265$, $p = .001$. This findings go in line with the in previous research studies as resilience particularly emotional have preventive role in controlling child obesity and mental health irrespective of any income stratum (Foster & Weinstein., 2018), significantly higher level among normal weight student than thin student (Secer and Yildizhan, 2020), high psychosocial weight-resilience factor acted as significant role in preventive strategy for obese (Brogan et al., 2012), psychological resilience acted as mediating role in controlling or diminishing dietary energy intake (Williamson et al., 2021), and psychological resilience particularly meaningfulness was negatively correlated with depression and inversely associated with affective, cognitive and somatic symptoms of depression (Toukhsati et al., 2017), resilience was significantly related with mental health (Tian et al., 2016), high resilience were prone to have increased

life satisfaction (Poole et al., 2017), and psychological resilience have strong positive correlation with mental health (Li et al., 2021).

Self-esteem has negative relationships with mental health comparatively low correlation among obese with Spearman's correlation coefficient $\sigma = -.090$, $p = .001$ than non-obese with correlation coefficient $\sigma = -.417$, $p = .001$. This findings go in line with previous research studies as self-compassion which is higher in non-obese than obese mediated the association between self-esteem and mental health regardless of age (Hwang et al., 2016), personal self-esteem acted as significant predictor of mental health (Jomeena & Martin, 2005), self-esteem reciprocally associated with mental health (Moksnes & Reidunsdatter, 2019), self-esteem played as affective mediating role in relationship between weights related self-devaluation and disordered eating (Almenara et al., 2017), weight bias internationalization scale positively related to body image, depression and stress, and negatively associated with self-esteem (Durso et al., 2016), body dissatisfaction based on BMI negatively impacts self-esteem and mental health (Prabhu & D'Cunha, 2019), low self-esteem is correlated with mental health disorders (Mann et al., 2004), self-esteem have more positive influence on the mental health in girls than in boys (Bolognini et al., 1996), self-esteem have an inverse association with mental health (de Brito et al., 2010), self-esteem have negative correlation with mental health (Lee, 2013), self-esteem have significant positive prediction on depression/anxiety and significant negative prediction on mental well-being, in short self-esteem negatively associated with mental health (Moksnes and Reidunsdatter, 2019), and self-esteem have negative prediction on mental health disorder such as anxiety, delusional disorder, obsessive compulsiveness, and psychosis (Yu *et al.*, 2012).

5.3.4 Objective-4: To find out the influence of social support, resilience and self-esteem on Mental Health among obese and non-obese people.

Aim to find out the influences of predictor variables on mental health among obese and non-obese with social support, psychological resilience and self-esteem as predictor variables on mental health (criterion variables). The influences of social support, psychological resilience and self-esteem on mental health among obese and non-obese

have showed significant distinguish difference between them. Present study revealed that the social support has comparatively lesser impacts on mental health in obese, $\beta = .425$, $R^2 = .158$, and $p = .001$ than non-obese, $\beta = .667$, $R^2 = .236$, and $p = .001$, which means an increase in one point of social support will increase .425 points in mental health among obese is lesser than .667 points among non-obese and the social support have 23.6% of contribution on prediction in non-obese and only 15.8% contribution in obese. It showed the influence of social support on one's mental health is better in non-obese people than obese people. These findings go side by side with previous studies which stated that the level of social support with acculturation revealed higher obesity rate among low or no social support (Yoshida *et al.*, 2020), the significant positive relationship was there between social network support and physical activity and healthy food behaviour which can impact on body weight (Guevara-Valtier *et al.*, 2021), social support acted as buffering agent in minimizing perceived peer isolation on mental health and BMI (Xie *et al.*, 2005), and mental health of offenders or body weight victims depends on perceived social support, resilience and self-acceptance (Huang *et al.*, 2020). Among obese youth, support perceived from close friends and parents have higher social support than from classmates and schoolmates (Herzer *et al.*, 2011). In overall social support have significant positive influence on mental health in line with previous studies as the apparent significance of social support in association with mental health which revealed low social support acted as risk factor for mental health problem (Turner & Brown., 2009), the role of social support on mental health depends on contextual factors like copying strategies, stressful events, mental health based on income status (Kocot & Goodman., 2003), low social support especially from family, friends and others have relationship with mental health, but such association did not vary with ethnicity (Klineberg et al., 2006), close and emotional support plays significant role in women mental health and not in men (Fiori & Denckla., 2012), the dynamic action between received social support and perceived social support with sense of community helps as coping resources for natural disasters and health issues (Kaniasty, 2019), and resilient coping with high social support associated with low mental health symptoms than low social support (Jones et al., 2021). High social support has significant

relationship with good mental health, quality of life, and better cognitive function, even good motor function especially among women (Kever *et al.*, 2021). The relationship between social support and mental health are multifactorial depending upon person who perceived social support and person who perceived his or her mental health issues (Bjørlykhaug *et al.*, 2021). Mental health of children has significant route from parental mental health especially maternal mental health, and the study mentioned marital close relationship between parents acts as essential determinants of maternal mental health (Balaji et al 2007).

The psychological resilience has comparatively very lesser impacts on mental health in obese, $\beta = .210$, $R^2 = .178$, and $p = .001$, than non-obese with $\beta = .426$, $R^2 = .291$, and $p = .001$, which means an increase in one point of psychological resilience will increase only .210 points in mental health among obese and .426 points among non-obese and also it have 29.1% of contribution in prediction of mental health among non-obese in compared with only 17.8% contribution among obese. It showed the influence of psychological resilience on one's mental health is better in non-obese people than obese people. These findings goes side by side with psychological resilience which showed significantly higher level among normal weight student than thin student (Secer & Yildizhan, 2020), high psychosocial weight-resilience factor acted as significant role in preventive strategy for obese (Brogan *et al.*, 2012), psychological resilience acted as mediating role in controlling or diminishing dietary energy intake (Williamson *et al.*, 2021), resilience particularly emotional have preventive role in controlling child obesity irrespective of any income stratum (Foster & Weinstein., 2018), and psychological resilience was negatively correlated with depression and inversely associated with affective, cognitive and somatic symptoms of depression. Psychological resilience, particularly meaningfulness, accounted for more of the variance in affective features of depression than for somatic features. (Toukhsati *et al.*, 2017). Another study stated that women who classified as "resilient to obesity" were young, highly educated, unmarried, have more leisure time physical activity, and consumed less junk food & soft drinks than obese women. Social, cognitive and behavioural factors also have direct and indirect effect on obesity (Ball *et al.*, 2011).

Further studies revealed similar findings as among medically ill patient especially cancer patients with low optimism, social support acted as buffering effect to minimize mental health symptoms than patient with high optimism. (Applebaum et al 2014). The study stated there was gender-based difference in physical quality of life among male and female in which social support acted as significant effect over it among youth people (Ingenski *et al.*, 2007). Social support from older caregivers is significantly correlated with mental health (Muñoz-Bermejo *et al.*, 2020). Social support from friends and family has significant associations with mental health among girls, have not seen in boys (Noret, Hunter and Rasmussen, 2019). Social support plays moderate role in mediation between perceived uncontrollability and mental health (Liu *et al.*, 2021). During covid-19 time, low and medium social support have significant impact on mental health among adolescents (Qi et al., 2020). Peer victimized and social support are two different social phenomena in society and have significant contribution with mental health of obese individuals. (Lim et al., 2011).

Present study stated the self-esteem have comparatively very lesser impacts on mental health, $\beta = -.598$, $R^2 = .189$, and $p = .001$ than non-obese, $\beta = -1.24$, $R^2 = .330$, and $p = .001$ which means an increase in one point of self-esteem will decrease only .598 points in mental health among obese while in non-obese it is 1.24 points. Self-esteem has 33% of contribution in prediction of mental health among non-obese in compared with only 18.9% contribution among obese. It showed the influence of self-esteem on one's mental health is negative and have higher impact on non-obese people than obese people. These findings goes side by side with previous studies which revealed that self-esteem reciprocally associated with mental health (Moksnes & Reidunsdatter, 2019), self-esteem played as affective mediating role in relationship between weights related self-devaluation and disordered eating (Almenara *et al.*, 2017), self-compassion which is higher in non-obese than obese mediated the association between self-esteem and mental health regardless of age (Hwang et al., 2016), weight bias internationalization scale positively related to body image, depression and stress, and negatively associated with self-esteem (Durso et al., 2016), personal self-esteem acted as significant predictor of mental health (Jomeena &

Martin, 2005), and body dissatisfaction based on BMI negatively impacts self-esteem and mental health (Prabhu & D'Cunha, 2019). Further studies revealed in general irrespective of body mass index, self-esteem have significant positive prediction on depression/anxiety and significant negative prediction on mental well-being, in short self-esteem negatively associated with mental health (Moksnes & Reidunsdatter, 2019), self-esteem have more positive influence on the mental health in girls than in boys (Bolognini *et al.*, 1996), low self-esteem is correlated with mental health disorders (Mann *et al.*, 2004), self-esteem have an inverse association with mental health (de Brito *et al.*, 2010), self-esteem have negative correlation with mental health (Lee, 2013), and self-esteem have negative prediction on mental health disorder such as anxiety, delusional disorder, obsessive compulsiveness, and psychosis (Yu *et al.*, 2012)

5.3.5 Objective-5: To investigate the difference in social support, resilience, self-esteem and mental health with respect to demographic variables.

Demographics variables help us to understand the size, status, and behavior of populations. Which refers as a group of individuals living within a given area with respect to age, gender, family type, location, social status, income status, cultural value, belief system etc. In this study the researcher analysed the study under demographic variables such as age, gender, family type, location and income status for better clinical and research significances. One of aim of this study is to investigate the difference in social support, resilience, self-esteem and mental health with respect to demographic variables.

5.3.5.1 Social support

In this study, the finding revealed that there is statistically significant mean difference in social support with respect to age (Kruskal Wallis $H = 9.432$, $p = .015$) in which age group above 35 years have very high mean (mean rank = 317.46) than age group 26 to 35 years (mean rank = 305.22) and age group 15 to 25 years (mean rank = 268.24). This finding is supported in line with previous studies as youngest people age group from 18 to 44 years have significantly lower social support than age group 45 to 64, and above 65 years (Sherbourne *et al.*, 1992), older people have significantly better social support

than younger in order to reduce stress on mental health (Tyler & Hoyt, 2000), older people with family dependents and locally integrated individuals have higher social support than corresponding young people (Wojszel & Politynska, 2021), young people especially girls perceived lower social support than elder people (Van Droogenbroeck *et al.*, 2018), the study on age-loneliness stated that loneliness was peak at age 19 years, later it diminished slowly in young adults due to their social adjustment and well-being (Shovestul *et al.*, 2020), experienced staff have scored better social support than fresh staff (Cai *et al.*, 2020) and young person who have better education and healthier lifestyles might perceive higher social support than others (Alcañiz & Solé-Auró, 2018). Also, stated there is statistically significant mean difference in social support with respect to gender (z statistic = -3.083, $p = .002$) in which female have significantly higher mean (mean rank = 316.47) than male (mean rank = 271.48). This finding is supported in line with previous studies as female participants have significantly higher perceived satisfaction than male counterpart in training program on social isolation, loneliness and quality of life (Neil-Sztramko *et al.*, 2020), social support perceived by female students have significantly better prediction on depression and quality of life among university students (Alsubaie *et al.*, 2019), among middle-aged individuals female people have higher social support in controlling their depression (Takizawa *et al.*, 2006), women people have high social support especially in expressive trait than men (Matud *et al.*, 2019), among judges females with high social support than males have better subjective job performance (Miller *et al.*, 2018), in Social network media female participants perceived and shared higher social support than male (Tifferet 2020), female depended on social support to buffer their distress than male (Zhang *et al.*, 2018), and women people with high social support have better thriving or successful career than men (Abdollahi *et al.*, 2018).

Further, the finding revealed there is no statistically significant mean difference in social support with respect to family type (z statistic = -.718, $p = .473$) in which joint family type have higher mean (mean rank = 308.04) than nuclear family type (mean rank = 297.17). This finding is supported in line with previous studies as irrespective of family type support structure perceived either from family or friend enhance adherence towards

treatment protocol (DiMatteo 2004), social support from family either joint or nuclear promotes adherence to diabetes management (Miller & Dimatteo, 2013), most support group to cancer patient were from white middle-class females irrespective of family type (Taylor et al., 1986), irrespective of family type, the gender plays essential role in social support (Spitze & Logan, 1990), close family circle acted as major support system for elderly people irrespective of family type (Shanas 1979), the emotional well-being and Overload of caregiver have influence over social support of patients with Alzheimer disease (Hernández-Padilla et al., 2020), and family support also moderated with culture and economic context (French *et al.*, 2018). Thus, family type whether joint or nuclear have no significant role in social support.

Present study stated there is no statistically significant mean difference in social support with respect to location (z statistic = -1.764, $p = .078$) in which rural people have higher mean (mean rank = 311.13) than urban people (mean rank = 286.22). This finding is supported in line with previous studies as residential location have no significant role on social support and smatphone addiction (Gökçearslana et al, 2018), presence and distance of adult child caregiver irrespective of location have significant effect on perceived social support (Li et al., 2017) and irrespective of locations emotional and social loneliness have significant role on social support (Labrague et al., 2017). The finding also revealed that there is statistically significant mean difference in social support with respect to income status (Kruskal Wallis $H = 36,150$, $p = .000$) in which income status below 15,000 INR have very high mean (mean rank = 331.20) than income status 15,001 INR to 30,000 INR (mean rank = 248.37) and income status above 30,001 (mean rank = 235.56). This finding is supported in line with previous studies as social support have correlation with income of family and baseline family functioning especially among low income people (Carlson *et al.*, 2019), social support acted as main contributor for mental health among low income people (Ashley *et al.*, 2020), comparatively low income people have high social support which significantly reduce unintentional pregnancy (Feld *et al.*, 2020), there was significant association between income status and social support (Sánchez-Moreno & Gallardo-Peralta, 2021), low household income have significant association with social

isolation among low social support women (Wang *et al.*, 2005), and social support have significant association with income status, socially disadvantage family with low social support acted as risk factor for illness (Min-Kyoung *et al.*, 2003)

5.3.5.2 Resilience

The finding in the present study revealed that there is statistically significant mean difference in psychological resilience with respect to age (Kruskal Wallis $H = 42.412$, $p = .001$) in which age group above 35 years have very high mean (mean rank = 338.65) than age group 26 to 35 years (mean rank = 310.19) and age group 15 to 25 years (mean rank = 228.98). This finding is supported in line with previous studies as high resilience were correlated with older age, male gender and less illness (Cohen *et al.*, 2014), quality of life were predicted from resilience and age (Yazdi-Ravandi *et al.*, 2012), the dimensions of well-being was not in relation with age, but it's sub-dimensions such as purposefulness, perception and transcendence were associated with age (Svence & Majors, 2015), age gives meaning for necessitates creative and conscientious thought about health (Hayman *et al.*, 2016), real resilience comes with life experience and increased age (Lamb 2020), proactive coping was positively associated with age, it was high among older adults than younger adults (Pearman *et al.*, 2020), and trait resilience were getting increased across lifespan (Linnemann *et al.*, 2020)

Also, stated there is no statistically significant mean difference in psychological resilience with respect to gender (z statistic = -0.710 , $p = .478$) in which female have higher mean (mean rank = 304.15) than male (mean rank = 293.87). This finding is supported in line with previous studies as women faces more intersecting vulnerabilities due to socio-cultural conditions (Jordan 2018), there was significant higher resilience among females (Zhang *et al.*, 2018), female have better disaster resilience than male (Chisty *et al.*, 2022), in trauma situations male have significantly higher resilience (Portnoy *et al.*, 2018), neuroticism predicted resilience in female and extraversion predicted resilience in male (Iimura & Taku, 2017).

Further, the finding revealed there is no statistically significant mean difference in psychological resilience with respect to family type (z statistic = -1.240 , $p = .215$) in which

nuclear family type have higher mean (mean rank = 306.21) than joint family type (mean rank = 287.58). The studies related to relationship between psychological resilience and family type is far more limited. Previous studies explained it as psychological resilience is associated with many familial factors like family situations which includes developmental factors, risk and protective factors, (Hawley & DeHaan, 1996), psychological resilience also depends on childhood trauma and family resilience (Dong et al., 2020), resilience in family type relies on cultural values, financial resources, parental monitoring and support, stable home life, coping skills, supportive members and perseverance (Graber *et al.*, 2015), Individual resilience acted as mediator in the relationship between caregiver burden and family resilience (Li *et al.*, 2018), implicit aspects of psychological resilience are closely associated with people like family member, companion, and friend, and attitudes towards calm and anxiety (Ihaya *et al.*, 2010), and resilience and childhood abuse have negative association between them (Chang *et al.*, 2021)

Present study stated there is statistically significant mean difference in psychological resilience with respect to location (z statistic = -4.611, $p = .001$) in which rural people have significantly higher mean (mean rank = 328.06) than urban people (mean rank = 263.47). This finding is supported in line with previous studies as strong social ties with respect to location were correlated with resilience (Wells 2010), the dimensions of psychological resilience such as risk perception, perceived hazard knowledge, and evacuation mode efficacy have relationship with demographic variables location (Chen et al., 2021), and psychological resilience have significant positive relationships with demographic variables like gender, community size, income status and sense of danger (Kimhi et al., 2020). The finding also revealed that there is statistically significant mean difference in psychological resilience with respect to income status (Kruskal Wallis $H = 36,150$, $p = .001$) in which income status below 15,000 INR have very high mean (mean rank = 343.21) than income status above 30,001 INR (mean rank = 229.03) and income status 15,001 INR to 30,000 INR (mean rank = 216.35). This finding is supported in line with previous studies as demographic variable income status was one of main predictor of psychological resilience (Bonanno et al., 2007), resilience have significant positive

correlations with income status (Kimhi *et al.*, 2020), and being employed and married were significant resilience factors (Gruebner *et al.*, 2015).

5.3.5.3 Self-esteem

Present study revealed that there is statistically significant mean difference in self-esteem with respect to age (Kruskal Wallis $H = 11.198$, $p = .004$) in which age group above 35 years have very high mean (mean rank = 330.13) than age group 26 to 35 years (mean rank = 310.83) and age group 15 to 25 years (mean rank = 274.69). This finding is supported in line with previous studies as self-esteem increases from adolescence to adulthood (Erol & Orth, 2011; O'Malley & Bachman, 1983; McMullina & Cairney, 2004), increases with age and gets peak at 50 to 60 years (Orth & Robins, 2014), high in childhood, then drops little bit, again increases till adulthood and declines slowly in old ages (Robins *et al.*, 2002), lower in early childhood (Khadri *et al.*, 2020), and self-esteem have significant difference with age, gender and ethnicity (Dias *et al.*, 2002).

Also, stated there is no statistically significant mean difference in self-esteem with respect to gender (z statistic = -1.374, $p = .169$) in which male have insignificantly higher mean (mean rank = 313.54) than female (mean rank = 293.32). This finding is supported in line with previous studies as there was no difference in self-esteem among women and men (Erol & Orth, 2011), women have slight lower self-esteem than men (McMullina & Cairney, 2004; Mageea and Upenieks, 2019; Bang *et al.*, 2020), gender difference such as lower self-esteem in women was seen in young adulthood, not in late adulthood and old ages (Orth *et al.*, 2010), male population have slightly higher self-esteem than female from late adolescence to middle adulthood (Bleidorn *et al.*, 2016), adolescent girls have lower self-esteem and more negative assessments about their body image (Kearney-Cooke, 1999) and self-esteem have significant difference with age, gender and ethnicity (Dias *et al.*, 2002).

Further, the finding revealed there is no statistically significant mean difference in self-esteem with respect to family type (z statistic = -.370, $p = .712$) in which nuclear family type have higher mean (mean rank = 302.23) than joint family type (mean rank = 296.58). This finding is supported in line with previous studies as irrespective of family type, self-

esteem was predicted based on difference in degree of support and closeness (Cooper et al., 1983), association of family type with self-esteem is quite challenging due to the complexity of family influence in well-being (Partridge & Tamara, 1987), self-esteem have no mean difference in family type (Clark & Barber, 1994), but there was a significant association between self-esteem and community type whether in cities or villages (Abu-saad *et al.*, 1999), family types have relationships with self-esteem especially among girls (Nagar et al., 2008), parenting styles acted as key influencer of self-esteem with different family types (Martínez & García, 2007; Martinez et al., 2020; and Queiroz *et al.*, 2020), and family and peer support have significant association with self-esteem (Wilburn & Smith, 2009). Present study stated there is no statistically significant mean difference in self-esteem with respect to location (z statistic = -1.185, $p = .236$) in which urban people have insignificantly higher mean (mean rank = 310.18) than rural people (mean rank = 293.30). This finding is supported in line with previous studies as there was no significant difference between geographic locations and the psychosocial variable self-esteem (Wilburn & Smith, 2009), the nature of people have significant difference in self-esteem as urban Bedouin townships have higher self-esteem than rural people (Abu-saad *et al.*, 1999), self-esteem have significant difference with ethnicity (Dias et al., 2002), and cultural homelessness was highly related to self-esteem (Hoersting & Jenkins, 2010). The finding also revealed that there is statistically significant mean difference in self-esteem with respect to income status (Kruskal Wallis $H = 6,540$, $p = .038$) in which income status 15,001 to 30,000 INR have significantly very high mean (mean rank = 331.82) than income status below 15,000 INR (mean rank = 295.57) and income status above 30,001 (mean rank = 273.66). This finding is supported in line with previous studies as income class have significant difference in self-esteem especially with middle age and older age groups and lower class have low self-esteem (McMullina & Cairney, 2004), income status with low and high showed less self-esteem than middle status people (Robins *et al.*, 2002), and demographic variables such as education and the financial situation have significant difference in the level of self-esteem (Ryszewska-Łabędzka *et al.*, 2022)

5.3.4.4 Mental health

Present study revealed that there is no statistically significant mean difference in mental health with respect to age (Kruskal Wallis $H = 2,129$, $p = .345$) in which age group above 35 years have very high mean (mean rank = 310.21) than age group 15 to 25 years (mean rank = 301.49) and age group 26 to 35 years (mean rank = 285.69). This finding is supported in line with previous studies as prevalence and onsets of mental health disorders need in-depth analysis of various factors especially causes and mechanisms of illness and interventions used upon it (Jones 2013), differences with respect to age merely depended on beliefs about the treatment helpfulness, usually older people have likely high belief (Farrer et al., 2008), few studies stated there was variations in types of mental health disorders with respect to age like behaviour disorders and specific anxiety disorders were likely more in childhood, mood, anxiety and substance use present during adolescence and psychotic disorders in early adulthood (Girolamo *et al.*, 2012), mental health issues begins as early from in childhood or adolescents (Kessler et al., 2007), mental health have significant difference within age groups based on category distribution and not by age (Li *et al.*, 2021), mental health in older ages depended on parenthood, social activities or marital satisfactions (Becker *et al.*, 2018), social and familial restrictions affect in higher rate among young adults than older adults (Sojli *et al.*, 2021), there was significantly higher prevalence of substance and alcohol abuse among military veterans (Williamson *et al.*, 2017), there was increased presence of mental health illness diagnosis among young and female (Rossell *et al.*, 2021), and risk of mental health care discontinuation were more among young adults, male and people from rural background (Seidler *et al.*, 2020). Studies during covid-19 pandemic stated mental health status of young and middle-aged adults were highly affected than older one (Ueda *et al.*, 2020)

Also, stated there is no statistically significant mean difference in mental health with respect to gender (z statistic = $-.691$, $p = .490$) in which male have insignificantly higher mean (mean rank = 307.09) than female (mean rank = 296.87). This finding is supported in line with previous studies as differences in mental health merely based on social context and not by gender (Kiely *et al.*, 2019), and there were no significant mean

differences among students with respect to gender, grade and location for depression and anxiety (Liu *et al.*, 2020). World Health Organisation (2002) stated the gender difference in mental health were varied based on age groups in which depression, eating disorder, suicidal ideation and suicide attempts were more among girls than boys during adolescence, substance abuse and antisocial behaviours were common among men in adulthood, women from aged people get more prevalence of Alzheimer's disease than men (Gender and Mental health, WHO 2002) Further, few more studies revealed gender differences in mental health have as conflicting evidence due to high nature of psychopathology within women (Dhejne *et al.*, 2016), gender differences in mental health also vary based on age groups as conduct disorder was more among boys than girls in childhood (Scott 1998), depression and eating disorders was common among women in adulthood (Hawton *et al.*, 2002; Parker & Roy., 2001), and adult men have higher chances for substance use disorders and antisocial personality disorder (Linzer *et al.*, 1996). Another study revealed that facts and conception in gender differences within mental health relies on type of labour, power between men and women, and personality traits (Rosenfield & Mouzon, 2013), prevalence of increased negative emotions were common among young female (Rossell *et al.*, 2021), while risk of discontinuation in mental health care were very common among young male and peoples from rural areas (Seidler *et al.*, 2020)

Further, the finding revealed there is no statistically significant mean difference in mental health with respect to family type (z statistic = -1.875, $p = .061$) in which joint family type have higher mean (mean rank = 320.45) than nuclear family type (mean rank = 291.68). This finding is supported in line with previous studies as there was no significant differences in mental health within family types due to varying nature of family members within family type towards symbolic aggression, demand/withdraw patterns, and negative disclosures (Schrodt & Afifi, 2007), and security of attachment were highly related to mental health (Riggs & Jacobvitz, 2002). Family members within family structures have different nature of significant mean differences in mental health as children and grandmothers in extended families than nuclear families, while mothers in nuclear families than joint families (Sonuga-Barke & Mistry, 2000). Another study stated that

psychological well-being of child was affected more among mother alone families (Kellam *et al.*, 1977). Present study stated there is statistically significant mean difference in mental health with respect to location (z statistic = -3.477, $p = .001$ in which urban people have significantly higher mean (mean rank = 329.02) than rural people (mean rank = 279.28). This finding is supported in line with previous studies as depression were associated with female, low self-esteem, low family income, less satisfaction with peer relationships and less connectedness to social gatherings (Lin *et al.*, 2008), prevalence of depression were higher among married people urban population and older people (Masoumeh *et al.*, 2021), peoples from minority tribes reported more anxiety than majority tribes (Osborn *et al.*, 2019), mean difference in mental health due to location were due to variety of social and cultural diversity (Gaither 2020), risk of discontinuation for mental health care were common among people from rural background (Seidler *et al.*, 2020), and there was presence of poor awareness percentage in telepsychology in rural areas (Pierce *et al.*, 2021).

The finding also revealed that there is no statistically significant mean difference in mental health with respect to income status (Kruskal Wallis $H = 5,692$, $p = .058$) in which income status below 15,000 INR have low mean (mean rank = 288.31) than income status 15,001 INR to 30,000 INR (mean rank = 319.17) and income status above 30,001 (mean rank = 329.59). This finding is supported in line with previous studies as depression rate were high among low family income status, family conflict, and poorer family function (Lin *et al.*, 2008), the risk of mental health problems were high among female students, and students from low income groups (Farrer *et al.*, 2016), adolescents in lower Socio-economic status have higher psychological distress and conduct problems (Rivenbark *et al.*, 2019), mental health have significant differences among different socioeconomic status indicators such as household income, parental education and parental unemployment (Reiss *et al.*, 2019), higher risk of developing mental health issues were common among female and people from history of chronic diseases with high income status (Naser *et al.*, 2020), there was a significant difference in mental health between different socioeconomic

status (Kamalulil & Panatik, 2021), and the prevalence of depression and anxiety depended on household income (Donnelly & Farina, 2020).

5.4 Significant Research Output

1. Obese people (mean rank = 328.02) have statistically significant higher mean in social support (z statistic = -3.940, $p = .000$) than non-obese people (mean rank = 272.98).
2. Obese people (mean rank = 332.91) have statistically significant higher mean in psychological resilience (z statistic = -4.678, $p = .001$) than non-obese people (mean rank = 268.09).
3. Obese people (mean rank = 270.18) have statistically significant lower mean in mental health (z statistic = -4.286, $p = .000$) than non-obese people (mean rank = 330.82).
4. Obese people (mean rank = 291.49) have no statistically significant mean difference in self-esteem (z statistic = -1.279, $p = .201$) with non-obese (mean rank = 309.51).
5. Social support has significant positive influence on mental health ($\beta = .507$, $R^2 = .162$, $p = .001$)
6. Psychological resilience has significant positive influence on mental health ($\beta = .279$, $R^2 = .188$, $p = .001$)
7. Self-esteem has significant negative influence on mental health ($\beta = -1.18$, $R^2 = .210$, $p = .001$)
8. Social support has comparatively lesser positive influence on mental health in obese ($\beta = .425$, $R^2 = .158$, $p = .000$) than non-obese ($\beta = .667$, $R^2 = .236$, $p = .001$).
9. Psychological resilience has comparatively lesser positive influence on mental health in obese ($\beta = .210$, $R^2 = .178$, $p = .000$) than non-obese ($\beta = .426$, $R^2 = .291$, $p = .000$).
10. Self-esteem has comparatively lesser negative influence on mental health in obese ($\beta = -.598$, $R^2 = .189$, $p = .001$) than non-obese ($\beta = -1.24$, $R^2 = .330$, $p = .001$).

11. Social support has significant positive correlation with psychological resilience ($\sigma = .586$, $p = .001$) among obese.
12. Social support ($\sigma = .227$, $p = .001$), and psychological resilience ($\sigma = .265$, $p = .001$) have significant positive correlation with mental health among obese.
13. Social support ($\sigma = -.236$, $p = .001$), psychological resilience ($\sigma = -.200$, $p = .001$) and mental health ($\sigma = -.090$, $p = .001$) have significant negative correlation with self-esteem among obese.
14. Social support has significant positive correlation with psychological resilience ($\sigma = .514$, $p = .001$) among non-obese.
15. Social support ($\sigma = .442$, $p = .001$), and psychological resilience ($\sigma = .353$, $p = .001$) have significant positive correlation with mental health among non-obese.
16. Social support ($\sigma = -.447$, $p = .001$), psychological resilience ($\sigma = -.419$, $p = .001$) and mental health ($\sigma = -.417$, $p = .001$) have significant negative correlation with self-esteem among non-obese.
17. Social support in obese ($\sigma = .586$, $p = .001$) have more or less same positive correlation with psychological resilience as non-obese ($\sigma = .514$, $p = .001$).
18. Psychological resilience in non-obese ($\sigma = .442$, $p = .001$) have slightly higher positive correlation with mental health than obese ($\sigma = .227$, $p = .001$).
19. Social support in obese ($\sigma = -.236$, $p = .001$) have slightly lesser negative correlation with self-esteem than non-obese ($\sigma = -.447$, $p = .001$).
20. Psychological resilience in obese ($\sigma = -.200$, $p = .000$) have slightly lesser negative correlation with self-esteem than non-obese ($\sigma = -.419$, $p = .001$).
21. Mental health in obese ($\sigma = -.090$, $p = .001$) have lesser negative correlation with self-esteem than non-obese ($\sigma = -.417$, $p = .001$).
22. Social support has statistically significant mean difference with respect to age (*Kruskal Wallis* $H = 8,432$, $p = .015$), and have high mean in age group above 35 years (*mean rank* = 317.46) than age group 26 to 35 years (*mean rank* = 305.22) and 15 to 25 years (*mean rank* = 268.24).

23. Psychological resilience has statistically significant mean difference with respect to age (*Kruskal Wallis* $H = 42,412$, $p = .001$), and have high mean in age group above 35 years (*mean rank* = 338.65) than age group 26 to 35 years (*mean rank* = 310.19) and 15 to 25 years (*mean rank* = 228.98).
24. Self-esteem has statistically significant mean difference with respect to age (*Kruskal Wallis* $H = 11,198$, $p = .004$), and have low mean in age group above 35 years (*mean rank* = 274.69) than age group 26 to 35 years (*mean rank* = 310.83) and 15 to 25 years (*mean rank* = 330.13).
25. Mental health has no statistically significant mean difference with respect to age (*Kruskal Wallis* $H = 2,129$, $p = .345$), and have mean in age group above 35 years (*mean rank* = 310.21) than age group 26 to 35 years (*mean rank* = 285.69) and 15 to 25 years (*mean rank* = 301.49).
26. Social support has statistically significant mean difference with respect to gender (*z statistic* = -3.083, $p = .002$), and have high mean among female (*mean rank* = 316.47) than male (*mean rank* = 271.48).
27. Psychological resilience has no statistically significant mean difference with respect to gender (*z statistic* = -.710, $p = .478$), and have high mean among female (*mean rank* = 304.15) than male (*mean rank* = 293.87).
28. Self-esteem have no statistically significant mean difference with respect to gender (*z statistic* = -1.374, $p = .169$), and have high mean among male (*mean rank* = 313.54) than female (*mean rank* = 293.32).
29. Mental health has no statistically significant mean difference with respect to gender (*z statistic* = -.691, $p = .490$), and have high mean among male (*mean rank* = 307.09) than female (*mean rank* = 296.87).
30. Social support has no statistically significant mean difference with respect to family type (*z statistic* = -.718, $p = .473$), and have high mean among joint family (*mean rank* = 308.04) than nuclear family (*mean rank* = 297.17).

31. Psychological resilience has no statistically significant mean difference with respect to family type (z statistic = -1.240 , $p = .215$), and have high mean among nuclear family ($mean\ rank = 306.21$) than joint family ($mean\ rank = 287.58$).
32. Self-esteem have no statistically significant mean difference with respect to family type (z statistic = $-.370$, $p = .712$), and have high mean among nuclear family ($mean\ rank = 302.23$) than joint family ($mean\ rank = 296.58$).
33. Mental health has no statistically significant mean difference with respect to family type (z statistic = -1.875 , $p = .061$), and have high mean among joint family ($mean\ rank = 320.45$) than nuclear family ($mean\ rank = 291.68$).
34. Social support has no statistically significant mean difference with respect to location (z statistic = -1.764 , $p = .078$), and have high mean among rural ($mean\ rank = 311.13$) than urban ($mean\ rank = 286.22$).
35. Psychological resilience has statistically significant mean difference with respect to location (z statistic = -4.611 , $p = .000$), and have high mean among rural ($mean\ rank = 328.06$) than urban ($mean\ rank = 263.47$).
36. Self-esteem have no statistically significant mean difference with respect to location (z statistic = -1.185 , $p = .236$), and have high mean among urban ($mean\ rank = 310.18$) than rural ($mean\ rank = 293.30$).
37. Mental health has statistically significant mean difference with respect to location (z statistic = -3.477 , $p = .001$), and have high mean among urban ($mean\ rank = 329.02$) than rural ($mean\ rank = 279.28$).
38. Social support has statistically significant mean difference with respect to income status ($Kruskal\ Wallis\ H = 36,150$, $p = .001$), and have low mean among income status above 30,001 INR ($mean\ rank = 235.56$) than income status 15,001 to 30,000 INR ($mean\ rank = 248.37$) and income status below 15,000 INR ($mean\ rank = 331.20$).
39. Psychological resilience has statistically significant mean difference with respect to income status ($Kruskal\ Wallis\ H = 70,868$ $p = .001$), and have high mean among income status below 15,000 INR ($mean\ rank = 343.21$) than income status above

30,001 INR (*mean rank* = 229.03) and income status 15,001 to 30,000 INR (*mean rank* = 216.35).

40. Self-esteem has statistically significant mean difference with respect to income status (*Kruskal Wallis* $H = 6,540$, $p = .038$), and have high mean among income status 15,001 to 30,000 INR (*mean rank* = 331.82) than income status below 15,000 INR (*mean rank* = 295.57) and income status above 30,001 INR (*mean rank* = 273.66).
41. Mental health has no statistically significant mean difference with respect to income status (*Kruskal Wallis* $H = 5,692$, $p = .058$), and have mean among income status above 30,001 INR (*mean rank* = 329.59) than income status 15,001 to 30,000 INR (*mean rank* = 319.17) and income status below 15,000 INR (*mean rank* = 288.31).

5.5 Conclusion

Mental health issues and obesity are two important health challenges in 21st century. The researcher studied mental health and obesity as exploratory study in light of literature review with psychological variables such as social support, psychological resilience and self-esteem, and with demographic variables such as age, gender, family type, location and income status. Current study has in numerous research outcomes with more findings and significance to enhance mental health among obese and non-obese, and to prevent weight gain through positive energy balance in which there is an increase food (energy) intake and decrease energy expenditure. In summary, the findings in this study revealed obese people especially from study population were in comfort zone with high social support, high psychological resilience, low self-esteem and low mental health which means they are in underestimation and adjusted with their body weight with poor mental health. Probably, they have information barrier towards weight reduction practices. Whereas mental health of study population revealed obese people have significantly low mental health than non-obese.

In demographic details, the social support, psychological resilience and self-esteem have statistically significant mean difference among different age group in which age group above 35 years old have high social support, high resilience and low self-esteem than age

group 26 to 35 years old and age group 15 to 25 years old which have very low social support, low resilience and high self-esteem. Mental health with respect to age group have no statistically significant at all. Gender studies in present research revealed among all psychological variables such as social support, resilience, self-esteem and mental health. Psychological variables such as social support, resilience, self-esteem and mental health have no statistical significance between joint and nuclear family type. Psychological resilience has statistically significant mean difference among location in which rural people have significant high mean than urban people. Similarly, mental health has statistically significant mean difference with high mean among urban people than rural people. Whereas social support and self-esteem have no statistical significance mean difference among urban and rural people. Except mental health, all other psychological variables such as social support, resilience and self-esteem have statistically significant mean difference among varies income status in which people in low income have high social support and high resilience than middle- and high-income people. People with middle income have significantly better self-esteem than low- and high-income people. Thus, people from age group above 35 years old, female and low income have significantly high social support, while age group 15 to 25 years, male and high-income people have significantly low social support. Similarly, people from age group above 35 years old, rural and low income have significantly high resilience, while age group 15 to 25 years, urban and middle-income people have significantly low psychological resilience. Self-esteem have showed statistical significance mean difference only with respect to age and income status, in which age group above 35 years old have high self-esteem than age group below 35 years, and middle-income people have better self-esteem than low-income and high-income people. Similarly, mental health has statistical insignificant mean difference with respect to age, gender, family type and income status except location in which urban people have high mental health than rural people.

As WHO definition for Health, the optimum health has complete state of physical, mental and social health. These research outcomes will help policy maker especially clinical field as well as research orientation in obesity and mental health. Social support

and psychological resilience have positive influence on mental health while self-esteem have negative influence on mental health among obese and non-obese. Proper strategies with appropriate information in shifting energy balance towards negative will reduce body weight and bring mental health in optimum level. Obese people have high social support, high resilience, and low mental health than non-obese people. However, social support and resilience have significant positive prediction on mental health as per the present study. This controversy findings can be managed through appropriate information and practices with respect to energy intake and energy expenditure through behavioural intervention and strategies.

5.6 Summary

The review of literature and statistical findings related to the theme of present research opened more insights, and have explained in detailed in this chapter. The psychological parameters such as social support, resilience, self-esteem, and mental health were explained with separate heading based obtained statistical findings and related literature. Further, the objectives of the present study were discussed in detailed one by one. More than 30 significant research output were listed in this chapter. The end of chapter concluded with insight explanation from significant outputs and literature review from this study.

CHAPTER-6

RECOMMENDATIONS AND LIMITATIONS

6.1 Recommendation for policy maker

As everybody knew obesity caused due to positive energy balance in which there is an increase food (energy) intake and decrease in energy expenditure. A shift in positive energy balance to negative energy balance can favour through healthy food behaviour and increased physical activity, which can be possible through lifestyle change and behavioural performances. In other hand, hectic daily life schedules, and life stressful event make one's mental health in problematic way. Poor mental health can cause obesity and diminish one's psychological activity. Maintaining optimum mental health and preventing obesity through behavioural intervention in order to limit energy intake and maximise energy expenditure, present study and previous studies from literatures revealed the following recommendations.

1. Present study revealed significant high social support among obese than non-obese, will help policy maker to educate people about burden of over eating, acculturation lifestyle. Sedentary life activity and unhealthy food. High social support with acculturation (Yoshida *et al.*, 2020), lack of health information (Tolvanen *et al.*, 2020), Father's high body mass index (Li *et al.*, 2019) increase body weight and results obesity.
2. High social support with recommended physical activity and healthy food behaviour (Guevara-Valtier *et al.*, 2021) and healthy promoting behaviour (Cho *et al.*, 2013) enhance energy balance towards negative aspect to decrease body weight.
3. Peer victimisation, social bullying, health inequality and neglect in sexual life among obese further worsen mental health which have seen in this study as significant low mean in mental health among obese than non-obese which can be prevented through enhancing social support and psychological resilience as it showed high significant positive influence over mental health.

4. Obese people have significantly high psychological resilience than non-obese which showed obese people were in comfort and resilient zone with their high body mass index. It represented that obese with is high psychological resilience can increase their mental health and reduce their body weight through appropriate behavioural intervention and strategies.
5. Most of the study population have low self-esteem (89% of obese people and 72.3% of non-obese), low self-esteem further worsens mental health and body weight through physical bullying (Ercan & Özcebe, 2020), dysfunctional perfectionism parental neglect (Taylor *et al.*, 2011) and poor body image (DeBate & Thompson, 2005). Thus, prevalence of low self-esteem further leads to mental health issues and increase body weight. Here, the policy marker has to consider one's self-esteem before weight reduction activities.
6. Even though the study population stated increased prevalence of low self-esteem, there was no statistically significant mean differences in self-esteem with respect to demographic variables except age groups which showed as an increase in age will decrease self-esteem. As years passed, they get underestimated with their mental health and body weight. It is highly recommended for policy maker to create healthy self-esteem for the people who have poor mental health and increased body weight. Whereas gender, family type, location and income status didn't play any effect over one's self-esteem
7. Self-esteem has comparatively lesser negative influence on mental health in obese than non-obese. Healthy self-esteem is highly recommended to bring better mental health irrespective of body weight. Preventing one's personal negative bias through elaboration of thought (Scimeca *et al.*, 2016), avoiding stigmatization situations (Myers & Rosen, 1999), rectifying cognitive understanding of childhood obese (Wang *et al.*, 2009) help policy makers to maintain healthy self-esteem from teen age period itself.
8. Obese people have significantly lower mean of mental health than non-obese people. Mental health issues can lead to improper life activities as sedentary lifestyle (Jenatabadi *et al.*, 2020), emotional eating (Conceição *et al.*, 2019), perceived false

- physical health (Knoesen *et al.*, 2012), having more leisure time (Ball *et al.*, 2011) and obesity environment (Crawford *et al.*, 2015). Nature of being in such wellbeing made obese people in comfortable area or false comfort zone. It is advised for policy makers to avoid such false comfort zone among mentally well-established obese people.
9. Present study also indicated that mental health has no statistically significant differences with respect to demographic variables such as age, gender, family type, and income status except demographic locations in which urban people have higher mental health than rural one. Peoples from minority tribes reported more anxiety than majority tribes (Osborn *et al.*, 2019), risk of discontinuation for mental health care were common among people from rural background (Seidler *et al.*, 2020), and presence of poor awareness percentage in telepsychology in rural areas (Pierce *et al.*, 2021). Due to this reason, policy maker has to give more importance among rural people in association with urban circumferences.
 10. Age group above 35 years, female and low-income status have significantly high social support, and at same time the prevalence of obesity was more among age group above 35 years, female, rural people and low-income people. High social support acted as buffering agent in minimizing perceived peer isolation on mental health and BMI (Xie *et al.*, 2005), and High social network support in association with physical activity and healthy food behaviour which can regulate body weight (Guevara-Valtier *et al.*, 2021). These facts help policy makers in weight reduction activities and mental health.
 11. Present study also mentioned that significant presence of low social support among age group below 15 to 25 years, male and high-income people, and it also stated significant presence of high self-esteem among age group 15 to 25 years and middle-income people. Since the study revealed that social support has negative correlations with self-esteem, healthy self-esteem can be achieved from appropriate social support structure. Optimizing the size of social group will decrease social self-esteem (Bertucci *et al.*, 2010), Maintaining balanced equilibrium between social support and self-esteem will help to create appropriate room for behavioural intervention (DuBois *et al.*, 2002), and avoiding discrimination among people particularly young and high-income people also

helps to maintain healthy self-esteem and optimum social support (Cénat *et al.*, 2022). This strategy helps policy maker for optimum benefits in terms of social support, self-esteem, mental health and obesity.

12. Present study also mentioned that significant presence of low psychological resilience among age group 15 to 25 years, urban and middle-income people, and it also stated significant presence of high self-esteem among age group 15 to 25 years and middle-income people. Since the study revealed that psychological resilience has negative correlations with self-esteem, an increase in psychological resilience will help to enhance healthy self-esteem. People with low trait resilience always willing to prefer high job autonomy with high self-esteem (Gardner, 2019) which is not typically recommended. Enhancing psychological resilience among age group 15 to 25 years, urban people and middle-income people is highly recommendation for optimum psychological resilience, self-esteem, mental health and obesity.

6.2 Recommendation for further Research

The proposed quantitative study conducted by the researcher have a lot of interpretations and research outcomes. The interpretation of obtained from findings and relevant literature revealed facts and information for further insights which is more applied and useful for further research in this theme. Obesity and mental health are two prime health consideration what many clinical physician and medical professional have omitted due to multifactorial in nature and they act as two eyes of human. The optimum body mass index defines our physical health and optimum mental health defines our psychological well-being. The rest parameters of this study (social support, resilience and self-esteem) act as mediators or buffers in maintaining desired body mass index and mental health. Thus, this study brought all in one straight line as body mass index and mental health are two extreme parameters and social support, resilience and self-esteem are mediation parameters in straight line. Each objective of this study stated the word to link all these variables to give strong insights and roots to new theoretical paradigm in health psychology research. The mean difference and relationship of social support, resilience, self-esteem and mental health that obese (high BMI) has significant high social support and significant

high resilience with significant low mental health than non-obese (above normal, normal & low BMI). The regression analysis showed obese people have significantly lesser positive influence of social support and resilience, and significant lesser negative influence of self-esteem on mental health than non-obese. These findings give an insight that in obese high perceived social support and high resilience have not much impact on their mental health and body mass index than non-obese people. For example, as discussed in this chapter high social support cause room for over eating, acculturation, sedentary lifestyle and unhealthy food habits, similarly same high social support also promotes physical activity, healthy eating habits and health-related behaviours. Another insight related to age factor, revealed age groups 15 to 25 years have significant low social support, low resilience, high self-esteem and high mental health might make them into abnormal lifestyle without fear and depression can leads to high body mass index. Here, the concept of straight line in which body mass index and mental health as two extremes and three mediation parameters (social support, resilience and self-esteem) can do further study to strengthen this theoretical concept by appropriate moulding of social support, resilience and self-esteem might helpful particular age group (15 to 25 years) for desired BMI and excellent mental health.

Further at begin the researcher have explained in details regarding energy balance in which positive energy balance favours obesity and negative energy balance reduce body weight. In management of obesity, there is no pharmacological drug invented till date, which is not possible due to nature of complicated and complex system in energy balance. Beyond medicinal treatment for obesity, there is only hope in weight reduction in modern medicine is obesity surgery (bariatric surgery). But, even after surgical intervention there is a need to maintain energy balance either towards negative side or neutral one to avoid weight relapse. If the energy balance shifts toward positive side even after surgical intervention of obesity due to an increase of energy intake and decrease energy expenditure, will lead to weight regain. Thus, the management of obesity prevention protocol or research requires to follow behavioural intervention in controlling energy balance curve in negative side through decrease energy intake and increase energy

expenditure as physical activity. Mental health among obese and non-obese plays key role in maintaining behavioural activities at optimum level. In order to strengthen behavioural intervention strategies in obesity reduction measure, the researchers have to concentrate more on psychological factor in behavioural intervention, and mental wellbeing of obese and non-obese people. In this study, the researcher has listed various significant output from descriptive statistics to normality test, non-parametric test, z-test, mean difference, correlation analysis, multiple linear analysis which further give room for further researches in this field.

Present study has given room for proceeding further research in systematic manner with more variables such as peer pressure, social bullying peer victimisation, behavioural change, body image, body dissatisfaction, and psychological variables with extended demographic details. There is vast research gap in behavioural intervention of obesity reduction measures. After 1975, Obesity prevalence became tripled, and it is two in one person among American are either overweight or obese. In India, it is almost three in one rate for overweight and obese. It is highly recommended to carry further research in the field of obesity and mental health. Nowadays obesity became high risk factors for many chronic diseases like Hypertension, Diabetes, Cardio-vascular disease, Hyperlipidaemia, Asthma, sleep apnoea and other metabolic disease. Female population have higher victim of obesity than male, and consequences to physical and psychological disturbances.

6.3 Limitations and Delimitations of the study

Our research plan as proposed went in healthy ways as expected at begins as early before march-2019. Around 20% of data were collected comfortably from primary health centres as per research design. Later, the study was stopped due to covid-19 pandemic and national wise lockdown. Covid-19 pandemic and lockdown created a huge distress among population and had high impact on the mental health among obese and non-obese people. The average mental health among study population during pre-pandemic and pre-lockdown period was more than 145 score in mental health. The researcher waited

for a period of 10 month to start field work again after lockdown to avoid situational bias. The research plan and situational circumferences have a list of limitation as following.

1. The research was limited to urban and rural background only and avoided database from cities. Most of datasets were collected from low socio-economic status background.
2. Due to the nature of social and cultural factor the study was restricted to limited taluk in Cuddalore district of Tamil Nadu.
3. The data were collected from age group from 15 to 70 years old, and it have omitted children and adolescent who have age less than 15 years old.
4. The study did not collect data related to marital status of obese and non-obese people. As marital status plays important role in social support, resilience, self-esteem, and mental health and body mass index.
5. The cause of obesity may be due to hormonal, metabolic, genetic or medical factors. Here, the researcher omitted medical and illness aspect behind obesity due to study the interpretation of the results in light of psychology.
6. Duration of obesity also plays a key role in psychological background of obesity; the researcher omitted it from research plan due subjective bias and errors.
7. As the study primarily focused on the mental health of obese than body mass index, behaviours related to physical activity and food practices were not included in the research plan.
8. Even though the prevalence of obesity is high among female population. The study should include equal sample size or at least female sample as 60% and male sample as 40%. But due to covid-19 threat, the data collection was quit challenging and willingness to participate in this study was very low among obese male population, non-obese sample size was normal with 57% female and 43%.
9. Another limitation in data collection related to demographic aspect is income status in which only 9% obese sample from high income (above 30,001) were collected. Probably this was due to study sample mostly from low socioeconomic people and presence of middle-income and low-income status were more in the study area.

10. The research plan has omitted work status in which physical activity of obese and non-obese people have a role in maintaining body weight. But, many similar previous studies in this research background and study plan have not shown details about work status as demographic variables.
11. This study has focused only to quantitative aspects other than demographic details. Qualitative aspect of study about lifestyle, behaviour pattern, food habits, physical activity, personality, stress, and daily events have to be considered. But, the study with quantitative and qualitative approach in one umbrella will complicate research outcomes.
12. This study has focused mainly on mental health aspects of obese and non-obese through social support, resilience and self-esteem and not on body mass index. Non-obese sample have overweight as separate variable within it based on body mass index. Many previous studies have considered obese and overweight as same entity.

6.4 Summary

Finally, this chapter concluded with further insights in the form of recommendations to policy maker as list with supported parallel research. Further, present study has root and insight to various theoretical inputs for further future study were listed. At last the limitation and delimitation of present study were explained at the end.

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Appendix-01

MEASURING TOOLS

Multidimensional Scale of Perceived Social Support

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
 Circle the "2" if you **Strongly Disagree**
 Circle the "3" if you **Mildly Disagree**
 Circle the "4" if you are **Neutral**
 Circle the "5" if you **Mildly Agree**
 Circle the "6" if you **Strongly Agree**
 Circle the "7" if you **Very Strongly Agree**

	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help & support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7
11. My family is willing to help me make decisions.	1	2	3	4	5	6	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

Psychological Resilience Scale

This scale is meant for a psychological investigation. Given in every statement please tell us, how you feel about it? Please rate each statement on a five point scale as given to right side. Select (✓) only one option, which is most closure to your feelings.

There is no correct or wrong statement. Your responses received through this inventory shall be used for research work only and shall strictly be confidential. Please do not place your signature or name on this sheet.

S. No.	Statement	Option				
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
1	When I make plans I follow through with them.					
2	I usually manage one way or another.					
3	I am able to depend on myself more than anyone else.					
4	Keeping interested in things is important to me.					
5	I can be on my own if I have to.					
6	I feel proud that I have accomplished things in my life.					
7	I usually take things in stride.					
8	I feel that I can handle many things at a time.					
9	I am determined.					
10	I seldom wonder what the point of it all is.					
11	I take things one day at a time.					
12	I have a self discipline.					
13	I keep interested in tings.					
14	In an emergency, I am someone people generally can rely on.					
15	I can usually look at a situation in a number of ways.					
16	Sometimes I make myself do things whether I want to or not.					
17	My life has meaning.					
18	I do not dwell on things that I can't do anything about.					
19	When I'm in a difficult situation, I can usually find my way out of it.					
20	I have enough energy to do what I have to do.					
21	It's okay if there are people who don't like me.					

ROSENBERG SELF-ESTEEM SCALE

Instructions

Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree with each statement.

1. On the whole, I am satisfied with myself.

Strongly Agree	Agree	Disagree	Strongly Disagree

2. At times I think I am no good at all.

Strongly Agree	Agree	Disagree	Strongly Disagree

3. I feel that I have a number of good qualities.

Strongly Agree	Agree	Disagree	Strongly Disagree

4. I am able to do things as well as most other people.

Strongly Agree	Agree	Disagree	Strongly Disagree

5. I feel I do not have much to be proud of.

Strongly Agree	Agree	Disagree	Strongly Disagree

6. I certainly feel useless at times.

Strongly Agree	Agree	Disagree	Strongly Disagree

7. I feel that I'm a person of worth, at least on an equal plane with others.

Strongly Agree	Agree	Disagree	Strongly Disagree

8. I wish I could have more respect for myself.

Strongly Agree	Agree	Disagree	Strongly Disagree

9. All in all, I am inclined to feel that I am a failure.

Strongly Agree	Agree	Disagree	Strongly Disagree

10. I take a positive attitude toward myself.

Strongly Agree	Agree	Disagree	Strongly Disagree

The Mental Health Inventory (MHI-38)

INSTRUCTIONS: Please read each question and tick the box by the ONE statement that best describes how things have been FOR YOU during the past month. There are no right or wrong answers.

1. How happy, satisfied, or pleased have you been with your personal life during the past month? **(Tick one)**
 - 1 ☐ Extremely happy, could not have been more satisfied or pleased
 - 2 ☐ Very happy most of the time
 - 3 ☐ Generally, satisfied, pleased
 - 4 ☐ Sometimes fairly satisfied, sometimes fairly unhappy
 - 5 ☐ Generally dissatisfied, unhappy
 - 6 ☐ Very dissatisfied, unhappy most of the time
2. How much of the time have you felt lonely during the past month? **(Tick one)**

1 ☐ All of the time	4 ☐ Some of the time
2 ☐ Most of the time	5 ☐ A little of the time
3 ☐ A good bit of the time	6 ☐ None of the time
3. How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month? **(Tick one)**

1 ☐ Always	4 ☐ Sometimes
2 ☐ Very often	5 ☐ Almost never
3 ☐ Fairly often	6 ☐ Never
4. During the past month, how much of the time have you felt that the future looks hopeful and promising? **(Tick one)**

1 ☐ All of the time	4 ☐ Some of the time
2 ☐ Most of the time	5 ☐ A little of the time
3 ☐ A good bit of the time	6 ☐ None of the time
5. How much of the time, during the past month, has your daily life been full of things that were interesting to you? **(Tick one)**

1 ☐ All of the time	4 ☐ Some of the time
2 ☐ Most of the time	5 ☐ A little of the time
3 ☐ A good bit of the time	6 ☐ None of the time
6. How much of the time, during the past month, did you feel relaxed and free from tension? **(Tick one)**

1 ☐ All of the time	4 ☐ Some of the time
2 ☐ Most of the time	5 ☐ A little of the time
3 ☐ A good bit of the time	6 ☐ None of the time

7. During the past month, how much of the time have you generally enjoyed the things you do? **(Tick one)**
- | | |
|---|---|
| ☐ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
8. During the past month, have you had any reason to wonder if you were losing your mind, or losing control over the way you act, talk, think, feel, or of your memory? **(Tick one)**
- | |
|---|
| ☐ 1 No, not at all |
| ☐ 2 Maybe a little |
| ☐ 3 Yes, but not enough to be concerned or worried about |
| ☐ 4 Yes, and I have been a little concerned |
| ☐ 5 Yes, and I am quite concerned |
| ☐ 6 Yes, I am very much concerned about it |
9. Did you feel depressed during the past month? **(Tick one)**
- | |
|--|
| ☐ 1 Yes, to the point that I did not care about anything for days at a time |
| ☐ 2 Yes, very depressed almost every day |
| ☐ 3 Yes, quite depressed several times |
| ☐ 4 Yes, a little depressed now and then |
| ☐ 5 No, never felt depressed at all |
10. During the past month, how much of the time have you felt loved and wanted? **(Tick one)**
- | | |
|---|---|
| ☐ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
11. How much of the time, during the past month, have you been a very nervous person? **(Tick one)**
- | | |
|---|---|
| ☐ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
12. When you have got up in the morning, this past month, about how often did you expect to have an interesting day? **(Tick one)**
- | | |
|---|---|
| ☐ 1 Always | ☐ 4 Sometimes |
| ☐ 2 Very often | ☐ 5 Almost never |
| ☐ 3 Fairly often | ☐ 6 Never |
13. During the past month, how much of the time have you felt tense or "high-strung"? **(Tick one)**
- | | |
|---|---|
| ☐ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
14. During the past month, have you been in firm control of your behaviour, thoughts, emotions or feelings? **(Tick one)**
- | | |
|---|--|
| ☐ 1 Yes, very definitely | ☐ 4 No, not too well |
| ☐ 2 Yes, for the most part | ☐ 5 No, and I am somewhat disturbed |
| ☐ 3 Yes, I guess so | ☐ 6 No, and I am very disturbed |

15. During the past month, how often did your hands shake when you tried to do something? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
16. During the past month, how often did you feel that you had nothing to look forward to? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
17. How much of the time, during the past month, have you felt calm and peaceful? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
18. How much of the time, during the past month, have you felt emotionally stable? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
19. How much of the time, during the past month, have you felt downhearted and blue? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
20. How often have you felt like crying, during the past month? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
21. During the past month, how often have you felt that others would be better off if you were dead? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
22. How much of the time, during the past month, were you able to relax without difficulty? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
23. How much of the time, during the past month, did you feel that your love relationships, loving and being loved, were full and complete? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |

24. How often, during the past month, did you feel that nothing turned out for you the way you wanted it to? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
25. How much have you been bothered by nervousness, or your "nerves", during the past month? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Extremely so, to the point where I could not take care of things | 4 ☐ Bothered some, enough to notice |
| 2 ☐ Very much bothered | 5 ☐ Bothered just a little by nerves |
| 3 ☐ Bothered quite a bit by nerves | 6 ☐ Not bothered at all by this |
26. During the past month, how much of the time has living been a wonderful adventure for you? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
27. How often, during the past month, have you felt so down in the dumps that nothing could cheer you up? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
28. During the past month, did you think about taking your own life? **(Tick one)**
- | |
|---|
| 1 ☐ Yes, very often |
| 2 ☐ Yes, fairly often |
| 3 ☐ Yes, a couple of times |
| 4 ☐ Yes, at one time |
| 5 ☐ No, never |
29. During the past month, how much of the time have you felt restless, fidgety, or impatient? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
30. During the past month, how much of the time have you been moody or brooded about things? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
31. How much of the time, during the past month, have you felt cheerful, lighthearted? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |

32. During the past month, how often did you get rattled, upset or flustered? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
33. During the past month, have you been anxious or worried? **(Tick one)**
- 1 ☐ Yes, extremely to the point of being sick or almost sick
- 2 ☐ Yes, very much so
- 3 ☐ Yes, quite a bit
- 4 ☐ Yes, some, enough to bother me
- 5 ☐ Yes, a little bit
- 6 ☐ No, not at all
34. During the past month, how much of the time were you a happy person? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
35. How often during the past month did you find yourself trying to calm down? **(Tick one)**
- | | |
|---|---|
| 1 ☐ Always | 4 ☐ Sometimes |
| 2 ☐ Very often | 5 ☐ Almost never |
| 3 ☐ Fairly often | 6 ☐ Never |
36. During the past month, how much of the time have you been in low or very low spirits? **(Tick one)**
- | | |
|---|---|
| 1 ☐ All of the time | 4 ☐ Some of the time |
| 2 ☐ Most of the time | 5 ☐ A little of the time |
| 3 ☐ A good bit of the time | 6 ☐ None of the time |
37. How often, during the past month, have you been waking up feeling fresh and rested? **(Tick one)**
- | | |
|--|---|
| 1 ☐ Always, every day | 4 ☐ Some days, but usually not |
| 2 ☐ Almost every day | 5 ☐ Hardly ever |
| 3 ☐ Most days | 6 ☐ Never wake up feeling rested |
38. During the past month, have you been under or felt you were under any strain, stress or pressure? **(Tick one)**
- 1 ☐ Yes, almost more than I could stand or bear
- 2 ☐ Yes, quite a bit of pressure
- 3 ☐ Yes, some more than usual
- 4 ☐ Yes, some, but about normal
- 5 ☐ Yes, a little bit
- 6 ☐ No, not at all

Appendix-02

CANDIDACY LETTER



Centre for
Research Degree Programmes

LPU/CRDP/PHD/EC/20190831/001082

Dated: 16 May 2019

Mohamed Yousuf M A
Registration Number: 41800397
Programme Name: Doctor of Philosophy (Psychology)

Subject: Letter of Candidacy for Ph.D.

Dear Candidate,

We are very pleased to inform you that the Department Doctoral Board has approved your candidacy for the Ph.D. Programme on 16 May 2019 by accepting your research proposal entitled: "SOCIAL SUPPORT, RESILIENCE, SELF-ESTEEM AND MENTAL HEALTH AMONG OBESE AND NON OBESE."

As a Ph.D. candidate you are required to abide by the conditions, rules and regulations laid down for Ph.D. Programme of the University, and amendments, if any, made from time to time.

We wish you the very best!!

In case you have any query related to your programme, please contact Centre of Research Degree Programmes.

Head

Centre for Research Degree Programmes

Note:-This is a computer generated certificate and no signature is required. Please use the reference number generated on this certificate for future conversations.

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Ph : +91-1824-444594 E-mail : drp@lpu.co.in website : www.lpu.in

Appendix-03

SAMPLE RESPONSE SHEET

(Participant's response with consent thumb impression)

DEMOGRAPHIC DETAILS

Name (Initial Only) F Age & Gender: 31/12
 Location ☐ Urban ☒ Rural
 Family Type ☐ Joint ☒ Nuclear
 Socioeconomic Status (குடும்பம் வகுப்பம்) ☒ 15k ☐ 15-30k ☐ 30k+
 Height: 1.64... Weight: 64... Body Mass Index:
 Instructions Self Esteem Scale

Below is a list of statements dealing with your general feelings about yourself. Please indicate how strongly you agree or disagree with each statement.

Strongly Agree	Agree	Disagree	Strongly Disagree
☒	☒	☐	☐
☒	☐	☐	☐

- On the whole, I am satisfied with myself.
 Strongly Agree ☒ Agree ☒ Disagree ☐ Strongly Disagree ☐ 2
- At times I think I am no good at all.
 Strongly Agree ☐ Agree ☒ Disagree ☐ Strongly Disagree ☐ 3
- I feel that I have a number of good qualities.
 Strongly Agree ☒ Agree ☐ Disagree ☐ Strongly Disagree ☐ 1
- I am able to do things as well as most other people.
 Strongly Agree ☒ Agree ☐ Disagree ☐ Strongly Disagree ☐ 2
- I feel I do not have much to be proud of.
 Strongly Agree ☐ Agree ☐ Disagree ☐ Strongly Disagree ☒ 4
- I certainly feel useless at times.
 Strongly Agree ☐ Agree ☐ Disagree ☒ Strongly Disagree ☐ 4
- I feel that I'm a person of worth, at least on an equal plane with others.
 Strongly Agree ☐ Agree ☒ Disagree ☐ Strongly Disagree ☐ 2
- I wish I could have more respect for myself.
 Strongly Agree ☐ Agree ☐ Disagree ☐ Strongly Disagree ☐ 1
- All in all, I am inclined to feel that I am a failure.
 Strongly Agree ☐ Agree ☒ Disagree ☐ Strongly Disagree ☐ 3
- I take a positive attitude toward myself.
 Strongly Agree ☒ Agree ☐ Disagree ☐ Strongly Disagree ☐ 1

Page Score:

Multidimensional Scale of Perceived Social Support

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

- Circle the "1" if you **Very Strongly Disagree** - மிக உறுதியாக மறுக்கிறேன்
 Circle the "2" if you **Strongly Disagree** - உறுதியாக மறுக்கிறேன்
 Circle the "3" if you **Mildly Disagree** - குறைவாக மறுக்கிறேன்
 Circle the "4" if you are **Neutral** - நடுநிலை
 Circle the "5" if you **Mildly Agree** - குறைவாக ஏற்க்கிறேன்
 Circle the "6" if you **Strongly Agree** - உறுதியாக ஏற்க்கிறேன்
 Circle the "7" if you **Very Strongly Agree** - மிக உறுதியாக ஏற்க்கிறேன்

	Very Strongly Disagree	Strongly Disagree	Mildly Disagree	Neutral	Mildly Agree	Strongly Agree	Very Strongly Agree
1. There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2. There is a special person with whom I can share joys and sorrows.	1	2	3	4	5	6	7
3. My family really tries to help me.	1	2	3	4	5	6	7
4. I get the emotional help & support I need from my family.	1	2	3	4	5	6	7
5. I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6. My friends really try to help me.	1	2	3	4	5	6	7
7. I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8. I can talk about my problems with my family.	1	2	3	4	5	6	7
9. I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10. There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7
11. My family is willing to help me make decisions.	1	2	3	4	5	6	7
12. I can talk about my problems with my friends.	1	2	3	4	5	6	7

Psychological Resilience Scale

This scale is meant for a psychological investigation. Given in every statement please tell us, how you feel about it? Please rate each statement on a five point scale as given to right side. Select (✓) only one option, which is most closure to your feelings.

- ☒ Strongly Agree - உறுதியாக ஏற்றுக்கொள்கிறேன்
☒ Strongly Disagree - உறுதியாக மறுக்கிறேன்
☒ Uncertain - குறியிடவில்லை
☒ Agree - ஏற்றுக்கொள்கிறேன்
☒ Disagree - மறுக்கிறேன்

S. No.	Statement	Option					Score
		Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	
1	When I make plans I follow through with them.				✓		
2	I usually manage one way or another.		✓				
3	I am able to depend on myself more than anyone else.				✓		
4	Keeping interested in things is important to me.		✓				
5	I can be on my own if I have to.	✓					
6	I feel proud that I have accomplished things in my life.			✓			
7	I usually take things in stride.	✓					
8	I feel that I can handle many things at a time.					✓	
9	I am determined.		✓				
10	I seldom wonder what the point of it all is.		✓				
11	I take things one day at a time.			✓			
12	I have a self discipline.			✓			
13	I keep interested in things.				✓		
14	In an emergency, I am someone people generally can rely on.			✓			
15	I can usually look at a situation in a number of ways.					✓	
16	Sometimes I make myself do things whether I want to or not.					✓	
17	My life has meaning.		✓				
18	I do not dwell on things that I can't do anything about.				✓		
19	When I'm in a difficult situation, I can usually find my way out of it.				✓		
20	I have enough energy to do what I have to do.					✓	
21	It's okay if there are people who don't like me.					✓	

The Mental Health Inventory (BHI-38)

INSTRUCTIONS: Please read each question and tick the box by the ONE statement that best describes how things have been FOR YOU during the past month. There are no right or wrong answers.

1. How happy, satisfied, or pleased have you been with your personal life during the past month? *(Tick one)*
 - ☐ 1 Extremely happy, could not have been more satisfied or pleased
 - ☐ 2 Very happy most of the time
 - ☐ 3 Generally, satisfied, pleased
 - ☒ 4 Sometimes fairly satisfied, sometimes fairly unhappy
 - ☐ 5 Generally dissatisfied, unhappy
 - ☐ 6 Very dissatisfied, unhappy most of the time
2. How much of the time have you felt lonely during the past month? *(Tick one)*
 - ☐ 1 All of the time
 - ☐ 2 Most of the time
 - ☐ 3 A good bit of the time
 - ☐ 4 Some of the time
 - ☐ 5 A little of the time
 - ☐ 6 None of the time
3. How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month? *(Tick one)*
 - ☐ 1 Always
 - ☐ 2 Very often
 - ☐ 3 Fairly often
 - ☐ 4 Sometimes
 - ☐ 5 Almost never
 - ☐ 6 Never
4. During the past month, how much of the time have you felt that the future looks hopeful and promising? *(Tick one)*
 - ☐ 1 All of the time
 - ☐ 2 Most of the time
 - ☐ 3 A good bit of the time
 - ☐ 4 Some of the time
 - ☐ 5 A little of the time
 - ☐ 6 None of the time
5. How much of the time, during the past month, has your daily life been full of things that were interesting to you? *(Tick one)*
 - ☐ 1 All of the time
 - ☐ 2 Most of the time
 - ☐ 3 A good bit of the time
 - ☐ 4 Some of the time
 - ☐ 5 A little of the time
 - ☐ 6 None of the time
6. How much of the time, during the past month, did you feel relaxed and free from tension? *(Tick one)*
 - ☐ 1 All of the time
 - ☐ 2 Most of the time
 - ☐ 3 A good bit of the time
 - ☐ 4 Some of the time
 - ☐ 5 A little of the time
 - ☐ 6 None of the time
7. During the past month, how much of the time have you generally enjoyed the things you do? *(Tick one)*
 - ☐ 1 All of the time
 - ☐ 2 Most of the time
 - ☐ 3 A good bit of the time
 - ☐ 4 Some of the time
 - ☐ 5 A little of the time
 - ☐ 6 None of the time
8. During the past month, have you had any reason to wonder if you were losing your mind, or losing control over the way you act, talk, think, feel, or of your memory? *(Tick one)*
 - ☐ 1 No, not at all
 - ☐ 2 Maybe a little
 - ☐ 3 Yes, but not enough to be concerned or worried about
 - ☐ 4 Yes, and I have been a little concerned
 - ☐ 5 Yes, and I am quite concerned
 - ☐ 6 Yes, I am very much concerned about it

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9. Did you feel depressed during the past month? *(Tick one)*
- ☐ 1 Yes, to the point that I did not care about anything for days at a time
☒ 2 Yes, very depressed almost every day
☐ 3 Yes, quite depressed several times
☐ 4 Yes, a little depressed now and then
☐ 5 No, never felt depressed at all
10. During the past month, how much of the time have you felt loved and wanted? *(Tick one)*
- ☐ 1 All of the time
☐ 2 Most of the time
☐ 3 A good bit of the time
☐ 4 Some of the time
☐ 5 A little of the time
☐ 6 None of the time
11. How much of the time, during the past month, have you been a very nervous person? *(Tick one)*
- ☐ 1 All of the time
☐ 2 Most of the time
☐ 3 A good bit of the time
☒ 4 Some of the time
☐ 5 A little of the time
☐ 6 None of the time
12. When you have got up in the morning, this past month, about how often did you expect to have an interesting day? *(Tick one)*
- ☐ 1 Always
☐ 2 Very often
☐ 3 Fairly often
☒ 4 Sometimes
☐ 5 Almost never
☐ 6 Never
13. During the past month, how much of the time have you felt tense or "high-strung"? *(Tick one)*
- ☒ 1 All of the time
☐ 2 Most of the time
☐ 3 A good bit of the time
☐ 4 Some of the time
☐ 5 A little of the time
☐ 6 None of the time
14. During the past month, have you been in firm control of your behaviour, thoughts, emotions or feelings? *(Tick one)*
- ☐ 1 Yes, very definitely
☐ 2 Yes, for the most part
☒ 3 Yes, I guess so
☐ 4 No, not too well
☐ 5 No, and I am somewhat disturbed
☐ 6 No, and I am very disturbed
15. During the past month, how often did your hands shake when you tried to do something? *(Tick one)*
- ☐ 1 Always
☐ 2 Very often
☐ 3 Fairly often
☒ 4 Sometimes
☐ 5 Almost never
☐ 6 Never
16. During the past month, how often did you feel that you had nothing to look forward to? *(Tick one)*
- ☒ 1 Always
☐ 2 Very often
☐ 3 Fairly often
☐ 4 Sometimes
☐ 5 Almost never
☐ 6 Never
17. How much of the time, during the past month, have you felt calm and peaceful? *(Tick one)*
- ☐ 1 All of the time
☐ 2 Most of the time
☒ 3 A good bit of the time
☐ 4 Some of the time
☐ 5 A little of the time
☐ 6 None of the time

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18. How much of the time, during the past month, have you felt emotionally stable? *(Tick one)*
- | | |
|---|---|
| ☒ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
19. How much of the time, during the past month, have you felt downhearted and blue? *(Tick one)*
- | | |
|---|---|
| ☒ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
20. How often have you felt like crying, during the past month? *(Tick one)*
- | | |
|--|---|
| ☒ 1 Always | ☐ 4 Sometimes |
| ☐ 2 Very often | ☐ 5 Almost never |
| ☐ 3 Fairly often | ☐ 6 Never |
21. During the past month, how often have you felt that others would be better off if you were dead? *(Tick one)*
- | | |
|---|---|
| ☐ 1 Always | ☐ 4 Sometimes |
| ☐ 2 Very often | ☐ 5 Almost never |
| ☐ 3 Fairly often | ☒ 6 Never |
22. How much of the time, during the past month, were you able to relax without difficulty? *(Tick one)*
- | | |
|---|---|
| ☒ 1 All of the time | ☐ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
23. How much of the time, during the past month, did you feel that your love relationships, loving and being loved, were full and complete? *(Tick one)*
- | | |
|---|--|
| ☐ 1 All of the time | ☒ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
24. How often, during the past month, did you feel that nothing turned out for you the way you wanted it to? *(Tick one)*
- | | |
|--|---|
| ☒ 1 Always | ☐ 4 Sometimes |
| ☐ 2 Very often | ☐ 5 Almost never |
| ☐ 3 Fairly often | ☐ 6 Never |
25. How much have you been bothered by nervousness, or your "nerves", during the past month? *(Tick one)*
- | | |
|--|---|
| ☒ 1 Extremely so, to the point where I could not take care of things | ☐ 4 Bothered some, enough to notice |
| ☐ 2 Very much bothered | ☐ 5 Bothered just a little by nerves |
| ☐ 3 Bothered quite a bit by nerves | ☐ 6 Not bothered at all by this |
26. During the past month, how much of the time has living been a wonderful adventure for you? *(Tick one)*
- | | |
|---|--|
| ☐ 1 All of the time | ☒ 4 Some of the time |
| ☐ 2 Most of the time | ☐ 5 A little of the time |
| ☐ 3 A good bit of the time | ☐ 6 None of the time |
27. How often, during the past month, have you felt so down in the dumps that nothing could cheer you up? *(Tick one)*
- | | |
|--|---|
| ☒ 1 Always | ☐ 4 Sometimes |
| ☐ 2 Very often | ☐ 5 Almost never |
| ☐ 3 Fairly often | ☐ 6 Never |

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28. During the past month, did you think about taking your own life? (Tick one)
- 1 ☐ Yes, very often 4 ☐ Yes, at one time
- 2 ☒ Yes, fairly often 5 ☐ No, never
- 3 ☐ Yes, a couple of times
29. During the past month, how much of the time have you felt restless, fidgety, or impatient? (Tick one)
- 1 ☐ All of the time 4 ☐ Some of the time
- 2 ☒ Most of the time 5 ☐ A little of the time
- 3 ☐ A good bit of the time 6 ☐ None of the time
30. During the past month, how much of the time have you been moody or brooded about things? (Tick one)
- 1 ☐ All of the time 4 ☐ Some of the time
- 2 ☒ Most of the time 5 ☐ A little of the time
- 3 ☐ A good bit of the time 6 ☐ None of the time
31. How much of the time, during the past month, have you felt cheerful, lighthearted? (Tick one)
- 1 ☐ All of the time 4 ☒ Some of the time
- 2 ☐ Most of the time 5 ☐ A little of the time
- 3 ☐ A good bit of the time 6 ☐ None of the time
32. During the past month, how often did you get irritated, upset or flustered? (Tick one)
- 1 ☐ Always 4 ☒ Sometimes
- 2 ☐ Very often 5 ☐ Almost never
- 3 ☐ Fairly often 6 ☐ Never
33. During the past month, have you been anxious or worried? (Tick one)
- 1 ☐ Yes, extremely to the point of being sick or almost sick
- 2 ☐ Yes, very much so 5 ☐ Yes, a little bit
- 3 ☒ Yes, quite a bit 6 ☐ No, not at all
- 4 ☐ Yes, some, enough to bother me
34. During the past month, how much of the time were you a happy person? (Tick one)
- 1 ☐ All of the time 4 ☒ Some of the time
- 2 ☐ Most of the time 5 ☐ A little of the time
- 3 ☐ A good bit of the time 6 ☐ None of the time
35. How often during the past month did you find yourself trying to calm down? (Tick one)
- 1 ☒ Always 4 ☐ Sometimes
- 2 ☐ Very often 5 ☐ Almost never
- 3 ☐ Fairly often 6 ☐ Never
36. During the past month, how much of the time have you been in low or very low spirits? (Tick one)
- 1 ☐ All of the time 4 ☒ Some of the time
- 2 ☐ Most of the time 5 ☐ A little of the time
- 3 ☐ A good bit of the time 6 ☐ None of the time
37. How often, during the past month, have you been waking up feeling fresh and rested? (Tick one)
- 1 ☒ Always, every day 4 ☐ Some days, but usually not
- 2 ☐ Almost every day 5 ☐ Hardly ever
- 3 ☐ Most days 6 ☐ Never wake up feeling rested
38. During the past month, have you been under or felt you were under any strain, stress or pressure? (Tick one)
- 1 ☐ Yes, almost more than I could stand or bear 4 ☐ Yes, some, but about normal
- 2 ☒ Yes, quite a bit of pressure 5 ☐ Yes, a little bit
- 3 ☐ Yes, some more than usual 6 ☐ No, not at all

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Declaration: I have given permission to use this for research purpose.

Student Signature: _____ Page Scores: _____ Accu. Scores: _____

Appendix-03

DATASETS

No.	Age	Gender	Family	Location	Income	Height in centimeter	Weight in Kg	BMI	OB/Non-OB	BMI Categories	Social Support	Resilience	Self-Esteem	Mental Health
1	2	1	2	1	1	158	69	27.64	2	2	76	85	24	130
2	3	2	2	2	1	150	58	25.78	2	2	69	85	22	151
3	3	1	1	1	1	158	75	30.04	1	1	63	82	24	137
4	3	2	1	1	1	150	52	23.11	2	3	50	72	21	175
5	3	2	1	1	1	184	70	20.68	2	3	32	51	29	116
6	2	2	2	2	1	150	46	20.44	2	3	55	78	24	131
7	2	2	1	2	1	164	64	23.80	2	3	45	65	15	123
8	3	1	2	2	1	171	55	18.81	2	3	72	97	19	145
9	2	1	2	1	1	171	99	33.86	1	1	67	104	22	158
10	3	1	1	2	3	160	74	28.91	2	2	28	81	21	149
11	3	2	2	1	2	155	59	24.56	2	3	72	96	20	139
12	3	1	2	2	2	171	95	32.49	1	1	82	96	21	153
13	3	1	2	2	1	160	59	23.05	2	3	54	98	23	135
14	3	2	2	2	1	150	55	24.44	2	3	79	99	22	136
15	3	1	2	2	1	175	71	23.18	2	3	81	83	21	143
16	2	2	2	1	1	173	82	27.40	2	2	83	105	21	159
17	3	1	2	2	2	150	70	31.11	1	1	61	88	23	156
18	3	2	2	2	1	150	43	19.11	2	3	78	92	26	136
19	2	1	2	2	1	158	65	26.04	2	2	81	93	27	130
20	1	1	2	2	1	163	69	25.97	2	2	81	97	23	134
21	1	1	2	2	1	163	80	30.11	1	1	78	93	25	142
22	3	2	2	2	1	140	67	34.18	1	1	58	80	23	140
23	3	1	2	1	1	166	74	26.85	2	2	72	83	21	142
24	2	2	2	2	1	150	47	20.89	2	3	72	84	19	131
25	2	2	2	2	1	150	58	25.78	2	2	54	87	21	145
26	1	2	1	1	1	155	85	35.38	1	1	61	92	25	125
27	1	2	1	2	1	150	82	36.44	1	1	48	63	22	140
28	2	2	1	2	1	145	75	35.67	1	1	59	91	24	130
29	2	1	1	2	1	169	74	25.91	2	2	56	84	25	137
30	3	1	2	2	1	160	75	29.30	2	2	77	79	25	156
31	2	1	1	2	1	155	59	24.56	2	3	80	91	25	144
32	3	1	1	2	1	165	84	30.85	1	1	72	94	23	134

33	2	1	2	1	1	160	91	35.55	1	1	80	88	22	144
34	3	2	2	2	1	150	60	26.67	2	2	36	88	20	136
35	3	2	2	1	1	140	62	31.63	1	1	78	94	22	146
36	3	1	2	2	1	165	72	26.45	2	2	49	80	26	142
37	2	2	1	2	1	150	60	26.67	2	2	80	97	19	157
38	3	1	2	1	1	140	54	27.55	2	2	72	90	20	152
39	3	2	1	2	1	140	76	38.78	1	1	72	84	21	167
40	2	2	1	2	1	150	76	33.78	1	1	81	85	25	156
41	3	2	2	1	1	150	75	33.33	1	1	72	84	24	135
42	3	2	1	2	1	140	56	28.57	2	2	72	84	22	138
43	3	2	2	2	1	155	70	29.10	2	2	62	83	26	141
44	3	2	1	2	1	145	76	36.15	1	1	76	105	23	115
45	3	2	1	1	1	155	73	30.39	1	1	67	88	22	164
46	3	2	2	2	2	140	60	30.61	1	1	67	84	27	145
47	2	2	2	2	1	140	60	30.61	1	1	79	96	23	103
48	2	2	2	1	1	145	62	29.49	2	2	81	97	21	153
49	2	2	2	2	1	145	71	33.77	1	1	76	97	22	169
50	1	2	1	2	1	145	65	30.92	1	1	72	87	22	170
51	3	1	2	1	1	160	98	38.28	1	1	78	98	20	164
52	3	1	2	2	1	150	89	39.56	1	1	72	84	20	136
53	2	2	2	1	1	140	65	33.16	1	1	80	84	22	148
54	3	1	2	2	1	150	76	33.78	1	1	72	84	23	137
55	3	2	2	2	1	140	70	35.71	1	1	77	95	23	144
56	2	2	2	2	1	145	82	39.00	1	1	84	96	22	149
57	2	2	2	2	1	135	69	37.86	1	1	77	105	22	152
58	2	2	2	2	1	135	69	37.86	1	1	80	105	22	145
59	3	2	2	1	1	140	55	28.06	2	2	84	84	22	143
60	1	2	2	1	1	140	55	28.06	2	2	72	84	23	138
61	3	2	1	2	1	155	95	39.54	1	1	72	84	23	137
62	2	2	2	1	2	145	82	39.00	1	1	84	84	20	131
63	3	2	2	1	1	150	87	38.67	1	1	72	84	22	136
64	3	2	2	2	1	150	89	39.56	1	1	72	84	23	139
65	3	2	2	1	1	145	77	36.62	1	1	79	84	22	149
66	2	1	1	2	1	155	90	37.46	1	1	72	105	21	169
67	3	2	1	2	1	140	69	35.20	1	1	82	84	20	136
68	3	2	2	1	1	145	72	34.24	1	1	72	84	23	143
69	3	2	2	1	1	140	70	35.71	1	1	72	84	21	138
70	2	1	2	2	1	145	67	31.87	1	1	84	84	22	127
71	3	2	1	2	1	130	55	32.54	1	1	72	84	22	136
72	3	1	2	2	1	145	73	34.72	1	1	84	84	20	127
73	3	2	2	1	1	145	69	32.82	1	1	84	105	23	139

74	3	2	2	1	1	140	77	39.29	1	1	80	84	23	138
75	3	2	2	1	1	140	65	33.16	1	1	72	84	23	137
76	2	1	2	1	1	150	65	28.89	2	2	72	84	23	141
77	3	2	2	2	1	140	60	30.61	1	1	72	88	24	127
78	1	1	1	2	1	175	90	29.39	2	2	72	84	21	130
79	2	2	1	2	1	145	83	39.48	1	1	72	84	25	143
80	3	2	2	2	1	135	70	38.41	1	1	72	84	21	135
81	3	2	2	2	1	140	61	31.12	1	1	72	84	21	137
82	2	2	2	2	1	150	85	37.78	1	1	84	84	20	137
83	3	1	1	1	2	150	70	31.11	1	1	72	84	22	124
84	3	2	2	2	1	140	70	35.71	1	1	72	84	21	141
85	2	2	2	2	1	140	73	37.24	1	1	72	84	21	133
86	3	2	2	2	1	150	86	38.22	1	1	72	84	20	123
87	3	1	1	1	1	150	80	35.56	1	1	84	84	21	146
88	3	2	2	2	1	135	64	35.12	1	1	72	84	20	128
89	3	2	2	2	1	140	68	34.69	1	1	72	84	21	135
90	1	1	1	1	1	185	88	25.71	2	2	72	84	18	160
91	3	1	2	2	1	155	85	35.38	1	1	72	84	22	132
92	3	2	2	2	1	140	63	32.14	1	1	76	81	24	143
93	3	1	2	2	2	150	78	34.67	1	1	72	84	23	139
94	3	2	2	2	1	135	55	30.18	1	1	72	84	21	120
95	2	2	2	2	1	145	65	30.92	1	1	72	89	23	136
96	2	2	2	2	1	140	59	30.10	1	1	72	84	21	119
97	3	2	2	2	2	145	75	35.67	1	1	72	84	20	136
98	3	1	1	2	1	150	89	39.56	1	1	72	84	22	141
99	3	1	2	2	1	150	75	33.33	1	1	78	84	27	134
100	3	2	2	2	1	145	65	30.92	1	1	78	84	21	143
101	3	1	2	1	1	145	78	37.10	1	1	73	105	22	146
102	3	2	2	1	3	145	80	38.05	1	1	80	84	20	118
103	2	2	2	2	1	140	63	32.14	1	1	72	84	25	141
104	1	2	2	2	1	135	61	33.47	1	1	72	84	21	123
105	2	2	2	2	1	140	66	33.67	1	1	72	84	22	145
106	2	2	2	2	1	140	55	28.06	2	2	77	90	23	149
107	2	2	2	1	1	140	55	28.06	2	2	84	84	21	136
108	3	2	2	2	1	140	59	30.10	1	1	72	105	22	140
109	2	2	1	1	1	145	56	26.63	2	2	72	84	20	133
110	2	2	2	2	2	150	60	26.67	2	2	78	84	23	131
111	3	2	1	1	1	145	81	38.53	1	1	72	84	20	140
112	2	2	1	2	1	130	51	30.18	1	1	72	102	21	140
113	3	2	2	2	1	140	76	38.78	1	1	58	84	20	148
114	2	2	2	1	1	145	64	30.44	1	1	57	71	21	139

115	3	2	2	2	1	145	70	33.29	1	1	80	84	22	130
116	1	2	2	2	1	145	74	35.20	1	1	77	84	20	133
117	3	2	2	2	1	145	75	35.67	1	1	72	84	23	141
118	2	2	2	2	1	150	80	35.56	1	1	72	84	22	138
119	3	2	2	2	1	145	75	35.67	1	1	72	84	19	135
120	2	2	1	2	1	145	72	34.24	1	1	76	84	19	145
121	3	2	2	2	1	140	67	34.18	1	1	72	84	22	127
122	1	2	1	2	1	140	59	30.10	1	1	79	84	20	150
123	3	2	2	2	1	155	80	33.30	1	1	72	84	21	116
124	3	2	1	2	1	135	70	38.41	1	1	78	84	20	139
125	1	2	1	2	1	140	70	35.71	1	1	72	84	19	134
126	3	2	2	2	2	130	49	29.01	2	2	57	58	23	137
127	3	1	1	2	1	155	75	31.22	1	1	72	84	20	142
128	3	2	1	2	1	140	60	30.61	1	1	72	84	22	149
129	3	1	2	1	1	150	80	35.56	1	1	57	62	25	132
130	3	2	1	1	1	145	60	28.54	2	2	77	84	20	147
131	2	2	1	2	1	135	55	30.18	1	1	72	84	21	142
132	3	2	2	2	2	150	75	33.33	1	1	72	84	21	140
133	3	2	1	1	1	155	95	39.54	1	1	77	84	17	142
134	3	2	1	2	1	145	73	34.72	1	1	72	84	21	136
135	3	2	2	2	1	130	52	30.77	1	1	79	84	23	136
136	2	1	2	2	1	150	81	36.00	1	1	81	84	26	137
137	2	2	2	2	1	145	75	35.67	1	1	81	84	19	116
138	1	2	2	2	1	145	80	38.05	1	1	75	95	17	131
139	3	2	2	1	2	140	65	33.16	1	1	72	84	22	149
140	3	2	2	2	1	140	76	38.78	1	1	78	84	19	122
141	2	2	2	2	1	150	63	28.00	2	2	75	84	19	132
142	2	2	2	2	1	150	83	36.89	1	1	72	93	22	134
143	2	2	2	2	1	145	56	26.63	2	2	72	84	17	152
144	2	2	2	2	1	130	57	33.73	1	1	72	84	20	118
145	1	2	2	2	1	135	60	32.92	1	1	78	84	22	146
146	3	2	2	2	1	135	67	36.76	1	1	72	84	18	138
147	2	2	2	1	2	150	64	28.44	2	2	72	84	18	135
148	3	2	2	2	1	140	73	37.24	1	1	72	84	19	134
149	2	2	2	2	1	135	60	32.92	1	1	72	84	19	118
150	1	2	2	2	1	135	57	31.28	1	1	79	96	19	136
151	2	2	1	2	1	145	71	33.77	1	1	72	84	18	142
152	3	2	2	2	1	145	70	33.29	1	1	77	84	19	132
153	3	1	2	1	1	155	81	33.71	1	1	79	84	18	136
154	3	1	1	1	1	150	76	33.78	1	1	79	84	21	143
155	2	2	1	2	1	140	68	34.69	1	1	77	84	20	140

156	1	2	1	2	1	150	50	22.22	2	3	72	84	17	128
157	2	2	2	2	1	145	57	27.11	2	2	77	84	21	129
158	3	2	2	2	1	145	76	36.15	1	1	76	98	18	132
159	3	2	2	2	1	135	57	31.28	1	1	43	63	23	139
160	2	2	2	1	1	145	60	28.54	2	2	78	84	20	139
161	3	2	2	2	1	145	62	29.49	2	2	79	84	20	139
162	3	2	2	2	1	140	55	28.06	2	2	72	84	20	144
163	3	1	2	1	1	150	76	33.78	1	1	72	84	21	138
164	2	2	2	2	1	155	70	29.14	2	2	72	84	20	134
165	1	2	2	2	1	153	56	23.92	2	3	72	84	18	139
166	3	2	1	2	1	140	52	26.53	2	2	72	84	18	150
167	3	2	1	2	2	135	56	30.73	1	1	67	84	19	143
168	3	2	1	1	2	150	68	30.22	1	1	62	49	20	130
169	2	2	2	2	1	145	62	29.49	2	2	80	96	18	134
170	3	2	2	1	1	150	63	28.00	2	2	80	84	19	145
171	3	1	1	1	1	155	85	35.38	1	1	79	84	20	131
172	3	1	1	1	1	150	80	35.56	1	1	75	90	20	133
173	3	2	2	1	1	140	60	30.61	1	1	78	101	18	149
174	3	2	1	1	1	150	82	36.44	1	1	72	84	22	150
175	3	1	2	2	1	150	76	33.78	1	1	53	67	20	149
176	3	2	1	1	1	140	68	34.69	1	1	72	105	20	148
177	3	1	2	1	1	150	77	34.22	1	1	79	84	20	143
178	3	1	2	1	1	150	80	35.56	1	1	74	84	23	155
179	3	2	2	2	1	145	58	27.59	2	2	79	84	19	148
180	2	2	2	2	1	135	55	30.18	1	1	82	84	21	132
181	3	2	2	2	1	155	81	33.71	1	1	72	84	18	130
182	2	2	2	2	1	150	75	33.33	1	1	45	54	22	149
183	3	2	1	1	1	145	67	31.87	1	1	58	84	19	133
184	3	2	2	2	1	135	57	31.28	1	1	76	95	20	132
185	3	1	2	2	1	150	78	34.67	1	1	50	84	22	132
186	2	2	2	2	1	140	70	35.71	1	1	72	84	18	146
187	1	2	1	2	1	135	61	33.47	1	1	72	84	18	137
188	3	1	1	2	1	135	62	34.02	1	1	72	84	21	133
189	2	2	2	2	1	150	86	38.22	1	1	72	84	26	144
190	3	1	2	2	1	135	56	30.73	1	1	72	84	21	115
191	2	1	1	2	1	150	76	33.78	1	1	72	84	18	152
192	3	2	1	2	1	135	55	30.18	1	1	72	84	22	145
193	3	2	2	2	1	140	75	38.27	1	1	72	84	19	137
194	2	2	2	2	1	150	68	30.22	1	1	72	84	19	134
195	2	2	2	2	1	145	60	28.54	2	2	72	84	19	137
196	3	2	1	2	1	140	78	39.80	1	1	53	84	18	139

197	3	2	2	2	1	135	60	32.92	1	1	72	84	21	142
198	2	2	2	2	1	145	70	33.29	1	1	72	84	19	145
199	3	2	2	1	1	155	76	31.63	1	1	72	84	21	136
200	3	2	1	1	1	145	64	30.41	1	1	72	84	17	142
201	3	2	2	1	1	140	72	36.73	1	1	78	84	18	119
202	3	2	2	2	1	145	70	33.29	1	1	72	84	19	133
203	2	2	1	2	2	158	78	31.24	1	1	72	84	20	125
204	3	2	1	2	1	150	81	36.00	1	1	72	100	21	137
205	2	2	2	2	1	150	52	23.11	2	3	72	84	18	134
206	2	2	2	2	1	135	50	27.43	2	2	72	84	18	143
207	1	2	1	2	1	145	52	24.73	2	3	84	84	22	143
208	3	2	2	1	1	135	56	30.73	1	1	72	84	19	130
209	3	2	1	2	1	145	66	31.39	1	1	72	84	20	138
210	2	2	2	2	1	155	78	32.47	1	1	72	84	19	149
211	3	2	1	2	1	145	68	32.34	1	1	72	84	19	134
212	2	2	2	1	1	140	70	35.71	1	1	72	84	23	132
213	2	2	2	2	1	150	66	29.33	2	2	51	40	23	142
214	2	2	2	1	1	145	70	33.29	1	1	72	84	20	145
215	2	2	1	1	1	140	65	33.16	1	1	72	84	24	132
216	1	2	1	2	1	135	56	30.73	1	1	62	84	24	135
217	1	2	1	2	1	145	62	29.49	2	2	61	60	23	139
218	3	2	2	1	1	140	78	39.80	1	1	72	84	20	121
219	3	2	1	2	1	145	75	35.67	1	1	72	84	21	149
220	1	2	1	2	1	150	76	33.78	1	1	72	84	22	143
221	2	2	2	2	1	150	86	38.22	1	1	72	84	26	140
222	3	2	2	2	1	140	66	33.67	1	1	72	84	18	133
223	3	2	1	2	1	155	78	32.47	1	1	72	84	22	151
224	3	2	1	2	1	145	62	29.49	2	2	72	84	19	136
225	2	2	2	2	1	150	79	35.11	1	1	72	84	20	142
226	3	2	2	2	1	145	60	28.54	2	2	54	62	19	133
227	2	2	1	2	1	145	62	29.49	2	2	72	84	20	130
228	2	2	2	2	1	140	56	28.57	2	2	72	84	21	143
229	3	2	1	2	1	145	60	28.54	2	2	72	84	19	142
230	3	2	2	2	1	145	57	27.11	2	2	72	84	24	140
231	2	2	1	2	1	150	78	34.67	1	1	72	84	21	137
232	3	2	1	2	1	135	56	30.73	1	1	72	84	19	140
233	3	2	2	2	1	135	52	28.53	2	2	72	84	21	150
234	3	2	1	2	1	150	66	29.33	2	2	72	84	22	139
235	3	2	2	2	1	150	72	32.00	1	1	72	84	18	136
236	3	2	1	2	1	145	75	35.67	1	1	72	84	18	132
237	3	2	2	2	1	145	56	26.63	2	2	54	76	21	139

238	3	1	2	2	1	155	78	32.47	1	1	72	84	19	128
239	2	1	2	2	1	157	84	34.08	1	1	72	91	22	152
241	2	1	2	2	1	155	79	32.88	1	1	72	84	19	129
242	1	1	1	2	1	185	65	18.99	2	3	72	84	22	138
243	2	1	1	2	1	168	89	31.53	1	1	72	84	23	134
244	2	1	1	2	1	170	81	28.03	2	2	72	84	20	143
245	2	1	2	2	1	169	86	30.11	1	1	72	84	21	150
246	1	2	2	2	1	140	55	28.06	2	2	72	84	18	140
246	1	1	1	2	1	180	69	21.30	2	3	77	95	22	123
247	3	1	2	2	1	180	86	26.54	2	2	72	84	19	145
248	3	1	2	2	1	185	90	26.30	2	2	72	84	22	135
249	2	1	2	2	1	170	79	27.34	2	2	72	84	22	134
250	2	2	2	2	1	145	75	35.67	1	1	72	84	22	116
251	3	2	2	2	1	145	50	23.78	2	3	72	84	22	138
252	2	2	2	2	1	140	69	35.20	1	1	66	58	19	127
253	1	2	2	2	1	135	50	27.43	2	2	64	84	26	140
254	3	2	2	2	1	150	69	30.67	1	1	72	84	18	136
255	2	2	2	2	1	140	60	30.61	1	1	72	84	24	119
256	1	2	2	2	1	140	51	26.02	2	2	72	84	23	133
257	2	1	2	2	1	150	75	33.33	1	1	72	84	20	134
258	3	1	2	2	1	158	86	34.45	1	1	72	84	19	144
259	3	1	2	2	1	158	78	31.24	1	1	72	84	18	124
260	2	1	2	2	1	156	78	32.05	1	1	72	84	21	142
261	3	1	2	2	1	150	60	26.67	2	2	72	84	22	134
262	3	1	2	2	1	157	85	34.48	1	1	72	84	22	143
263	2	1	2	2	1	156	82	33.69	1	1	72	84	18	145
264	3	1	2	2	1	145	62	29.49	2	2	72	84	19	132
265	3	2	2	2	1	145	67	31.87	1	1	72	84	22	140
266	3	2	2	2	1	145	73	34.72	1	1	48	63	19	132
267	2	2	2	2	1	150	75	33.33	1	1	84	84	24	138
268	3	2	2	2	1	150	78	34.67	1	1	72	84	21	130
269	2	2	2	2	1	150	68	30.22	1	1	72	84	25	146
270	3	1	1	2	1	155	84	34.96	1	1	72	84	21	136
271	3	1	2	2	1	155	79	32.88	1	1	72	105	21	126
272	2	1	2	2	1	180	75	23.15	2	3	72	84	20	146
273	2	1	2	2	1	145	62	29.49	2	2	72	84	20	121
274	1	1	2	2	1	155	65	27.06	2	2	72	84	20	138
275	1	1	2	2	1	158	65	26.04	2	2	72	84	22	131
276	2	1	1	2	1	155	84	34.96	1	1	72	84	23	137
267	3	1	2	2	1	159	89	35.20	1	1	72	91	21	148
278	3	1	2	2	1	155	60	25.00	2	2	72	84	24	152

279	3	2	1	2	1	145	78	37.10	1	1	72	84	21	134
280	3	1	2	1	1	150	85	37.78	1	1	72	84	21	128
281	3	1	1	2	1	160	89	34.77	1	1	72	84	20	147
282	3	1	1	2	1	155	82	34.13	1	1	72	84	18	143
283	1	1	2	1	1	160	77	30.08	1	1	72	84	21	146
284	3	1	2	1	1	155	73	30.40	1	1	72	84	17	142
285	1	2	2	2	2	150	84	37.33	1	1	66	66	18	139
286	1	2	1	2	2	150	85	37.78	1	1	70	76	18	138
287	2	1	2	2	1	155	73	30.40	1	1	72	84	20	128
288	1	1	2	1	1	155	86	35.80	1	1	72	84	19	145
289	3	1	2	2	1	150	69	30.67	1	1	72	84	21	138
290	2	2	1	2	1	145	73	34.72	1	1	63	68	21	126
291	2	2	2	2	1	156	84	34.52	1	1	71	69	20	126
292	2	2	2	2	2	145	75	35.67	1	1	60	55	20	133
293	2	2	1	2	1	145	70	33.29	1	1	60	69	22	136
294	2	2	2	1	2	155	84	34.96	1	1	58	64	22	132
295	2	2	2	2	2	145	68	32.34	1	1	56	76	19	143
296	1	2	1	1	1	130	53	31.36	1	1	67	63	19	128
297	1	2	2	1	2	150	76	33.78	1	1	55	71	20	132
298	1	2	2	2	2	145	68	32.34	1	1	71	73	18	130
299	1	2	1	1	2	145	76	36.15	1	1	69	68	20	128
300	1	2	1	2	1	145	64	30.40	1	1	65	71	22	122
301	1	2	1	2	1	140	59	30.10	1	1	64	67	20	138
302	1	2	2	1	2	135	55	30.18	1	1	63	62	19	132
303	1	2	2	1	2	140	59	30.10	1	1	61	68	19	127
304	1	2	2	1	2	135	55	30.18	1	1	69	76	17	135
305	1	2	2	1	1	140	59	30.10	1	1	63	61	24	128
306	1	2	2	1	1	140	65	33.16	1	1	70	66	22	137
307	2	2	1	1	3	152	73	31.60	1	1	67	71	23	138
308	1	2	2	1	2	168	70	24.80	2	3	75	74	20	164
309	3	1	2	1	2	165	69	25.34	2	2	52	55	29	133
310	1	2	2	1	1	158	49	19.63	2	3	55	78	20	148
311	2	2	1	2	3	150	68	30.22	1	1	54	78	26	136
312	1	2	2	1	1	152	70	30.30	1	1	13	58	24	76
313	3	2	2	1	3	165	64	23.51	2	3	82	82	14	181
314	3	1	2	1	2	163	72	27.10	2	2	67	97	16	171
315	1	1	2	2	2	160	52	20.31	2	3	62	83	24	127
316	3	1	2	1	2	160	77	30.08	1	1	34	57	22	96
317	1	2	2	2	1	151	69	30.26	1	1	54	60	24	119
318	1	2	2	2	1	159	90	35.60	1	1	49	51	27	135
319	3	1	1	2	3	174	75	24.77	2	3	72	81	21	151

320	3	1	2	1	3	162	93	35.44	1	1	40	82	21	139
321	1	1	2	2	1	179	65	20.29	2	3	58	68	21	119
322	3	2	2	2	2	156	73	30.00	1	1	20	57	26	101
323	1	2	2	2	2	170	89	30.80	1	1	46	63	21	137
324	2	1	1	2	2	165	76	27.92	2	2	67	81	20	184
325	2	1	1	2	2	165	76	27.92	2	2	67	81	20	184
326	1	2	2	1	1	177	70	22.34	2	3	78	88	18	170
327	1	2	2	2	1	159	65	25.71	2	2	50	86	18	145
328	1	2	2	1	1	153	60	25.63	2	2	58	58	23	147
329	3	2	2	1	1	171	94	32.15	1	1	70	84	19	158
330	1	2	1	1	2	160	82	32.03	1	1	77	81	20	165
331	3	1	2	1	3	162	93	35.44	1	1	40	82	21	139
332	1	2	1	2	2	149	67	30.18	1	1	68	51	22	146
333	3	2	2	1	1	171	72	24.62	2	3	58	74	19	134
334	2	1	2	1	2	176	92	30.22	1	1	22	49	30	67
335	3	1	1	1	1	150	60	26.67	2	2	68	74	15	142
336	3	1	2	1	1	175	70	22.86	2	3	62	87	19	187
337	1	2	2	1	1	142	63	31.24	1	1	53	61	30	105
338	3	2	2	2	1	153	71	30.33	1	1	57	78	27	102
339	2	1	1	2	1	155	85	35.38	1	1	78	105	14	139
340	3	1	1	1	3	165	70	25.71	2	2	58	73	20	137
341	3	1	2	1	2	162	55	20.96	2	3	50	77	18	165
342	3	1	2	2	2	165	60	22.04	2	3	39	87	19	135
343	3	1	1	1	1	160	58	22.66	2	3	83	101	16	163
344	2	1	2	1	2	165	62	22.77	2	3	53	36	33	89
345	3	1	2	1	2	154	59	24.88	2	3	44	79	24	153
346	1	2	2	2	1	182	62	18.71	2	3	60	60	22	153
347	3	1	1	1	3	157	72	29.21	2	2	72	98	15	177
348	2	1	1	2	2	166	55	19.96	2	3	46	61	19	178
349	3	2	2	2	2	154	67	28.25	2	2	81	98	17	189
350	3	2	2	2	3	163	80	30.11	1	1	48	57	22	102
351	3	1	1	1	3	185	55	16.07	2	4	53	37	27	98
352	1	1	2	2	1	149	45	20.27	2	3	72	70	21	203
353	3	1	2	2	2	173	73	24.39	2	3	53	49	23	127
354	2	1	1	1	2	172	115	38.87	1	1	59	74	23	115
355	3	2	2	1	2	160	63	24.61	2	3	74	74	21	135
356	3	1	1	1	3	172	103	34.82	1	1	61	95	17	157
357	3	1	2	2	1	172	89	30.08	1	1	30	68	24	131
358	3	1	1	2	1	170	87	30.10	1	1	65	61	20	140
359	3	1	1	2	2	176	83	26.79	2	2	30	68	24	131
360	1	1	2	2	1	169	58	20.31	2	3	67	48	26	122

361	2	2	1	1	2	157	52	21.10	2	3	78	90	18	169
362	1	1	2	1	1	170	60	20.76	2	3	54	36	29	107
363	3	1	2	1	1	155	60	25.00	2	2	30	57	25	145
364	2	1	1	2	1	158	58	23.23	2	3	65	69	24	120
365	3	1	1	1	3	156	60	24.65	2	3	79	96	16	172
366	3	1	2	1	3	167	84	30.12	1	1	57	65	23	143
367	3	1	1	1	2	167	72	25.82	2	2	84	70	24	153
368	3	1	2	1	1	180	65	20.06	2	3	70	99	16	141
369	2	1	2	1	1	183	74	22.10	2	3	41	94	21	128
370	3	2	2	2	3	146	60	28.15	2	2	29	55	22	156
371	2	2	2	1	2	154	58	24.46	2	3	33	62	22	127
372	3	1	2	2	1	172	89	30.08	1	1	31	83	22	156
373	2	1	2	2	2	165	75	27.55	2	2	59	102	18	150
374	3	1	2	1	3	170	87	30.10	1	1	47	90	14	138
375	1	2	2	2	1	142	50	24.80	2	3	67	85	28	126
376	2	1	1	2	3	162	52	19.81	2	3	55	68	21	130
377	3	2	2	2	1	161	78	30.09	1	1	50	76	21	164
378	1	2	2	2	1	157	100	40.57	1	1	69	82	19	81
379	1	1	2	1	3	156	90	36.98	1	1	27	44	24	136
380	2	1	2	1	2	170	87	30.10	1	1	52	69	21	101
381	1	2	1	1	1	168	58	20.55	2	3	54	39	31	132
382	1	2	2	1	3	157	46	18.66	2	3	57	64	33	103
383	3	1	2	1	3	154	65	27.41	2	2	72	75	21	152
384	1	2	2	1	2	145	53	25.20	2	2	72	75	21	152
385	3	1	2	1	3	174	70	23.12	2	3	53	54	23	116
386	1	2	2	1	2	153	53	22.64	2	3	65	61	21	124
387	3	2	2	1	2	163	42	15.81	2	4	46	50	27	85
388	3	2	1	1	1	156	82	33.69	1	1	13	75	26	99
389	2	2	2	1	1	159	58	22.94	2	3	52	60	23	121
390	1	1	2	1	3	171	69	23.60	2	3	58	74	13	190
391	3	1	1	1	2	175	97	31.67	1	1	64	83	21	143
392	2	1	2	1	1	163	53	20.07	2	3	49	58	26	139
393	1	2	1	1	2	157	36	14.61	2	4	38	52	27	129
394	3	2	1	2	3	167	61	21.87	2	3	68	80	17	165
395	1	2	1	1	2	146	65	30.49	1	1	24	51	34	70
396	2	2	2	1	3	156	58	23.83	2	3	50	60	27	135
397	2	2	2	1	3	152	50	21.64	2	3	35	46	28	100
398	1	1	2	1	3	180	51	15.74	2	4	79	90	15	135
399	2	2	2	1	2	145	40	19.02	2	3	65	68	24	142
400	1	2	2	2	3	158	52	20.83	2	3	39	54	32	102
401	1	1	1	2	1	167	59	21.16	2	3	32	61	27	113

402	1	2	2	1	3	156	48	19.72	2	3	19	53	32	106
403	2	2	2	2	2	157	45	18.26	2	4	26	53	29	113
404	2	2	2	1	2	174	62	20.48	2	3	20	52	27	84
405	1	2	2	1	2	155	55	22.89	2	3	64	86	23	157
406	1	1	2	1	2	160	41	15.86	2	4	30	58	32	85
407	3	2	2	1	3	170	87	30.10	1	1	32	65	22	86
408	1	2	2	1	3	158	55	22.03	2	3	45	51	27	124
409	2	2	2	1	1	165	49	18.00	2	4	64	60	18	124
410	1	1	1	1	1	171	55	18.81	2	3	64	65	20	153
411	1	1	1	1	1	171	55	18.81	2	3	64	65	20	153
412	2	1	2	1	1	165	68	24.48	2	3	68	60	20	128
413	2	1	2	1	2	167	65	23.31	2	3	32	80	24	117
414	2	1	2	2	1	174	68	22.46	2	3	26	33	17	99
415	3	2	2	1	3	154	72	30.36	1	1	24	56	26	125
416	2	1	1	2	1	165	65	23.88	2	3	38	67	25	120
417	3	1	1	2	2	176	63	20.34	2	3	48	53	27	134
418	2	1	1	2	1	170	69	23.88	2	3	40	40	21	118
419	3	1	1	1	2	180	98	30.25	1	1	55	73	30	154
420	2	1	2	2	1	177	76	24.26	2	3	39	70	26	119
421	2	2	1	1	2	145	55	26.16	2	2	26	63	28	145
422	3	1	2	2	3	153	56	23.92	2	3	47	43	28	120
423	3	2	2	2	2	163	65	24.46	2	3	55	62	25	125
424	2	1	2	1	2	168	75	26.57	2	2	35	44	24	111
425	3	1	2	1	1	154	72	30.36	1	1	31	84	26	107
426	3	1	2	1	3	163	65	24.46	2	3	68	79	27	179
427	2	1	2	2	1	150	53	23.56	2	3	54	52	22	125
428	1	1	2	2	1	135	55	30.18	1	1	16	69	28	133
429	3	1	2	1	2	155	43	18.90	2	3	42	78	25	154
430	3	1	2	1	3	173	63	21.05	2	3	57	85	29	163
431	3	2	1	1	2	152	55	23.81	2	3	42	33	26	126
432	2	1	2	2	2	182	50	15.09	2	4	51	95	27	119
433	2	2	1	2	2	152	80	34.63	1	1	72	78	20	114
434	2	1	1	2	1	175	69	22.53	2	3	39	46	23	100
435	1	1	2	2	1	179	59	18.70	2	3	52	83	26	138
436	1	2	2	1	1	155	45	18.13	2	4	58	75	20	119
437	1	1	1	2	2	166	54	19.60	2	3	21	70	30	95
438	2	1	2	1	1	152	40	17.31	2	4	61	65	23	147
439	1	1	1	2	1	170	62	21.45	2	3	53	58	21	125
440	2	1	2	1	2	153	72	30.76	1	1	55	37	21	107
441	2	2	2	1	1	169	65	22.76	2	3	23	54	21	101
442	3	1	1	1	2	153	60	25.63	2	2	42	52	25	133

443	1	2	2	2	2	153	54	23.07	2	3	49	61	22	95
444	2	1	1	1	1	165	66	24.24	2	3	57	58	32	185
445	2	2	2	1	2	175	65	21.22	2	3	54	69	27	148
446	2	2	2	1	1	152	55	23.81	2	3	26	68	26	136
447	1	1	1	2	1	165	50	18.37	2	4	49	76	25	102
448	1	2	1	2	1	156	40	16.44	2	4	57	56	30	138
449	1	1	1	2	1	163	58	21.83	2	3	33	48	24	128
450	1	2	2	2	1	156	34	13.97	2	4	20	93	27	120
451	3	2	1	2	3	135	69	37.86	1	1	41	39	22	111
452	3	2	2	1	2	157	95	38.54	1	1	59	80	21	145
453	3	2	2	2	1	153	65	27.77	2	2	62	82	25	139
454	1	1	1	2	1	151	55	24.12	2	3	59	41	29	129
455	2	1	1	2	1	145	68	32.34	1	1	46	68	25	107
456	2	1	1	2	1	165	58	21.30	2	3	58	82	24	155
457	2	1	1	2	2	170	68	23.53	2	3	62	69	26	178
458	1	1	2	1	1	178	57	17.99	2	4	53	90	28	174
459	2	2	2	1	3	170	88	30.45	1	1	44	85	29	128
460	2	1	2	2	1	172	68	22.99	2	3	55	65	20	156
461	2	2	1	2	1	155	68	28.30	2	2	71	75	23	170
462	2	2	1	2	1	155	68	28.30	2	2	71	75	23	170
463	3	1	2	1	2	162	58	22.10	2	3	41	79	26	181
464	2	1	1	1	2	174	74	24.44	2	3	60	82	30	159
465	3	2	2	1	1	153	60	25.63	2	2	58	71	26	136
466	1	1	2	2	1	172	65	21.97	2	3	27	65	18	104
467	1	2	2	1	2	186	84	24.28	2	3	30	78	32	169
468	1	2	2	1	2	186	84	24.28	2	3	30	74	28	170
469	1	2	2	1	2	186	84	24.28	2	3	30	75	30	174
470	1	1	1	2	1	165	60	22.04	2	3	12	53	27	119
471	3	2	2	2	3	140	68	34.69	1	1	22	47	22	100
472	3	2	2	2	2	143	69	33.74	1	1	55	63	24	151
473	3	1	2	1	2	168	85	30.12	1	1	52	61	29	124
474	3	2	2	2	1	157	81	32.86	1	1	45	48	27	127
475	1	1	2	2	1	185	49	14.32	2	4	28	53	29	136
476	1	2	2	2	2	162	58	22.10	2	3	53	72	27	172
477	1	2	2	1	1	154	39	16.44	2	4	37	51	20	100
478	3	2	1	2	3	147	46	21.29	2	3	54	90	27	135
479	2	2	2	2	3	151	50	21.93	2	3	12	54	23	57
480	2	2	2	2	3	168	85	30.12	1	1	31	62	29	115
481	2	2	2	2	1	167	42	15.06	2	4	33	86	29	106
482	1	1	2	1	1	180	60	18.52	2	3	37	81	26	139
483	1	1	1	2	1	165	48	17.63	2	4	66	79	30	163

484	1	1	2	1	2	180	78	24.07	2	3	59	40	24	131
485	1	2	2	2	2	155	84	34.96	1	1	57	73	18	164
486	1	2	2	1	2	150	55	24.44	2	3	34	79	23	110
487	1	2	2	2	1	153	53	22.64	2	3	84	82	17	170
488	2	2	2	2	1	157	62	25.15	2	2	35	82	25	150
489	1	2	2	1	1	170	70	24.22	2	3	50	97	13	182
490	1	2	2	2	2	152	70	30.30	1	1	65	59	24	151
491	1	2	1	2	2	162	50	19.05	2	3	77	68	22	144
492	1	2	2	1	1	145	40	19.00	2	3	72	73	22	141
493	1	2	1	2	1	155	42	17.48	2	4	84	91	14	192
494	1	2	2	1	2	154	49	20.66	2	3	70	91	13	173
495	2	2	2	1	3	174	96	31.71	1	1	55	60	24	159
496	2	2	1	2	3	154	65	27.41	2	2	72	66	21	161
497	1	2	1	1	2	150	60	26.67	2	2	77	70	19	173
498	1	1	2	1	3	160	77	30.08	1	1	48	51	25	134
499	2	2	2	1	3	159	70	27.69	2	2	84	84	13	183
500	1	2	1	1	2	158	55	22.03	2	3	76	79	25	152
501	1	1	2	1	1	170	65	22.49	2	3	65	57	24	149
502	1	2	2	2	1	169	55	19.26	2	3	81	62	22	158
503	3	1	2	1	2	180	80	24.69	2	3	72	73	13	189
504	1	2	2	2	2	168	45	15.94	2	4	50	81	20	168
505	3	1	1	1	2	175	80	26.12	2	2	73	80	18	166
506	2	2	2	1	3	164	81	30.12	1	1	73	91	15	163
507	1	1	2	1	1	164	66	24.54	2	3	65	65	24	163
508	2	2	1	1	1	143	73	35.70	1	1	72	80	21	142
509	2	2	2	1	3	159	76	30.06	1	1	53	68	23	147
510	3	1	2	2	3	174	92	30.39	1	1	81	67	16	171
511	1	2	2	1	3	153	56	23.92	2	3	75	75	22	145
512	3	2	1	1	3	153	71	30.33	1	1	53	73	21	151
513	3	2	2	1	3	152	62	26.84	2	2	65	68	14	130
514	2	2	2	1	3	155	57	23.73	2	3	77	76	17	151
515	2	1	1	2	3	178	73	23.04	2	3	75	70	15	162
516	2	2	2	1	3	154	72	30.36	1	1	50	50	23	135
517	1	1	2	2	1	159	69	27.29	2	2	44	84	18	145
518	1	2	2	1	1	159	76	30.06	1	1	82	56	21	160
519	3	2	2	1	3	162	65	24.77	2	3	81	89	19	177
520	2	2	1	2	2	164	81	30.12	1	1	84	79	15	146
521	1	2	2	2	2	152	42	18.60	2	3	62	64	20	143
522	1	2	1	2	1	152	43	18.61	2	3	52	71	18	112
523	2	2	2	1	2	156	73	30.00	1	1	14	73	27	142
524	3	2	2	2	3	155	66	27.47	2	2	62	72	16	156

525	3	1	2	1	3	173	80	26.73	2	2	44	74	21	117
526	3	2	2	1	1	157	63	25.56	2	2	83	95	13	168
527	3	2	2	1	3	154	72	28.36	2	2	59	86	18	179
528	1	2	2	2	1	160	78	30.47	1	1	77	72	20	121
529	1	2	2	1	1	142	38	18.85	2	3	73	87	23	140
530	2	2	1	1	2	167	65	23.31	2	3	48	78	24	125
531	1	1	2	1	1	173	76	25.23	2	2	41	67	21	144
532	2	1	1	2	1	168	63	22.32	2	3	50	73	16	164
533	3	1	2	1	1	170	62	21.45	2	3	71	76	23	136
534	3	1	2	1	3	178	70	22.09	2	3	64	74	12	189
535	2	2	1	1	3	152	58	25.10	2	2	31	83	26	129
536	1	2	2	1	1	153	76	32.42	1	1	64	59	29	108
537	1	2	1	2	2	162	50	19.05	2	3	76	74	21	141
538	2	2	2	1	3	152	70	30.30	1	1	57	48	20	148
539	1	2	2	2	2	164	43	15.99	2	4	35	86	22	127
540	2	2	2	2	1	158	79	31.65	1	1	31	88	16	144
541	2	2	1	2	2	159	60	23.73	2	3	79	76	20	186
542	1	2	1	2	2	160	70	27.34	2	2	76	68	23	151
543	1	1	2	1	3	160	70	27.34	2	2	45	55	25	115
544	3	1	2	2	3	182	68	20.53	2	3	67	89	16	170
545	1	1	2	1	1	178	78	24.62	2	3	82	78	14	192
546	3	1	1	1	3	156	60	24.65	2	3	76	83	17	180
547	1	2	2	1	2	159	67	26.50	2	2	59	51	23	149
548	3	2	2	1	3	152	70	27.30	2	2	82	78	18	193
549	1	2	2	1	2	155	68	28.39	2	2	69	79	17	182
550	1	2	1	2	1	160	54	21.09	2	3	84	87	13	171
551	1	2	2	2	1	158	45	18.03	2	4	58	75	23	137
552	3	1	2	1	2	160	88	34.38	1	1	78	80	20	160
553	3	1	2	2	3	168	78	27.64	2	2	79	86	13	167
554	2	2	1	2	3	155	73	30.39	1	1	81	80	26	151
555	2	1	2	2	1	163	80	30.10	1	1	43	52	26	136
556	2	2	2	1	3	164	62	23.05	2	3	84	99	13	192
557	2	2	2	1	1	158	73	29.20	2	2	56	78	22	180
558	3	2	1	1	2	154	72	30.36	1	1	50	84	24	141
559	1	2	1	1	2	160	40	15.63	2	4	72	72	13	169
560	3	2	2	1	1	148	71	32.41	1	1	84	91	24	157
561	1	2	1	1	2	155	59	24.56	2	3	79	64	23	152
562	1	2	1	2	1	166	60	21.77	2	3	70	91	18	164
563	3	2	2	2	3	150	68	30.22	1	1	35	83	17	82
564	1	2	2	1	1	158	75	30.04	1	1	75	55	30	109
565	3	2	2	1	2	153	82	35.03	1	1	71	57	22	138

566	1	2	2	1	1	160	78	30.47	1	1	23	72	28	136
567	3	1	2	1	3	175	74	24.16	2	3	67	57	22	165
568	3	2	2	2	2	154	80	33.73	1	1	34	86	17	147
569	1	2	2	2	1	161	65	25.08	2	2	30	79	21	146
570	3	1	2	1	3	173	77	25.73	2	2	42	75	18	152
571	3	1	1	1	3	175	92	30.04	1	1	62	48	21	142
572	2	2	2	1	3	155	62	25.81	2	2	82	104	14	190
573	3	2	2	1	3	150	58	25.78	2	2	76	74	20	140
574	2	2	1	2	1	155	73	30.39	1	1	34	42	26	109
575	1	2	1	1	2	155	59	24.56	2	3	79	64	23	152
576	2	2	2	1	3	163	58	21.83	2	3	80	84	17	180
577	1	2	1	1	2	155	59	24.56	2	3	79	64	23	152
578	1	2	2	1	1	128	38	23.19	2	3	77	80	28	157
579	1	2	1	1	1	158	58	23.07	2	3	70	79	17	156
580	3	1	2	1	1	165	73	26.81	2	2	73	79	21	147
581	1	2	2	1	1	162	45	17.15	2	4	56	78	19	160
582	1	2	2	1	1	162	45	17.15	2	4	56	78	19	160
583	3	1	1	1	3	173	70	23.39	2	3	61	81	19	136
584	1	2	2	1	2	150	59	25.91	2	2	47	66	21	137
585	2	2	2	1	2	155	73	30.39	1	1	81	78	21	148
586	1	2	1	1	2	155	59	24.56	2	3	79	64	23	152
587	1	2	1	1	2	155	59	24.56	2	3	79	64	23	152
588	1	2	2	1	2	143	79	38.63	1	1	74	80	21	142
589	3	2	2	1	3	151	65	28.51	2	2	69	74	15	159
590	1	2	2	1	2	161	50	19.29	2	3	84	53	26	123
591	1	2	2	1	1	158	45	18.03	2	4	65	71	27	139
592	1	2	2	2	3	198	58	14.79	2	4	41	62	24	116
593	2	2	2	1	2	156	73	30.00	1	1	64	93	12	147
594	1	2	2	1	1	130	38	22.49	2	3	70	79	24	173
595	3	1	2	1	3	173	78	26.06	2	2	51	72	22	116
596	1	1	2	1	2	185	90	26.30	2	2	84	97	18	187
597	1	1	2	1	2	185	90	26.30	2	2	84	97	18	187
598	1	2	2	1	2	156	68	27.94	2	2	76	74	22	160
599	3	1	2	2	3	182	68	20.53	2	3	66	85	17	158
600	1	2	1	2	2	168	56	19.84	2	3	50	57	24	132

Coding For Demographic Variables					
Age		Location		Obese	
15 to 25	1	Urban		1	
26 to 35	2	Rural		2	
above 35	3				
Gender		Income status		BMI Categories	
Male	1	Below 15,000 INR		Obese	1
Female	2	15,001 to 30,000 INR		Overweight	2
		Above 30,001 INR		Normal weight	3
Family Type				Underweight	4
Joint	1				
Nuclear	2				

Appendix-05

LIST OF PUBLICATIONS

No	Title of paper with author names	Name of journal / conference	Publish -ed date	Issn no/ vol no, issue no	Indexing in Scopus/ Web of Science/UGC-CARE list
1.	Resilience and Mental Health among Obese and Non-Obese People Authors Name: Adam, M. Y., & Wani, M. A. (2022).	Journal of Positive School Psychology	2022	ISSN 2717-7564 Vol. 6 No. 8 (2022)	Scopus SCImago Journal Rank (SJR): 0.639 H-index: 5 Impact Score: 8.00 Overall Rank/Ranking: 7679
2.	Self-esteem and mental health among obese and non-obese people Authors Name: Adam, M. Y., & Wani, M. A. (2022).	International journal of health sciences	04-08-2022	ISSN:2550-6978 EISSN: 2550-696X Vol.26, No.3(10)	Scopus H-index: 6 CiteScore 2021 2.0 63rd percentile
3.	Social Support and Mental Health among obese and non-obese Authors Name: Adam, M. Y., & Wani, M. A. (2022).	Chettinad Health City Medical Journal	2022	pISSN: 2277-8845; eISSN: 2278-2044 Vol. 11, Issue.3	UGC Care List Listed in UGC Care list Group I Journals
4.	Social support and Resilience among Obese people Authors Name: Adam, M. Y., & Wani, M. A. (2022).	Madhya Pradesh journal of social sciences	September 2022	ISSN: 0973-855X Vol 27 No 9	UGC Care List Listed in UGC Care list Group I Journals
5.	Social Support and Mental Health among Obese People Authors Name: Adam, M. Y., & Wani, M. A. (2022).	Stochastic Modelling & Applications	Jan-June 2022	ISSN: 0972-3641 Vol.26, No.3 (10)	UGC Care List Listed in UGC Care list Group I ABCD Index for this Journal is "C"

Resilience And Mental Health Among Obese And Non-Obese People

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Abstract:

Obesity and mental health issues act as two side of coin in respect to chronic condition among most of countries due to so called modernization. In other hand the term resilience is derived from the Latin term “resilio” (back behind, back from a jump, or bounce), nature of it is present within each of us which acts as preventing role in obesity and mental health issues. Aim and objectives of this study to explore various research input in obesity research through multiple linear analysis and non-parametric test such as Mann-Whitney test and Kruskal Wallis test among 500 obese and non-obese participants from Tamil Nadu, India using Psychological Resilience Scale (PRS) and the Mental Health Inventory-38 (MHI-38) along with body mass index (BMI) measurement. The findings revealed psychological resilience have significant mean difference at the level of .000 with respect to age, location, income, and body mass index, whereas gender and family type have statistical insignificant mean difference at .154 and .262 respectively. Similarly mental health have significant mean difference at the level of .040 for family type, at .042 for and at .000 for body mass index, whereas rest demographic variables such as age, gender and income status were in statistical insignificant mean difference. Body mass index showed U-shaped relationship with mental health. Regression line showed significant positive influence of resilience over mental health have statistically significant positive influence over mental health, $p = .000$, $R = .357$, $R^2 = .127$, adjusted $R^2 = .126$, and also showed significant positive influence of resilience over body mass index $p = .000$, $R = .367$, $R^2 = .135$, adjusted $R^2 = .133$.

Keywords: Mental health, obesity, Resilience, Body mass index, Mann-Whitney test and Kruskal Wallis test.

Introduction:

Obesity is trending disease in modern society due to global prevalence and develops as result of consumption of more foods (calories) than its body utilization through exercise and routine daily activities. Overweight occurs in an individual when his or her body mass index (BMI) is 25 or greater till 29.99. After body mass index above 30 is termed as obesity. This increase in body weight is due to excessive deposition of body fat which acts as risk factor for several health problems. Mainstream causative factor for overweight and obesity is lifestyle changes beyond medical and genetic factors. Similarly the

mainstream in management or treatment of overweight and obesity are lifestyle changes like change in diet pattern and physical activities. World Health Organisation (WHO) Data sheet revealed around two billion adults were with overweight, and one third of them in obese. Overweight and obesity is becoming as killer disease than malnutrition as seen statistical report from many countries (World Health Organization, 2021). Many people in world's population dies due to overweight and obesity than underweight or malnutrition. Obesity is becoming very trending topic among many researchers due to its impact on medical and psychological health. In general, overweight

status which is a part of non-obese condition acts as step to obesity and it is around 40% of world population. NCI dictionaries from National Institutes of Health stated the definition for energy balance as “the state at which the number of calories eaten equals the number of calories used”. Body size, amount of body fat and muscle, physical activity, exercise, and genetics affects energy balance of an individual (National Cancer Institute, 2011). When there is disturbance in energy balance will change our body weight, a positive energy balance which means there is increase energy intake than energy expenditure will lead to fat deposition. Similarly a negative energy balance in which there is decreased energy intake than energy expenditure will favour body weight loss (Hill et al., 2010). The disturbance in energy balance in beginning as low birth weight, later during lifespan developing into obesity, disruption in glucose homeostasis and increase blood pressure due to altered in fat metabolism have recorded in epidemiological as well as experimental studies (Cottrell & Ozanne, 2007). An increased in body weight due to positive energy balance have been caused by linking between genetic and environmental factors, of which excessive food intake, sedentary lifestyle, behavioural factors, parental obesity, individual metabolism and genetic predisposition are acted as predominant role in it (Bethesda et al., 2007). Obesity acted as risk factor for many metabolic diseases such as cardiac disease, stroke, high blood pressure, diabetes, gallstones, sleep apnea, back pain, joint disease, and few cancers like breast cancer and colon cancer (Rockville et al., 2001). Mental health problems and chronic stress may disturb energy balance through dietary over-consumption mainly palatable foods and increased visceral adiposity which leads to obesity (Rabasa & Dickson, 2016).

An individual behaviour patterns such as smart phone addictions, consumption of sugar-sweetened beverages and excess snacking have positive correlation with obesity (Landsberg et al., 2010). Regular exercise, optimal sleep, proper nutrition, avoid alcohol, no smoking and mindfulness are top lifestyle factor in preventing and treating obesity (Mihaela Hăncu, 2021). Our lifestyle includes both enhancing and preventing factors for obesity as the researchers mentioned last two statement. Energy balance is prime

metabolic center in managing body weight through maintenance of body fat. Our body survival under critical conditions is well understood and mechanism of energy balance are likely predicted or controlled in light of resilience generated within us

Human physical survival under harsh environmental conditions is fairly well understood and somewhat predictable as a function of known physiological mechanisms (Lukey & Tepe, 2008). Kevin Cashman (2022) from the Global Co-Leader of CEO and Enterprise Leader Development at Korn Ferry stated under title “The Resilience Principle: Restore and Multiply Energy Across” as to energize ourselves which help us energy balance system in equilibrium and can prevent or reduce obesity, which provides key contents as ‘be on-purpose, but be aware’, ‘fostering your energy vs. managing time’, ‘learn to exercise with ease’, ‘deal with life-damaging habits’, ‘avoid taking yourself so seriously’, ‘develop mind-body awareness’, ‘managing stress more effectively’, ‘nurture your close relationships, and ‘integrate more reflection and introspection into your lifestyle’ (Cashman, 2021). Thus resilience acted as key component in maintaining our body weight as well as mental health. In other hand, mental health and emotional regulation have positive influence over health people through psycho-neuro-endocrine-immune homeostasis as well as in association with epigenetic relationships (Gómez-Acosta & Londoño Pérez, 2020). Energy balance can controlled through behaviour in association with resilience and mental health. The researchers were aimed to nature, difference and level of resilience and mental health among obese and non-obese people with respect to demographic variables such as age, gender, family type, and income status.

Resilience:

The sentence “Bounce back from adversity” is not a proverb, but it defines the meaning for resilience. In short, it is meant for the process of adaptation. The person with high resilience have three characteristic features like accepting truth, have strong faith on life, and has talent to adjust with situations (Goleman et al., 2017). Resilience in association with social support have strong buffering effect on stress (Celik et al., 2021). It

has positive effect on quality of life (Mohlin et al., 2021), with physical activity (Seçer & Çakmak yildizhan, 2020), in food behaviour (Spinosa et al., 2019), and as preventive role in obesity (Williamson et al., 2021). The American Psychological Association (2012) outlined few strategies to improve one's resilience as smart action plan, social network, ignoring negativity, accepting changes in life, have positive hope and self-orientation.

Mental Health:

Every day within each fractions of minute or second our neural system programmed to act in such a way as thinking, feeling or behaving in different dimensions either internally as attitudes or externally as behaviours. These programmed patterns of thinking, feeling and behaving give status to our temperament either in positive mood or negative mood which determines our mental health. Thus, mental health of an individual varies in accordance with our thinking, feeling and behaving, and it also varies from person to person. Mental health with body weight have U-shaped relationship in which mental health increases with body weight from underweight category till a level and then it gets decreases with an increase in body weight beyond overweight or obese category (de Wit et al., 2009; Linna et al., 2013; Heidari-Beni et al, 2021; Magallares & Pais-Ribeiro, 2013; Knoesen et al., 2012). Mental health relation and body weight also correlated with resilience (Wu et al., 2020). Similarly, body weight also associated with emotional disorder especially in women populations (Scott et al., 2007; Simon et al., 2006; Seo et al., 2020).

Objectives of this study:

1. To find out influence of resilience on mental health among obese and non-obese people.
2. To find out influence of resilience on body mass index among obese and non-obese people.
3. To examine age difference in resilience and mental health among obese and non-obese people.
4. To examine gender difference in resilience and mental health among obese and non-obese people.
5. To examine family difference in resilience and mental health among obese and non-obese people.
6. To examine location difference in resilience and mental health among obese and non-obese people.
7. To examine income difference in resilience and mental health among obese and non-obese people.
8. To examine body mass index difference in resilience and mental health among obese non-obese people.
9. To identify the level of resilience, and mental health among obese and non-obese people.

Methodology:

Present study is quantitative, descriptive and survey type with non-experimental in nature. The study considered psychological resilience and mental health as interdependent psychological variables with age, gender and body mass index as demographic variables. Present study carried as community based survey with 295 non-obese participants from Cuddalore district in Tamil Nadu, India.

Table 1, Descriptive statistical details with respect to age, gender, social support, self-esteem and mental health among non-obese (295).

	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
<u>Age Group</u>				
15 to 25	38	15.2	83	33.2
26 to 35	73	29.2	82	32.8
Above 35 years	139	55.6	85	34.0
<u>Gender</u>				
Male	72	28.8	114	45.6
Female	178	71.2	136	54.4

<u>Family Type</u>				
Joint	79	31.6	76	30.4
Nuclear	171	68.4	174	69.6
<u>Location</u>				
Urban	75	30.0	113	45.2
Rural	175	70.0	137	54.8
<u>Income status</u>				
Low income	209	83.6	153	61.2
Middle income	31	12.4	62	24.8
High income	10	4.0	35	14.0
<u>Total</u>				

Table 1 described number of observations in each category with demographic variables such as age, gender, family type, location, and income status among obese and non-obese. Since the collection samples were based on purposive sampling technique, the data related obesity might not accurate due to availability of non-obese is greater than obese. The prevalence of obesity is restricted and it vary with respect to demographic variables. The study on Control of Diabetes in India (2017) revealed that the obesity rate was high among adult people with age above 40 years old (Venkatrao et al., 2020). Further past researches like Al-Raddadi et al., 2019; Dwivedi et al., 2019; Djalalinia et al., 2020; and Adeloye et al., 2021 stated that female obesity was more prevalence than male. When looked to non-obese people, data obtained in present study revealed as 40% of them were in overweight which was in line with previous studies as in World Health Organization, (2020); Chen et al., (2019). Irrespective of obesity, most of the samples were from nuclear family. Many previous obesity research showed obesity rate was high among nuclear family than joint family (Singh et al., 2014; Laxmaiah et al., 2006; Kumar et al., 2011; and Gupta et al., 2013). Obesity statistics with respect to location stated that prevalence rate was high in the most rural areas, but it was opposite among older adults in which urban population had higher obesity than rural background (Cohen et al., 2018). Analytical studies conducted from 147 countries revealed developed countries have

high adult obesity rate, male obesity was more common in developed countries while female obesity was high in low economic countries such as Sub-Saharan Africa, South Asia, Latin America & Caribbean and Middle East & North Africa (Talukdar et al., 2020).

Measuring Tools:

In this study, the researchers used the following measuring scales,

1. **Demographic Sheet:** It includes demographic detail such as age, gender, family type and income status which was collected with semi-structured questionnaires.
2. **Body Mass Index:** It is a measurement to calculate fat deposition with respect to weight and height of participants. Non-obese people consist of body mass index categories as overweight, normal weight and underweight.
3. **The Psychological Resilience Scale (PRS):** This tool was generated by Rizwan Hasaan Bhat and Shah Mohamed Khan (2018) from work done by Wagnild and Young (1993). The original tool by Wagnild and Young (1993) have 25 items in seven point likert scale. But, Bhat and Khan (2018) developed it with 21 items in 5-point likert type responses such as 'strongly disagree', 'Disagree', 'Uncertain', 'Agree', and 'strongly Agree', as five dimensions such as self-perception, single Mindedness, Task Orientation, Organised and self-Restraint.

4. **The Mental Health Inventory (MHI-38):**

This scale was developed by Veit & Ware (1983) for the purpose of health insurance with 38 items in six point Likert scale. Asked the respondents to fill this inventory with respect their mental status or mood related to last four week. This inventory reveals positive aspects of mental health like interest, cheerfulness, and enjoyment in life, and negative aspects as emotional instability, depression and anxiety.

Results and Discussions

The normality test which have carried in this study revealed that the datasets were not

distributed in normal distribution pattern. Hence the researchers used non-parametric test such as Man-Whitney test and Kruskal Wallis test for mean difference among demographic variables namely age, gender, family type, location, income status and body mass index.

Psychological Resilience:

As discussed earlier psychological resilience acted as prime protective action in terms of mental health and body weight. Prior to analysis result and interpretations related to prediction of resilience over mental health and body mass index, let us discuss various research output based on the framed objectives of present study.

Table 2, Descriptive statistical details of Resilience among Obese and Non-obese.

Resilience	Raw Score Range	Z-Score Range	Obese		Non-obese	
			Frequency	Percentage	Frequency	Percentage
Extr. Low	21 - 50	-2.01& below	3	1.2	18	7.2
Low	51 - 61	-2.00 to -1.26	13	5.2	37	14.8
Below.Ave	62 - 71	-1.25 to -0.51	24	9.6	35	14
Average	72 - 85	-.050 to 0.50	169	67.6	116	46.4
Above Ave	86 - 95	0.51 to 1.25	20	8	27	10.8
High	96 - 105	1.26 to 2.00	21	8.4	17	6.8
Extr.High	106 & above	2.00 & above	0	0	0	0
Total			250	100	250	100

Table 2 represented descriptive statistical details related to psychological resilience and the calculations to assess level of resilience were made using z-score with respect to study population. Obese population showed higher mean when compared to non-obese population. This finding goes in line side by side with previous studies as resilience played as protective strategies among high BMI peoples in association

with adjustment from environmental hazards (Luthar et al., 2000). Student with comparatively high BMI than with student with low BMI have significantly higher psychological resilience (Secer and Yildizhan., 2020), Healthy older people have better resilience (Lutz et al., 2016), and weight-resilience factor played as preventive role for psychological distress among obese (Brogan et al., 2012).

Table 3, Age difference in resilience among obese and non-obese by using Kruskal-Wallis Test.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	121	188.45				
26 to 35 years	155	253.41	78.38	13.76	35.482	.000
Above 35 years	224	282.00				
Total	500					

Table 3 represented age difference in psychological resilience using Kruskal-Wallis test among obese and non-obese people. It showed there was statistical significant age difference between different age group, and resilience increases with an increase in age. Kruskal-Wallis Test stated that age group 15 to 25 years have very low resilience with mean rank as 188.45, than age group 26 to 35 years with mean rank as 253.41, while age group above 35 years took very high resilience with mean rank

282.00 out of total study population, N= 500, Kruskal Wallis H = 35.482, $p = .000$. This finding goes in line with previous studies as older people have showed significantly high resilience than younger one (Cohen et al., 2014), age with adequate resilience predict good quality of life (Yazdi-Ravandi et al., 2012), in general psychological well-being was not in correlated with age, but it was related with purposefulness, perception and transcendence which were dimensions of resilience (Svence & Majors, 2015), and life experience with an increase in age

provided real resilience (Lamb 2020).

Table 4, Gender difference in resilience among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	186	238.94	44443.00	Mann-Whitney U	27052.000	
Female	314	257.35	80807.00	Wilcoxon W	44443.000	.154
Total	500			Z	-1.427	

Table 4 represented gender difference of resilience using Mann-Whitney test among obese and non-obese people. It showed there was no statistical significance between male and female. But female took higher mean rank than male. The mean rank for female is 257.35, the mean rank for male is 238.94, N=500, Mann-Whitney U is 27052.000, Wilcoxon W is 44443.000, Z = -

1.427, $p = .154$. This finding goes towards significance gender difference with previous studies as socio-cultural conditions in 21st century provides women to handle challenging vulnerabilities (Jordan 2018), women have significantly high resilience than men (Zhang et al., 2018), women have better disaster resilience than male (Chisty et al., 2022), while men have higher resilience in trauma (Portnoy et al., 2018).

Table 5, Family difference in resilience among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Joint	155	240.06	37210.00	Mann-Whitney U	25120.000	
Nuclear	345	255.19	88040.00	Wilcoxon W	37210.000	.262
Total	500			Z	-1.122	

Table 5 represented family difference of resilience using Mann-Whitney test among obese and non-obese people. It showed there was no statistical significance between joint and nuclear family type. But nuclear family type have slightly insignificant high mean rank than joint family type. The mean rank for nuclear family type is 255.19, the mean rank for joint is 240.06, N=500, Mann-Whitney U is 25120.000, Wilcoxon W is 37210.000, Z = -1.122, p = .262. This finding

goes towards significance family difference with previous studies as resilience was correlated with many familial factors and family situations which includes developmental factors, risk and protective factors, (Hawley & DeHaan, 1996), psychological resilience of an individual decided from also childhood trauma and family resilience (Dong et al., 2020), psychological resilience in family type also depends on financial resources, coping skills, cultural values, ,

Table 6, Location difference in resilience among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Urban	188	222.18	41769.00	Mann-Whitney U	24003.000	
Rural	312	267.57	83481.00	Wilcoxon W	41769.000	.000
Total	500			Z	-3.527	

parental support, stable home life, , supportive members and perseverance (Graber et al., 2015).

Table 6 represented location difference of resilience using Mann-Whitney test among obese and non-obese people. It showed there was statistical significance between urban and rural background. But rural have significantly higher mean rank than urban people. The mean rank for rural is 267.57, the mean rank for urban is 222.18, N=500, Mann-Whitney U is 24003.000, Wilcoxon W is 41769.000, Z = -3.527, p = .000. This finding is supported in line by line with

previous studies as psychological resilience was associated with strong social ties with respect to location (Wells 2010), risk perception, perceived hazard knowledge, and evacuation mode efficacy were the dimensions of psychological resilience have correlation with demographic location (Chen et al., 2021), and demographic variables such as gender, community size, income status and sense of danger have significant association with resilience (Kimhi et al., 2020).

Table 7, Income difference in resilience among obese and non-obese by using Kruskal-Wallis Test.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
Low income	362	279.89	78.38	13.76	58.527	.000
Middle income	93	169.41				
High income	45	181.66				
Total	500					

Table 7 described income difference of resilience using Mann-Whitney test among obese and non-obese people. It showed there was statistical significance between different income statuses. Here, people with low income have significantly higher mean rank which is 279.89, than high income with rank 181.66 and middle income with rank 169.41, N=500, Kruskal-Wallis

H = 58,527, p = .000. This finding is supported in line by line with previous studies as demographic variable income status acted as one of primary decider of resilience (Bonanno et al., 2007), income status has positive relationships with resilience (Kimhi et al., 2020), and being earning person and married were significant factors in psychological

Table 8, BMI difference in resilience among obese and non-obese by using Kruskal-Wallis Test.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
Obese	250	287.96	78.38	13.76	62.038	.000
Overweight	102	267.03				
Normal weight	128	174.38				
Underweight	20	185.20				
Total	500					

resilience (Gruebner et al., 2015).

Table 8 stated BMI difference of resilience using Kruskal-Wallis test. It showed there was statistically significant BMI difference in resilience between various body mass index categories in which obese had very high mean rank around 287.96, than overweight had mean rank as 267.03, normal weight took low mean rank as 174.38 and underweight were in very low mean rank as 185.20, Kruskal Wallis H = 62.038, p = .000. These findings goes in line with previous studies as high BMI people have

significantly higher resilience than low BMI (Secer & Yildizhan., 2020), people with better cardio-metabolic resilience can lead to overweight and obesity (Johnson., 2018), and old age peoples with better healthy index have high resilience (Lutz et al., 2016).

Mental Health:

Mental health is key factor in the definition of health by world health organisation as "Health is a state of complete physical, mental and social well-being and not merely the absence of disease

or infirmity” (World Health Organization, 1948). Thus, mental health is highly important to discuss due to its importance on health. The researcher also framed objectives to find out mean difference of mental health among various demographic variables such as age, gender,

family type, location, income status and body mass index. Let us discuss various research output with respect to mental health based on the framed objectives of present study as follows.

Table 9, Descriptive statistical details of mental health among Obese and Non-obese.

Resilience	Raw Score Range	Z-Score Range	Obese		Non-obese	
			Frequency	Percentage	Frequency	Percentage
Extr. Low	38 – 100	-2.01& below	5	2	12	4.8
Low	101 - 114	-2.00 to -1.26	6	2.4	13	5.2
Below.Ave	115 – 129	-1.25 to -0.51	40	16	38	15.2
Average	130 - 148	-.050 to 0.50	167	66.8	106	42.4
Above Ave	149 - 161	0.51 to 1.25	24	9.6	35	14
High	162 – 176	1.26 to 2.00	8	3.2	27	10.8
Extr.High	177 & above	2.00 & above	0	0	19	7.6
Total			250	100	250	100

Table 9 represented descriptive statistical details related to mental health and the calculations to assess level of mental health were made using z-score with respect to study population. People with high mental health were more in non-obese population than obese population. But, obese people showed more number of average mental health than non-obese people. These findings were in line with previous

studies as an increase in body weight acted as risk factor for mental health issues (AlQahtani et al. 2018). Patient with high body weight above obesity limit have more chances for depression (Reynolds et al. 2015). Among people in high body weight, better mental health acted as strong indicator for better perceived physical health (Knoesen et al. 2010). High body weight have positive correlation with depressive disorder

Table 10, Age difference in mental health among obese and non-obese by using Kruskal-Wallis Test.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	121	239.47				
26 to 35 years	155	238.90	138.34	18.82	3.807	.149
Above 35 years	224	264.49				
Total	500					

especially among women (Ahuja et al. 2020).

Table 10 revealed age difference in mental health using Kruskal-Wallis test. It showed that there was a statistically no significant age difference in mental health among obese and non-obese, Kruskal Wallis $H = 3.807$, $p = .149$, with 239.47 mean rank for age group 15 to 25 years, 238.90 mean rank for 26 to 35 years and 264.49 mean rank for above 35 years. Comparatively mental health is very low among age group 26 to 35 years, while it is very high

among age group above 35 years. This finding goes towards significant age difference previous studies as differences with age depended on beliefs about the life, usually older people have higher belief (Farrer et al., 2008), mental health problems starts as early in childhood or adolescents (Kessler et al., 2007), there was an age difference in mental health (Li et al., 2021), social and familial restrictions often affect mental health among young adults than older adults (Sojli et

al.,2021), increased mental health illness diagnosis among young especially female (Rossell et al.,

Table 11, Gender difference in mental health among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	186	258.39	48061.00	Mann-Whitney U	27734.000	
Female	314	245.82	77189.00	Wilcoxon W	77189.000	.347
Total	500			Z	-.940	

2021).

Table 11 stated gender difference in mental health using Mann-Whitney test among obese and non -obese. It showed mental health have no statistical significant mean difference in which non -obese women have higher mental health than men. Thus, a Mann-Whitney test indicated that gender difference in mental health have more or less same mean rank in female with 245.82, and Mean rank in male as 258.39, Mann-Whitney U is 27734.000, Wilcoxon W is 77189.000, $Z = -.940$, $p = .347$. This finding have

to support it through significant gender differences in mental health in previous studies as it depended based on social context than by gender (Kiely et al., 2019), have no significant differences not only in gender, but also in grade and location for depression and anxiety among students (Liu et al., 2020), gender differences in mental health was so conflicting because of its psychopathology in women (Dhejne et al., 2016), among young men risk of discontinuation in mental health care were high (Seidler et al., 2020)

Table 12, Family difference in mental health among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Joint	155	270.27	41891.50	Mann-Whitney U	23673.500	
Nuclear	345	241.62	83358.50	Wilcoxon W	83358.500	.040
Total	500			Z	-2.051	

showed no statistical significance but goes in line

Table 12 revealed family difference in mental health using Kruskal-Wallis test. It

showed that there was no statistical significant family difference in mental health among obese and non-obese. Mann-Whitney test indicated that

family difference in mental health have high mean rank in joint with 270.27, than nuclear family type with mean rank as 241.62, Mann-Whitney U is 23673.500, Wilcoxon W is 83358.500, $Z = -2.051$, $p = .040$. This finding goes in line by line with previous studies as security in attachment type were highly

correlated to mental health (Riggs & Jacobvitz, 2002), family structures with different family members have different nature of significant differences in mental health (Sonuga-Barke & Mistry, 2000), and well-being of offspring were impacted more among single mother parent than normal families (Kellam et al., 1977).

Table 13, Location difference in mental health among obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Urban	188	267.43	50276.50	Mann-Whitney U	26145.500	
Rural	312	240.30	74973.50	Wilcoxon W	74973.500	.042
Total	500			Z	-2.034	

Table 13 stated location difference in mental health using Kruskal-Wallis test. It showed that there was statistical significant location difference in mental health among obese and non-obese. Mann-Whitney test indicated that location difference in mental health as high mean rank around 267.43 within urban people joint than rural with 240.30, $N=500$, Mann-Whitney U is 26145.500, Wilcoxon W is 74973.500, $Z = -2.034$, $p = .042$. This finding goes in line by line

with previous studies as depression were correlated with people in less connectedness to social gatherings (Lin et al., 2008), depression rate was very high among urban married people than urban old aged people (Masoumeh et al., 2021), minority tribes people were reported more anxiety than people from majority tribes (Osborn et al., 2019), and difference in mean of mental health with respect to location were because of variety of social and cultural diversity (Gaither

Table 14, Income difference in mental health among obese and non-obese by using Kruskal-Wallis Test.

Income status	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
Low	362	247.55				
Middle	93	251.48	138.34	18.82	1.171	.557
High	45	272.20				
Total	500					

2020).

Table 14 stated income difference in mental health using Kruskal-Wallis test. It showed that there was no statistical significant location difference in mental health among obese and non-obese. Mann-Whitney test indicated that

income difference in mental health were high in high income people with mean rank around 272.20, than low with 247.55 and middle with 251.48 respective mean ranks, $N=500$, Kruskal-Wallis H is 1.171, $p = .557$. This finding goes towards statistical significant with previous

studies as prevalence of depression were high among low family income status (Lin et al., 2008), mental health problems were very common among female students with low income groups (Farrer et al., 2016), adolescents especially with lower Socio-economic status have greater chance

for psychological distress (Rivenbark et al., 2019), there was significant differences in mental health among different socioeconomic status (Reiss et al., 2019), and the depression and anxiety rate depended on household income (Donnelly

Table 15, BMI difference in resilience among obese and non-obese by using Kruskal-Wallis Test.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
Obese	250	234.20	138.34	18.82	23.675	.000
Overweight	102	304.79				
Normal weight	128	251.50				
Underweight	20	170.90				
Total	500					

& Farina, 2020).

Table 15 stated BMI difference of mental health using Kruskal-Wallis test. It showed there was strong statistically significant BMI difference in mental health between various body mass index categories in which BMI difference were as U-shaped relationship with obese people had comparatively low mean rank as 234.20, than overweight very high mean rank as 304.79, and normal weight 251.50. But underweight people have very low mean rank as 170.90, N=500, Kruskal Wallis H = 23.675, p = .000. These findings goes in line with previous studies as the strongest predictor of mental health among high BMI peoples were perceived physical health (Knoesen et al. 2010). Girls with high BMI have more mental health issues than Boys (Xie et al. 2005). Among young female mental health illness increased with an increase in BMI, but it was U-shaped relation with young male (McCrea et al., 2012). Overweight and obese people have higher chance of getting mood or mental

disorders than normal weight people (Bruffaerts et al., 2008). Depression have positive relation with BMI in school children (Tashakori et al., 2016). Body mass index have negative association with suicide mortality, while it has positive relationships with depression and no relationships with anxiety (Bjorngaard et al., 2015).

Influence of psychological resilience on Mental Health:

The influence of the, resilience on mental health was statistically analysed using regression analysis among obese and non-obese. The predicted values of the mental health (criterion variables) can be calculated from the observed values of the psychological resilience (predictor variables). Similarly, the factors which influence the result or outcome can be determined which will be very helpful for individual prognosis with respect to body mass index and mental health.

Table 16, Regression analysis shows the influence of psychological resilience on Mental Health among Obese and Non-obese people.

BMI Groups	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value

Overall*	.357	.127	.126	17.597	.488	.057	.357	8.530	.000
Obese*	.354	.125	.122	12.911	.451	.076	.354	5.955	.000
Non-obese*	.439	.193	.190	20.290	.647	.084	.439	7.697	.000

*Predictor Variable: Psychological Resilience; Criterion Variable: Mental Health

Table 16 described regression analysis to find influence of psychological resilience over mental health among obese and non-obese population. In general, psychological resilience have statistically significant positive influence over mental health, $p = .000$, $R = .357$, $R^2 = .127$, adjusted $R^2 = .126$. The regression co-efficient (B) for predictor variable resilience was .488, revealed an increase in one part of resilience will increase the criterion variable mental health with .488 points and resilience played 12.7 % prediction role over mental health. Regression analysis among obese and non-obese revealed psychological resilience have higher positive influence and high prediction over mental health among non-obese, $p = .000$, $R = .439$, $R^2 = .193$,

adjusted $R^2 = .190$ than obese people, $p = .000$, $R = .354$, $R^2 = .125$, adjusted $R^2 = .122$. It also revealed that overall study population and obese population have almost same level of impact over mental health. These findings goes side by side with psychological resilience in previous studies as resilience was significantly high level among student with normal BMI than thin student (Secer & Yildizhan, 2020), high weight-resilience factor played as preventive role among obese people (Brogan et al., 2012), among women people "resilient to obesity" were belonging to young, unmarried, highly educated have smart lifestyle strategies as minimum physical activity with less junk food & soft drinks than obese women (Ball et al., 2011).

Influence of psychological resilience on Body Mass Index:

Table 17, Regression analysis shows the influence of psychological resilience on body mass index among Obese and Non-obese people.

BMI Groups	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Overall*	.367	.135	.133	5.548	.159	.018	.367	8.810	.000
Obese*	.204	.042	.038	2.755	.053	.016	.204	3.282	.001
Non-obese*	.287	.083	.079	3.567	.070	.015	.287	4.725	.000

*Predictor Variable: Psychological Resilience; Criterion Variable: body mass index

Table 17 represented regression analysis to find influence of psychological resilience over body mass index among obese and non-obese population. In general, psychological resilience have statistically significant positive influence over body mass index, $p = .000$, $R = .367$, $R^2 = .135$, adjusted $R^2 = .133$. The regression coefficient (B) for predictor variable resilience was .159, revealed an increase in one part of resilience will increase the criterion variable body mass index with .159 points and resilience played 13.3 % prediction role over body mass index. Regression analysis among obese and non-obese revealed psychological resilience have higher positive influence and high prediction over body mass index among non-obese, $p = .000$, $R = .287$, $R^2 = .083$, adjusted $R^2 = .079$ than obese people, $p = .000$, $R = .204$, $R^2 = .042$, adjusted $R^2 = .038$. It also revealed that overall study population have showed significantly higher influence on body mass index than obese and non-obese population. These findings goes side by side with psychological resilience in previous studies as low BMI people better physical activity than high BMI people (Seçer & Yildizhan, 2020), diet quality is correlated with psychological resilience (Lutz et al., 2017), innovative strategies such as changing food habits and exercise have modest efficacy on BMI (Siwik et al., 2013), and strategies for improving resilience such as meditation and exercise will manage health condition and reducing BMI (Sun & Buys, 2014).

Conclusion:

Mental health issue and obesity are two important challenges in era of 21st century. Everyone in world population are either affected with mental issue, obesity or both. Mental health and obesity have bidirectional relationships with each other. When people gets obese due to behavioural or medical factors, he or she have more possibility to get mental health issue. Similarly any mental health issue such as depression, anxiety or emotional disorder might change behavioural pattern related to food habits and physical activities which lead to increase in body weight and obesity. Present study used psychological resilience as key factor and mediating or preventing factor between mental health and obesity. Since the present study is exploratory in

nature, it showed many significant research output as seen earlier. Among obese and non-obese, the present study revealed prevalence of mental health issues were more among obese people than non-obese people. Similarly the nature of obese people revealed through statistical evidence as statistical significant high psychological resilience among obese than non-obese. When analyzing the data sets in term of psychological resilience with respect to demographic variables and body mass index revealed various significant statistical research outputs as significant age difference ($p = .000$) in which as age increases the psychological resilience also significantly increased, significant location difference ($p = .000$) in which rural people have significantly higher resilience than urban people, significant income difference ($p = .000$) where low income people have high resilience than others, and significant BMI difference ($p = .000$) where an increase in body mass index increases resilience which mean overweight and obese people have higher resilience than normal weight and underweight people.

When looking into the data sets in relation to mental health with respect to demographic variables and body mass index revealed various significant statistical research outputs as significant family difference ($p = .040$) in which joint family people have better mental health than nuclear family people, significant location difference ($p = .042$) in which urban people have significantly higher mental health than rural people, and significant BMI difference ($p = .000$) where mental health have showed U-shaped relationship body mass index in which obese people have low mental health than overweight and normal weight people, and in other end underweight people also showed low mental health than normal weight, overweight and obese people. Regression analysis in finding the influence of psychological resilience on mental health stated that resilience have greater influence over mental health only among non-obese people. Even though obese people have significant higher resilience than non-obese people, they have comparatively low mental health than non-obese. In other side psychological resilience have significantly positive influence over body mass index.

Comparatively obese and non-obese people have showed very little change in prediction of the influence of psychological resilience over body mass index. Further researches are highly recommended in obesity research in order to identify the dimensions of resilience with their prediction over mental health and body mass index.

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Self-esteem and mental health among obese and non-obese people

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Abstract---Obesity and mental health problems are becoming as major health related issues in 21st century due to improper and unhealthy lifestyles. In other hand the term self-esteem is derived word “esteem” (in Latin aestimare means to value), it denotes how we value ourselves. It plays important role in body mass index and mental health. Aim and objectives of present study to explore various research input in obesity research through multiple linear analysis and non-parametric test such as Mann-Whitney test and Kruskal Wallis test among 560 obese and non-obese participants from Cuddalore district in Tamil Nadu, India using Rosenberg’s Self-esteem Scale (RSES) and the Mental Health Inventory-38 (MHI-38) along with body mass index (BMI) measurement. The results stated self-esteem have significant mean difference at the level of .001 with respect to age, and at level of .000 with respect to body mass index, whereas gender have showed statistical insignificant mean difference at .181. Whereas mental health have significant mean difference only in body mass index at the level of .000 and showed no significant mean difference in age and gender with p-value .504 and .421 respectively. Regression equation showed significant negative impact of self-esteem over mental health, $p = .000$, $R = .378$, $R^2 = .143$, *adjusted* $R^2 = .142$, *Regression co-efficient* $\beta = -2.09$, and also showed significant negative impact of self-esteem over body mass index $p = .000$, $R = .189$, $R^2 = .036$, *adjusted* $R^2 = .034$, *Regression co-efficient* $\beta = -.294$. It showed shocking research output and gave creative research input to explore further insight related to self-esteem and mental health among obese and non-obese people.

Keywords---mental health, obesity, self-esteem, regression analysis, Mann-Whitney test, Kruskal Wallis test, body mass index.

Introduction

Each person have their own valuation about themselves based on their personality, attitude, social interaction and physical appearance. Appropriate and realistic perception about themselves provide healthy self-esteem. The term self-esteem is derived word “esteem” (in Latin aestimare means to value), it denotes how we value ourselves. It plays important role in body mass index (BMI) and mental health. Body mass index are calculated based on weight and height of an individual. World Health Organisation (WHO) categorized body mass index as underweight with body mass index less than 18.5 kg/cm^2 , normal weight with 18.5 to 24.9 kg/cm^2 , overweight with 25 to 29.9 kg/cm^2 , and obesity with body mass index greater than 30 kg/cm^2 (World Health Organization, 2001). Apart from biological and hereditary nature of obesity, obese person have greater possibilities for mental health disorder (Milano et al., 2020). Obesity acts as risk factor for many disease like as high blood pressure, heart disease, stroke, type 2 diabetes, joint problems, high cholesterol, and sleep apnea (National Institute of Diabetes and Digestive and Kidney Diseases, 2019). Obesity have associated with many psychosocial problems related to social life, mood, life satisfaction, physical appearance, weight stigma and quality of life (Sarwer and Polonsky, 2019). Nowadays most of obese people have been facing inequalities in healthcare sectors and stigma in health stigma in addition with weight discrimination in social environment such as restaurants, schools, colleges and other public places (Puhl & Heuer, 2010). Past study in obesity stated that people with obesity have low exercise self-efficacy, high stigma induced stress, high depression, high anxiety, high external shame, feelings of social rejection, and poor psychological adjustment than non-obese people which create harmful circumferences in health promotion (Graham & Edwards, 2013). Aim of present study to find out impact of self-esteem over mental health and body mass index among obese and non-obese people. Usually people with obesity have unhealthy self-esteem which means they have overestimation about their own body appearance or under estimation about their own weight (Weinberger et al., 2016). Obese people have 55% of chance of getting mental health problem than people without obesity (Luppino et al., 2010). Thus, mental health in obese person is very important to strengthen themselves against psychological issues and medical complications through appropriate weight reduction strategies.

Self-esteem

Opinion about ourselves gives either positive or negative respect to ourselves which is termed as self-esteem. Positive feelings bring our self-esteem towards higher level while negative feelings creates our self-esteem to low. People from psychology, social science and anthropology defined self-esteem in different views like competence or ability to handle achievement in meaningful way, feeling or attitude of self-worth, and overall opinion about ourselves (Mruk, 2013). People with high self-esteem have high positive perception about themselves, but people from low self-esteem have poor evaluation and negative feelings with their own (Smith et al., 2020). Self-esteem starts to develop itself as early in childhood periods, then slowly increases over lifespan (Robins & Trzesniewski, 2005). Many research studies were documented as that self-esteem had strong negative

association with body image (ALAhmari et al., 2017; Almenara et al., 2017; (Ercan & Özcebe, 2020).

Mental Health

Mental health includes various dimensions such as cognitive, emotional, psychological and social. Our thoughts, feelings and behaviours determine nature and consequence of status of our mental health. Mental health acts as important element in everyday life and in each stages of development begin from birth to childhood, adolescence and adulthood. People with obesity perceives weak mental health due to social stigma, teasing, bullying, low social support, weight stigma, low self-esteem and body dissatisfaction (Puhl & Heuer, 2010) A review study revealed that about 80% of research related to obese and non-obese stated presence of depression in it, but around 53% of research in depression showed obesity (Faith et al., 2011). Thus, obesity plays an important causative factor for mental health problem. There was strong significant relationship between obesity and emotional disorder especially among women (Scott et al., 2007; Simon et al., 2006). Database from National Health Insurance in Korea stated there was significant relationship between unhealthy obese people and healthy obese female with metabolic disease with depression (Seo et al., 2020).

Objective of present study

1. To identify the influence of self-esteem on mental health among obese and non-obese people.
2. To examine age difference in self-esteem and mental health among obese and non-obese people.
3. To examine gender difference in self-esteem and mental health among obese and non-obese people.
4. To examine family difference in self-esteem and mental health among obese and non-obese people.
5. To examine location difference in self-esteem and mental health among obese and non-obese people.
6. To examine income difference in self-esteem and mental health among obese and non-obese people.
7. To examine BMI difference in self-esteem and mental health among obese and non-obese people.
8. To investigate the level of self-esteem and mental health among obese non-obese people

Methodology

Present study is a non-experimental, exploratory, survey type study with quantitative in nature.

Variable

Self-esteem and mental health are psychological variables used in this study in which mental health is criterion variable while self-esteem as predictor variables. Demographic variables used in this study are age, gender, family type, location,

and income status. Body mass index is used as categorical variable which includes underweight, normal weight, overweight in non-obese spectrum while in obese spectrum it has class I, class II and class III obesity.

Sampling

Present study were investigated as public study so that prime focus of datasets were from public population based on body mass index calculation from weight and height of participants. The researchers have collected around 560 obese and non-obese samples from this study from Tamil Nadu, India. Sample design used in this study were purposive sampling technique and the criteria includes participant above 15 years old, from Cuddalore district, and belonging to rural and urban areas only.

Table 1, Descriptive statistical details with respect to age, gender, social support, self-esteem and mental health among non-obese (295)

	Obese		Non-obese	
	Frequency	Percentage	Frequency	Percentage
Age Group				
15 to 25	49	17.5	109	38.9
26 to 35	88	31.4	77	27.5
Above 35 years	143	51.1	94	33.6
Gender				
Male	80	28.6	125	44.6
Female	200	71.4	155	55.4
Total	280	100.0	280	100.0

Table 1 described frequency of datasets in each demographic categories with respect to as age, gender, family type, location, and income status among obese and non-obese. Obesity was much more among people above 35 years old. This prevalence was in line with previous study especially carried by Control of Diabetes in India, (2017) revealed obesity risk was high among people above 40 years old (Venkatrao et al., 2020). Present study also stated female obesity was more common than male obese which were supported by many past studies as seen in Al-Raddadi et al., 2019; Dwivedi et al., 2019; Andoy-Galvan et al., 2020; and Adeloye et al., 2021.

Measuring Tools

In present study, the following measuring scales were in research design,

1. Demographic Sheet: Respondents' personal demographic information were asked through appropriate open type questionnaires.
2. Body Mass Index (BMI): it is a measure fat deposition and calculated from weight and height of respondents. WHO classified it as underweight with BMI below 18.5 kg/cm², normal weight with BMI from 18.5 to 24.9 kg/cm², overweight with BMI from 25 to 29.9 kg/cm² and obese with BMI above

30kg/cm². In obese spectrum class I obesity have BMI in between 30 to 34.9 kg/cm², class II obesity with BMI 35 to 39.9 kg/cm², and class III obesity with BMI above 40 kg/cm².

3. Rosenberg's Self-Esteem Scale (RSES): It is used for measuring the level of self-esteem, and this scale was developed by Rosenberg (1965) which consist of ten items in 4-point likert scale with response as strongly agree, agree, disagree and strongly disagree. The scale as 0.82 to 0.88 test-retest correlation, and 0.77 to 0.88 as Cronbach's alpha Co-Efficient values in different studies.
4. The Mental Health Inventory (MHI-38): Veit & Ware (1983) developed this scale to measure mental health with 38 items in six point likert type responses and includes questionnaires related to anxiety, depression, behavioural control, positive affect, emotional ties and Life satisfaction. This scale states both positive and negative aspects of mental temperaments.

Results and Discussions

The present study aimed to predict the influence of self-esteem on mental health among obese and non-obese people. Further to investigate age, gender and BMI difference in said variables. The level of self-esteem and mental health among obese and non-obese people was also investigated. The findings of the above cited objectives are given in following tables.

Self-esteem

Positive Opinion about ourselves gives positive impact, likewise negative opinion gives negative impact. Appropriate opinion whether positive or negative towards themselves will provide healthy self-esteem. Healthy self-esteem should be in moderate one and it should not either high or low. Here, the researchers aimed to measure the level of self-esteem among obese and non-obese people and also to find out age, gender and BMI difference among obese and non-obese.

Table 2., Descriptive details in level of self-esteem among Non-obese (300) and obese (300)

Self-esteem	Range	Obese		Non-obese	
		Frequency	Percentage	Frequency	Percentage
Very Low	0 - 15	5	1.8	22	7.8
Low	16 - 25	248	88.6	197	70.3
Average	26 - 35	27	9.6	61	21.7
High	36 - 40	0	0	0	0
Total		280	100	280	100

Table 2 described frequency of observation in level of self-esteem as very low, low average and high in which 88.6% of obese people have scored low self-esteem while non-obese it was 70.3%. 21.6% of non-obese have scored average self-esteem while in obese it was 9.6%. These findings in line by line with previous studies as obese people have lower body esteem than normal weight people (French et al., 1995), body dissatisfaction correlated with childhood obesity which

leads to low self-esteem (Shin & Shin, 2008), low self-esteem and depression have positive association with bodu dissatisfaction among overweight people (Ozmen et al., 2007), obese children have low self-esteem, low perceived competence in exercise and sports (Franklin et al., 2006) and stigmatization helps obese to cope with stigma through healthy self-esteem (Myers & Rosen, 1999).

Table 3, Age difference in self-esteem among obese and non-obese by using Kruskal-Wallis Test

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig. (2-tailed)</i>
15 to 25 years	158	310.51				
26 to 35 years	165	293.07	21.65	3.75	14.045	.001
Above 35 years	237	251.74				
Total	560					

Table 3 represented that age difference in self-esteem among obese and non-obese people using Kruskal-Wallis test which revealed there was statistically significant mean difference in self-esteem among different age groups with higher self-esteem among age group 15 to 25 years old with mean rank as 310.51 than age group 26 to 35 years old with mean rank 293.07 and age group above 35 years old with mean rank 251.74, Kruskal Wallis $H = 14.045$, $p = .001$. These findings goes in line with previous studies as self-esteem increases with age as from adolescence to adulthood (Erol & Orth, 2011; McMullina & Cairney, 2004), and there was significant age difference in self-esteem (Dias et al., 2002).

Table 4, Gender difference in self-esteem among obese and non-obese by using Mann-Whitney Test

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Male	205	292.49	59961.00	Mann-Whitney U	33929.000	
Female	355	273.57	97119.00	Wilcoxon W	97119.000	.181
Total	560			Z	-1.339	

Table 4 revealed that gender difference in self-esteem among obese and non-obese people using Mann-Whitney test which stated that there was no statistically significant gender difference found between male with mean rank as 292.49 and female with mean rank as 273.57, Mann-Whitney $U = 33929.000$, Wilcoxon $W = 97119.000$, $Z = -1.339$, $p = .181$. This finding is supported in line with previous studies as there was no mean difference in self-esteem with respect to (Erol & Orth, 2011). But few studies revealed women have slight lower self-esteem than men (McMullina & Cairney, 2004; Magee and Upenieks, 2019). Usually, in gender difference lower self-esteem have present in women only during young adulthood,

not in late adults and old ages (Orth et al., 2010), male obese have slightly higher self-esteem than female during adulthood (Bleidorn et al., 2016).

Table 5, BMI difference in self-esteem among obese and non-obese by using Kruskal-Wallis Test

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig. (2-tailed)</i>
Obese	280	267.89	21.65	3.75	18.610	.000
Overweight	103	247.58				
Normal weight	150	312.04				
Underweight	27	361.57				
Total	560					

Table 5 revealed that BMI difference in self-esteem among obese and non-obese people using Kruskal Wallis test in which there was statistically significant BMI difference found between various BMI categories as underweight people have very high mean rank with 361.57 than normal weight with 312.04, obese with 267.89 and overweight with 247.58, Kruskal Wallis $H = 18.610$, $p = .000$. This finding is supported in line with previous studies as prevalence of obese people with low self-esteem (Ercan & Özcebe 2020; Franklin et al. 2006; Wang & Beydoun, 2007; Unlu et al. 2019; Aggarwal 2019; Al-Ahmari et al. 2017; Almenara et al. 2017; and Griffiths et al. 2010). Low self-esteem in association with fear of failure, shame and negative appearance evaluation brought them to the feeling of weight stigma and disordered eating especially with obese women (Almenara et al.2017). Beyond physical or emotional bullying, obese people have highly associated with low self-esteem (Ercan & Özcebe 2020).

Mental Health

Mental health have both positive dimension such as positive affect, emotional control and life satisfaction, similarly have anxiety, depression and loss of behavioural control. Mental health also includes emotional, cognitive and psychological components of our temperament. The researchers aimed to measure the level of mental health among obese and non-obese people and also to find out age, gender and BMI difference among obese and non-obese.

Table 6, Descriptive statistical details of mental health among Obese and Non-obese

<i>Resilience</i>	<i>Raw</i>			<i>Obese</i>		<i>Non-obese</i>	
	<i>Score</i>	<i>Z-Score</i>		<i>Frequency</i>	<i>Percentage</i>	<i>Frequency</i>	<i>Percentage</i>
Extr. Low	38	-2.01&	below	7	2.5	8	2.9
	98						
Low	99	-2.00 to -	1.26	15	5.4	17	6.1
	113						
Below.Ave	114	-1.25 to -		45	16.1	42	15

	129	0.51					
Average	130 -	-.050	to	182	65	108	38.6
	150	0.50					
Above Ave	151 -	0.51	to	27	9.6	51	18.2
	165	1.25					
High	166 -	1.26	to	4	1.4	34	12.1
	181	2.00					
Extr.High	182	2.00	&	7	2.5	8	2.9
	& above	above					
Total				280	100	280	100

Table 6 stated descriptive statistical details of mental health among obese and non-obese people. It revealed greater frequency of them in obese have average and below average level of mental health, while non-obese have more frequency in average and above average level of mental health. This finding is supported in line with previous studies as mental health issues such as anxiety, depression and stress have positive relationship with obesity (AlQahtani et al. 2015), obese patient have greater chances for depression (Reynolds et al. 2018), mental health of obese people acted as strongest predictor for perceived physical health (Knoesen et al. 2010), and obesity was highly associated with depressive disorder especially in women (Ahuja et al. 2020).

Table 7, Age difference in mental health among obese and non-obese by using Kruskal-Wallis Test

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	158	281.35				
26 to 35 years	165	268.88	139.67	20.72	1.369	.504
Above 35 years	237	288.03				
Total	560					

Table 7 revealed age difference in mental health using Kruskal-Wallis test among obese and non-obese. It showed that there was no statistically significant age difference in mental health among obese and non-obese, Kruskal Wallis H = 1.369, p = .504, with lower mean rank in age group 26 to 35 years as 268.88 than age group 15 to 25 years with mean rank 281.35 and above 35 years with mean rank 288.03. Comparatively it was very low among age group 26 to 35 years, and very high among age group above 35 years. This finding goes towards significant age difference previous studies there was no significant age difference in mental health but beliefs about the life will vary based on age (Farrer et al., 2008), mental health illness begins as early as in childhood or adolescents (Kessler et al., 2007), Factors such as social and familial restrictions impact mental health especially more in young adults than old ages (Sojli et al., 2021), there was existence of

increased mental health problems diagnosis especially with young female (Rossell et al., 2021).

Table 8, Gender difference in mental health among obese and non-obese by using Mann-Whitney Test

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Male	205	287.74	58987.00	Mann-Whitney U	34903.000	
Female	355	276.32	98093.00	Wilcoxon W	98093.000	.421
Total	560			Z	-.805	

Table 8 stated gender difference in mental health using Mann-Whitney test among obese and non-obese people. It showed that mental health have no statistical significant mean difference between male with mean rank as 287.74 and female with mean rank as 276.32, Mann-Whitney U is 34903.000, Wilcoxon W is 98093.000, $Z = -.805$, $p = .421$. This finding have showed no statistical significance but goes in line to support it through significant gender differences in mental health in past studies as mental health status relied on social context better than by gender (Kiely et al., 2019), there was no significant differences between male and female (Liu et al., 2020), gender based differences in mental health of population have showed conflicting identity due to psychopathology seen in women (Dhejne et al., 2016), and among young men have greater chance for withdrawal mental health care (Seidler et al., 2020).

Table 9, BMI difference in mental health among obese and non-obese by using Kruskal-Wallis Test

<i>Age</i>	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig.(2-tailed)</i>
Obese	280	249.72				
Overweight	103	348.50				
Normal weight	150	302.05	139.67	20.72	34.701	.000
Underweight	27	220.63				
Total	560					

Table 9 stated BMI difference of mental health using Kruskal-Wallis test among obese and non-obese people. It showed there was strong statistically significant BMI difference in mental health between various body mass index categories in which BMI difference were as U-shaped relationship with obese people had comparatively low mean rank as 234.20, than overweight very high mean rank as 304.79, and normal weight 251.50. But underweight people have very low mean rank as 170.90, $N=500$, Kruskal Wallis $H = 23.675$, $p = .000$. These findings goes in line with previous studies as in obese peoples the mental health played as strong predictor for optimum perceived physical health (Knoesen et al. 2010), women with high BMI have greater mental health problems than Boys (Xie et al. 2005), mental health illness had positive correlation with BMI till a point after which it showed negative correlation with BMI (McCrea et al., 2012), mood or

mental disorders were common issues in overweight and obese people than normal weight people (Bruffaerts et al., 2008).

Impact of self-esteem over Mental Health

The impact of self-esteem over mental health was analysed statistically using linear regression equation among obese and non-obese. The predicted values of the criterion variables (mental health) can be made from the observed values of the predictor variables (self-esteem).

Table 10, Regression analysis shows the impact of self-esteem over mental health among obese and non-obese people.

BMI Groups	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Overall*	.378	.143	.142	19.200	-2.09	.216	.378	9.660	.000
Obese*	.279	.078	.074	15.316	1.491	.308	.279	4.838	.000
Non-obese*	.460	.211	.209	21.229	2.504	.290	.460	8.634	.000

*Predictor Variable: Self-esteem; Criterion Variable: Mental Health

Table 10 described regression analysis to identify impact of self-esteem over mental health among obese and non-obese people. It revealed that self-esteem have statistically significant negative impact over mental health, $p = .000$, $R = .378$, $R^2 = .143$, $adjusted R^2 = .142$. The regression co-efficient (B) of self-esteem was -2.09, stated that an increase in one part of self-esteem will decrease the mental health with 2.09 points and self-esteem played 14.2% determination role over mental health. Regression analysis among obese and non-obese people also stated that self-esteem have high negative impact and better determination over mental health among non-obese, $p = .000$, $R = .460$, $R^2 = .211$, $adjusted R^2 = .209$ than obese people, $p = .000$, $R = .279$, $R^2 = .078$, $adjusted R^2 = .074$. Which means an increase in one part of self-esteem will decrease the mental health with 2.504 points in non-obese and 1.491 in obese, similarly self-esteem played 20.9% determination role over mental health in non-obese and only 7.4% determination role over mental health in obese people. These findings goes side by side with previous studies as self-esteem have negative relationships with mental health (Moksnes & Reidunsdatter, 2019), self-esteem played as intermediate role with eating disorder and self-devaluation (Almenara et al., 2017), self-esteem have impaction over self-compassion with mental health among obese people irrespective of any age (Hwang et al., 2016), and body mass index were negatively correlated with self-esteem and mental health (Prabhu & D'Cunha, 2018).

Impact of self-esteem over Body Mass Index

The impact of self-esteem over body mass index was analysed statistically using multiple linear regression among obese and non-obese people. The predicted values of the criterion variables (body mass index) can be made from the observed values of the predictor variables (self-esteem).

Table 11, Regression analysis shows the influence of psychological resilience on body mass index among Obese and Non-obese people

<i>BMI Groups</i>	<i>R</i>	<i>R²</i>	<i>Adjusted R²</i>	<i>Std Error of Estimate</i>	<i>B</i>	<i>Std. Error</i>	β	<i>t-value</i>	<i>p-value</i>
Overall*	.189	.036	.034	5.75	-.294	.065	-.189	-4.535	.000
Obese*	.203	.041	.038	2.70	-.187	.054	-.203	-3.449	.001
Non-obese*	.249	.062	.059	3.57	-.209	.049	-.249	-4.295	.000

**Predictor Variable: Psychological Resilience; Criterion Variable: body mass index*

Table 11 represented regression analysis to identify impact of self-esteem over body mass index among obese and non-obese people. It stated that self-esteem have statistically significant negative impact over body mass index, $p = .000$, $R = .189$, $R^2 = .036$, *adjusted R² = .034*. The regression co-efficient (*B*) of self-esteem was $-.294$, stated that an increase in one part of self-esteem will decrease the body mass index with $.294$ points and self-esteem played 3.4% determination role over body mass index. Regression analysis among obese and non-obese people also stated that self-esteem have high negative impact and better determination over body mass index among non-obese, $p = .000$, $R = .249$, $R^2 = .062$, *adjusted R² = .059* than obese people, $p = .000$, $R = .203$, $R^2 = .041$, *adjusted R² = .038*. Which means an increase in one part of self-esteem will decrease the mental health with $.209$ points in non-obese and $.187$ in obese, similarly self-esteem played 5.9% determination role over body mass index in non-obese and 3.8% determination role over body mass index in obese people. These findings goes side by side with previous studies as obese people have lower body esteem than normal weight people (French et al., 1995), body dissatisfaction correlated with childhood obesity which leads to low self-esteem (Shin & Shin, 2008), low self-esteem and depression have positive association with body dissatisfaction among overweight people (Ozmen et al., 2007), obese children have low self-esteem, low perceived competence in exercise and sports (Franklin et al., 2006) and stigmatization helps obese to cope with stigma through healthy self-esteem (Myers & Rosen, 1999).

Conclusion

Mental health and Body mass index have bidirectional association with each other. Behaviours related to food habits and physical activities might disturb energy balance through energy intake and energy expenditure. Present study used self-esteem as interaction factor in mediating or preventing mental health issues and obesity. Present study stated prevalence of mental health problems were high among obese than non-obese. Similarly the self-esteem in non-obese people have statistically significant lesser negative impact on mental health and on body mass index than obese people. When analyzing the data sets in term of self-esteem with respect to demographic variables and body mass index revealed various significant statistical research outputs as significant age difference ($p = .001$) and BMI difference ($p = .000$) while gender showed no significant mean difference ($p = .181$). Meanwhile mental health have showed significant difference

only in body mass index ($p = .000$) and insignificant in age ($p = .504$) and gender ($p = .421$). in which as age increases the psychological resilience also significantly increased, significant location difference ($p = .000$) in which rural people have significantly higher resilience than urban people, significant income difference ($p = .000$) where low income people have high resilience than others, and significant BMI difference ($p = .000$) where an increase in body mass index increases resilience which mean overweight and obese people have higher resilience than normal weight and underweight people.

Regression line in this study revealed self-esteem have significant negative impact on mental health and also showed significant negative impact on body mass index. As the researchers found in this study as underweight people have very high mean rank with 361.57 than normal weight with 312.04, obese with 267.89 and overweight with 247.58. It denotes obese and overweight people have low self-esteem than normal weight people, while underweight people have very high self-esteem than all other. Similar findings stated in many past researches as prevalence of obese people with low self-esteem (Ercan & Özcebe 2020; Franklin et al. 2006; Wang & Beydoun, 2007; Unlu et al. 2019; Aggarwal 2019; Al-Ahmari et al. 2017; Almenara et al. 2017; and Griffiths et al. 2010). Low self-esteem in association with fear of failure, shame and negative appearance evaluation brought them to the feeling of weight stigma and disordered eating especially with obese women (Almenara et al. 2017). Beyond physical or emotional bullying, obese people have highly associated with low self-esteem (Ercan & Özcebe 2020). This denotes obesity have low self-esteem. So an increase in self-esteem will decrease body mass index and bring them to normal weight or reduce their body mass index. Present study also revealed it as statistically significant negative impact over body mass index, $p = .000$, $R = .189$, $R^2 = .036$, *adjusted R*² = .034. The regression co-efficient (*B*) of self-esteem was -.294, stated that an increase in one part of self-esteem will decrease the body mass index with .294 points and self-esteem played very less role of prediction on body mass index as 3.4% determination role. But, the regression analysis in present study revealed that impact of self-esteem over mental health have showed shocking research output as there was significant negative impact of self-esteem over mental health, $p = .000$, $R = .378$, $R^2 = .143$, *adjusted R*² = .142. The regression co-efficient (*B*) of self-esteem was -2.09, stated that an increase in one part of self-esteem will decrease the mental health with 2.09 points and self-esteem played 14.2% determination role over mental health. Although obese people have significantly low self-esteem, if any behavioural intervention on self-esteem enhancement carried, will automatically decrease mental health which can lead to mental health illness such as depression, anxiety, or emotional disorder. This research input made an insight to explore further insight related to self-esteem and mental health among obese and non-obese people.

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Research Article

Social Support and Mental Health among Obese and Non-obese

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A B S T R A C T

Context: Due to modernization, overeating becomes as trending topic due to its disturbance on our energy balance system and body weight. Behavioural issues such as overeating and sedentary lifestyle have impact on health through an increase in body mass index due to excessive deposition of body fat. Thus, it impacts on our body weight through positive energy balance in which there is an increase energy intake and decrease energy expenditure. On the other hand, it can be controlled through appropriate social support and optimum mental health.

Aims: The objective of this study was to reveal predictor role of social support on mental health among obese and non-obese using regression analysis, to know mean difference in social support and mental health using Mann-Whitney test, and to identify the level of social support and mental health among obese and non-obese individuals.

Methods and Material: The study design was non-experimental, quantitative study with descriptive in nature. The participants were 250 obese and 250 non-obese people and were collected from in Cuddalore district of Tamil Nadu, India. Both obese and non-obese participants were asked them to fill questionnaires with psychological tools namely the mental health inventory-38 (MHI-38) and multidimensional perceived social support scale (MDPSS).

Results: The data distribution were in non-normal pattern and the statistical test used were non-parametric test. The results stated that the predictor variable social support has shown significant positive impact on mental health. The effect of social support over mental health was high among non-obese ($R = .406$, $R^2 = .168$, adjusted $R^2 = .164$, co-efficient $B = .667$ and $p = .000$) than obese ($R = .522$, $R^2 = .272$, adjusted $R^2 = .270$, co-efficient $B = .729$ and $p = .000$). Social support and mental health have significant mean BMI difference among obese and non-obese in which obese people have higher social support and low mental health than non-obese people.

Keywords: Mental Health, Non-obese, Social Support, Regression Analysis, Mann-Whitney Test, Body Mass Index

Introduction

Behavioural issue like overeating won't be a problem until it impacts on our body weight, but nowadays it becomes as emerging issue in world population. Body weight have described in body mass index (BMI) calculation. Obese and non-obese are two different groups of body mass index (BMI) calculation in which obese can be defined as BMI above 30 kg/m² and it has three different classes as class I(30 - 34.9), class II(35 - 39.9) and class III(above 40) based on body mass index, while non-obese as BMI below 29.9 kg/m² and has three categories such as overweight (25 - 29.9), normal weight (18.5 - 24.9) and underweight (below 18.4). World Health Organisation (WHO) Datafacts sheet stated approximately two billion adults were in overweight and one third of them were obese people, and in most of countries many people die due to excessive body weight than underweight or malnutrition. The research which have carried in obese and non-obese spectrum will help researchers and policy makers for as new orientation towards nutrition, physical activity and body fat in association with social support and mental health. Body mass index has two anthropomorphic measurements as weight and height of an individual. In which, the height of an individual is predicated based on biological and hereditary nature of an individual, while weight of an individual depends on his or her energy balance equilibrium beyond biological or hereditary factors. In biology, energy balance is defined as the state in which the energy intake equals with energy expenditure, and is affected by various factor such as body size, physical activity, amount of body fat, muscle mass, and genetics.¹ Energy balance can shift to positive side as positive energy balance with an increase in energy (food) intake and decrease in energy expenditure. Similarly, it can shift to negative side as negative energy balance with decrease in food intake and increase in energy expenditure. Thus, the nature of energy balance and its control over our body can maintained through appropriate behavioural intervention under appropriate social support and optimum mental health within normal weight range. Aims and objectives of this study is to understand predictor role of social support over mental health, to identify mean difference in social support and mental health, and to find out the level of social support and mental health among obese and non-obese people.

Social Support

The perception of care and support from family members, friends, and others are termed as social support. It have positive influence over physical health, social health and mental health of an individual. Structural and functional elements are two important dimensions of social support. The structural dimension is defined as frequency of interaction and size of social system, whereas the functional dimension is denoted as emotional and instrumental natures.² Durkheim

in his book "suicide" had revealed about relation between social support and behavioural issues.³ Psychological status of an individual can be put as safe, respectable, competent and valued in doing behavioural activities for optimum wellbeing through perceived social support.⁴ Social support plays as mediating role to improve physical activity,⁵ to perform health-promoting behaviour,⁶ to prevent peer victimization⁷ and to stabilize emotional adjustment.⁸

Mental Health

What we think, feel and behave predict our temperament. If we think or feel positive, temperament be in positive mood. Similarly negative thinking or feeling creates negative mood. Our thinking, feeling and behaving are not in static state and these represent status of our mood. Mental health means status of mood with respect to emotional, psychological and social well-being.⁹ Mental health of an individual is multifactorial and can be predicted by many variables and factors. Mental health have U-shaped relation with body mass index which stated as an increase in body mass index will increase mental health till a point where further increase in body mass index will decrease mental health. Usually it is a point where body mass index have line of demarcation between obese and non-obese, which means among non-obese an increase in body mass index will increase mental health while in obese an increase in body mass index will decrease mental health.^{10, 11} Perceived social support have association with mental health and body mass index.¹² Among women population, body mass index have positive correlation with emotional disorder.¹³

Objectives of this Study

- To examine the influence of social support on mental health among obese and non-obese people
- To find mean difference in social support among obese and non-obese people
- To find mean difference in mental health among obese and non-obese people
- To identify the level of social support and mental health among obese and non-obese people

Methodology

This study is non-experimental, quantitative, survey type with comparative in nature.

Variable

The researcher have selected variables such as social support and mental health as psychological variables in which social support is predictor variable and mental health is criterion variable.

Sampling

Since this study were carried as non-experimental and survey type and the sampling was community based one, so

sampling technique used was purposive sampling technique with sample size 500 (250 obese and 250 non-obese) participants in age groups above 15 years old from rural and urban areas of Cuddalore district in Tamil Nadu, India.

Measuring Tools

In this study, the researchers used the following measuring scales.

Demographic Sheet: It has semi-structured questionnaires in relevant to respondent's demographic details.

Body Mass Index: It is a measurement with respect to level of fat deposition can be calculated from weight and height of respondents. WHO have categorized it into underweight, normal weight, overweight and obese.

1. Multi-Dimensional Perceived Social Support scale (MDPSS): This tool was developed by Zimet et al (1988)¹⁴ in seven points Likert scale with 12 items in it, four items each for family support, friend support and significant person support with responses from very strongly disagree to very strongly agree as 1 to 7 respectively. This scale were used by many Indian researchers.^{15,16,17} It has high reliability 0.92 to 0.93 Cronbach's alpha value and validity score even in recent study.¹⁸
2. The Mental Health Inventory (MHI-38): This tool consists of 38 items in six points Likert scale, was developed by Veit & Ware (1983).¹⁹ This scale has two global psychological well-being and psychological

distress and with six subscales from anxiety, depression, behavioural control, positive affect, emotional ties and till life satisfaction. This scale was designed for the RAND Health Insurance to measure general psychological distress and well-being and also used in study in India.²⁰

Results and Discussions

The objectives of this study are defined through appropriate statistical techniques to find the impact of social support on mental health, to know mean difference of social support and mental health, and to investigate the level of social support and mental health among obese and non-obese. The findings of these objectives are shown in the following tables.

Table 1, represented 73% of obese people have scored high social support than 49% of non-obese people. 21% of obese in moderate social support and 6% of them in low social support, while 39% of non-obese in moderate and 12% of them in low social support. This finding goes in line side by side with previous studies as obese people have high social support due to their high social status as wealthy,²¹ social support structure have positive relationship with overweight and obesity,²² high social supports creates room for obesity due to supportive accessibility towards social vulnerable atmosphere as over parental support and comfortable food access,²³ and social ties prone to obesity especially in obesity causing environment.²⁴ Thus, emerging obesity risks are due to high social support especially from family, friend, social structure or social relations.

Table 1. Descriptive details in Level of Social Support among non-obese (250) and Obese (250)

Social Support	Range	Obese		Non-obese	
		Frequency	%	Frequency	%
Low	12 - 33	16	6	29	12
Moderate	34 - 60	51	21	97	39
High	61 - 84	183	73	124	49
Total		250	100	250	100

Table 2. Descriptive details in Level of Mental Health among non-obese (250) and Obese (250)

Mental Health	Raw-Score Range	Z-Score Range	Obese		Non-obese	
			Frequency	%	Frequency	%
Extr.Low	38 - 106	-2.01 & below	14	6	19	8
Low	107 - 119	-2.00 to -1.26	18	7	17	7
Average	120 - 160	-1.25 to 1.25	208	83	151	60
High	161 - 173	1.26 to 2.00	10	4	31	12
Extr.High	174 & 228	2.00 & above	0	0	32	13
Total			250	100	250	100

Table 2, represented descriptive statistical details of mental health based on z-score calculation among 250 obese and 250 non-obese people. It stated around 25% of non-obese people were scored high and extremely high mental health, while only 4% of obese have high mental health. 83% of obese and 60% of non-obese have scored average level of mental health. These findings have supported in line with previous studies as an increase in BMI acted as risk factor for mental disorder such as anxiety, depression, and stress,²⁵ Patient with high body mass index have high chances for depression.²⁶ Perceived physical health acted as the good indicator of high mental health among high body mass index people.¹¹ Mental issues like depressive disorder have positive association with high BMI especially with women.²⁷

Table 3, stated regression analysis to find influence of social support on mental health among 250 obese and 250 non-obese population. It revealed that social support among obese have statistically significant positive influence over mental health, $p = .000$, $R = .406$, $R^2 = .168$, adjusted $R^2 = .164$. The regression co-efficient (B) for predictor variable social support is .437, mentioned that an increase in one part of social support will increase mental health with .437 points. The R^2 value .168 denoted social support have 16.8% of determination over mental health. The influence and determination of social support over mental health is higher in non-obese than obese. Social support among non-obese have statistically significant positive influence over mental health, $p = .000$, $R = .522$, $R^2 = .272$, adjusted $R^2 = .270$. The regression co-efficient (B) for predictor variable social support is .729, mentioned that an increase in one part of social support will increase mental health with .729 points. The R^2 value .272 denoted social support have 27.2% of determination over mental health. These

findings goes side by side with previous studies as the level of social support with acculturation revealed higher obesity rate among people with low or no social support,²⁸ there was significant positive associations between social network support and weight reduction activity,²⁹ social support played as mediating agent on mental health and body weight,³⁰ and people with mental health issues or body weight victims were associated with perceived social support.³¹

Table 4, stated mean difference in social support among 250 obese and 250 non-obese using Mann-Whitney test. It stated that the perceived social support was significantly higher in obese with mean rank 278.75 than non-obese with mean rank 222.25, $U = 24186.50$, Wilcoxon $W = 55561.50$, $Z = -4.390$ $p = .000$. This finding goes in line with previous studies as there was positive relationship between high social status and obesity,²¹ high parental support increases social vulnerabilities towards easy food access which leads to obesity,²³ and there was positive association between support network and body mass index.²²

Table 5, represented mean difference in mental health among 250 obese and 250 non-obese using Mann-Whitney test. It showed that the mental health was significantly higher in non-obese with mean rank 276.92 than obese with mean rank 224.08, $U = 24644.000$, Wilcoxon $W = 56019.000$, $Z = -4.090$ $p = .000$. This finding goes in line with previous studies as female Obese affected much with mental health problems such as depression, anxiety, and emotional issues than male, obese women with lower body appearance have significantly associated with more depressive symptoms than non-obese,³² and obesity have strongly association with increased risk for mental health disorder,²⁷ and abdominal obesity have significantly positive relationship with anxiety.¹⁰

Table 3. Regression Analysis shows the Influence of social support on Mental Health among Obese (250) and non-obese (250) people

BMI type	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Obese	0.409	0.168	0.164	14.713	0.437	0.062	0.409	7.065	0.000
Non-obese	0.522	0.272	0.270	20.984	0.729	0.076	0.522	9.638	0.000

Predictor Variable: Social Support; Criterion Variable: Mental Health

Table 4. Mean difference in social support with respect to obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Obese	250	278.75	69688.50	Mann-Whitney U	24186.500	0.000
Non-obese	250	222.25	55561.50	Wilcoxon W	55561.500	
Total	500			Z	-4.390	

Table 5. Mean difference in Mental Health with respect to obese and non-obese by using Mann-Whitney Test

	N	Mean Rank	Sum of Ranks	Test	Mental Health	Asymp. Sig. (2-tailed)
Obese	250	224.08	56019.00	Mann-Whitney U	24644.000	0.000
Non-obese	250	276.92	69231.00	Wilcoxon W	56019.000	
Total	250			Z	-4.090	

Conclusion

In summary, high social support and low mental health are key findings found among obese people in compare with non-obese people. Even though obese people have high perceived social support than non-obese, significant predictor and determination role of social support over mental health was very low among obese than non-obese. Some studies revealed that low social support as causation for increase in body weight especially among socioeconomically disadvantage people.^{33,34} In general, social support acted as mediating role for mental health and body mass index.^{35,36,37,38} But, this study revealed social support have role in enhancing body mass index and mental health. This contrasting nature of social support on body mass index with respect to obesity are due to lack of knowledge and awareness about obesity. Thus, utilization of social support to control behaviour such as overeating in preventing obesity and enhancing mental health need further researches and the policy maker should consider social support before implementing behavioural intervention in controlling obesity and enhancing mental health.

Key Message

High social support and low mental health are key findings found among obese people than non-obese people, these findings suggested the utilization of social support to control overeating behaviour in preventing obesity and enhancing mental health.

Conflict of Interest: None

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SOCIAL SUPPORT AND RESILIENCE AMONG OBESE PEOPLE

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Abstract:

Modern medical society considered obesity as a disease due to worldwide prevalence because of increased food consumptions beyond limits and decreased energy utilization from sedentary lifestyle. An increased body mass index (BMI) beyond normal range (18.5 to 24.99 kg/cm²) leads to overweight (25 to 29.99 kg/cm²) and further to obesity (above 30 kg/cm²). Social support and resilience are two important mediating factor to maintain body weight within normal range. Aim and objectives of this study to identify various research input from social support and resilience in obesity research through non-parametric test such as Mann-Whitney test and Kruskal Wallis test for mean difference and multiple linear analysis for prediction among 285 obese people from Cuddalore district in Tamil Nadu, India using demographic questionnaires, Multidimensional Perceived Social Support Scale (MDPSS) and Rosenberg's Self-esteem Scale (RSES) with body mass index (BMI) measurement. The findings stated that social support have significant mean difference at the level of .001 with respect to age, significant location difference at level of .006 and income difference at level of .000, whereas gender and family type have showed statistical insignificant mean difference at .859 and .978 respectively. Whereas psychological resilience have significant mean difference as same as social support at the level of .000 with respect to age, significant location difference at level of .003 and income difference at level of .000, whereas gender and family type have showed statistical insignificant mean difference at .199 and .503 respectively. Regression analysis showed there was significant positive influence of social support over resilience, $p = .000$, $R = .602$, $R^2 = .362$, $adjusted\ R^2 = .360$ and the co-efficient (B) for social support was .532. It showed favoring research output and gave creative research input to explore further insight related to social support, resilience and body mass index among obese people.

Keyword: Social support, Obesity, Resilience, Regression analysis, Mann-Whitney test, Kruskal Wallis Test, and Body Mass Index.

Introduction:

Modern medical society considered obesity as a disease due to worldwide prevalence because of increased food consumptions beyond limits and decreased energy utilization from sedentary lifestyle. An increased body mass index (BMI) beyond normal range (18.5 to 24.99 kg/cm²) leads to overweight (25 to 29.99 kg/cm²) and further to obesity (above 30 kg/cm²). It is due abnormal and excessive fat deposition in body acts as risk factors for many metabolic and chronic diseases. Obesity also have social and psychological consequences which highly impact on overall health of an individuals. Data sheet report from World Health Organization stated that around 2 billion adults have overweight and obesity and most of people from developed countries are dying due to obesity than malnutrition (World Health Organization, 2021). The fat deposition of an individual controlled by an energy balance of an individual which means a balance between energy intake and energy expenditure which depends on body size,

amount of body fat, muscle mass, exercise, physical activity and genetic (National Cancer Institute, 2011). A shift in energy balance towards positive side favours obesity and towards negative side favours weight loss (Hill et al., 2010). Many metabolic diseases and chronic diseases namely heart disease, stroke, an increased blood pressure, diabetes, gallstones, sleep apnea, back and joint pain, breast cancer and colon cancer can be developed from obesity (Rockville et al., 2001). Obesity might cause mental health issue which further creates abnormal food behaviours such as food over-consumption especially palatable which leads to further an increase in body weight to complicate obesity (Rabasa & Dickson, 2016).

Smart phone addictions, intake of excessive sugar-sweetened beverages and over snacking are risk factors for obesity (Landsberg et al., 2010). High health quality of life, optimal sleep, balanced nutrition, regular exercise, avoid sedentary lifestyle, no alcohol and no smoking are positive factors in minimizing and preventing obesity (Mihaela Hâncu, 2021). Our body Health concern can be maintained and predictable even in obesogenic environment through physiological mechanisms (Lukey & Tepe, 2008). Physiology of our body system as seen in psycho-neuro-immune homeostasis are in line with emotional regulation and behavioural action carried from epigenetic pathway are basically maintained through psychological resilience (Gómez-Acosta & Londoño Pérez, 2020). Further social support have role over resilience what the researchers were going to explain and analyse through emperial study as follows, thus the researchers aimed to identify nature, difference and level of social support and resilience among obese people with respect to demographic variables such as age, gender, family type, and income status. Further aimed to examine influence of social support over psychological resilience among obese population.

Social support:

Social support includes support structures from family, friend and special person have positive relationships on physical, social and psychological health. The structural and functional are two dimensions in social support in which structural denoted frequency and size of social connections and functional means emotional and commitment with social systems (Ozbay et al., 2008). Social support have significant relationships with behavioural issues (Gofman, 2014). Safe, secure, competent and respective psychological status of an individual and desirable behavioural performance might be developed from perceived social support (Lam, 2019). Previous studies stated physical health (Cohen et al., 2000; Brunet et al., 2014), health behaviours (Cho et al., 2013), emotional health (Graetz, 2000) of an individual irrespective of obesity can be buffered with social support.

Resilience:

The word “resilience” literally means as “Bounce back from adversity”. In summary, it denoted for the process of adaptation. Usually an individual with better resilience has three qualities as accepting truth, high faith on life, and have capacity to adapt with environments (Goleman et al., 2017). Perceived social support and psychological acted via strong buffering effect in controlling or minimizing stress (Celik et al., 2021). Psychological resilience showed positive relationships with quality of life (Mohlin et al., 2021), in food related behaviour (Spinosa et al., 2019), with exercise and physical activity (Seçer & Çakmak yildizhan, 2020), and as protective effect on obesity (Williamson et al., 2021). Resilience can be improved through implementation of few life strategies such as smart goal, social support, positive thinking, adaptability and self-orientation (American Psychological Association, 2012)

Objectives of this study:

1. To identify influence of social support on resilience among obese people.

SOCIAL SUPPORT AND RESILIENCE AMONG OBESE PEOPLE

2. To find out age difference in social support and resilience among obese people.
3. To find out gender difference in social support and resilience among obese people.
4. To find out family in social support and resilience among obese people.
5. To find out location difference in social support and resilience among obese people.
6. To find out income difference in social support and resilience among obese people.
7. To investigate the level of social support and resilience among obese people.

Methodology:

Research design in this study is non-experimental, descriptive and survey type with quantitative in nature. It includes social support and psychological resilience as variables in which social support acts as predictor variable while psychological resilience as criterion variable and age, gender, family type, location and income status as demographic variables. Present study is conducted in Cuddalore district of Tamil Nadu, India with 280 obese participants.

Table 1, *Descriptive statistical details with respect to age, gender, social support, self-esteem and mental health among non-obese (295).*

	Obese	
	Frequency	Percentage
<u>Age Group</u>		
15 to 25	46	16.1
26 to 35	87	30.5
Above 35 years	152	53.3
<u>Gender</u>		
Male	81	28.4
Female	204	71.6
<u>Family Type</u>		
Joint	88	30.9
Nuclear	197	69.1
<u>Location</u>		
Urban	96	33.7
Rural	189	66.3
<u>Income status</u>		
Low income	218	76.5
Middle income	43	15.1
High income	24	8.4
Total	285	100

Table 1 showed the frequency of each demographic variables namely age, gender, family type,

location, and income status among 285 obese people. The obesity prevalence was limited and it vary with respect to demographic variables. Control of Diabetes in India (2017) reported that the prevalence of obesity was high in adult with age group above 40 years (Venkatrao et al., 2020). Past studies conducted by Al-Raddadi et al., 2019; Dwivedi et al., 2019; Djalalinia et al., 2020; and Adeloje et al., 2021 revealed that obesity among female was more common than male. Among family type it was more prevalence among nuclear family. Many previous obesity studies by Singh et al., 2014; Laxmaiah et al., 2006; Kumar et al., 2011; and Gupta et al., 2013 reported obesity prevalence was high in nuclear family type. Obesity report with respect to demographic location suggested that risk rate was high among rural areas, but adult obesity was more common among urban population (Cohen et al., 2018). Analytical report from 147 countries stated that high income countries showed higher adult obesity rate with high male obesity, while female from low economic countries such as Sub-Saharan Africa, South Asia, Latin America & Caribbean and Middle East & North Africa have greater risk for obesity (Talukdar et al., 2020).

Measuring Tools:

It includes the following measuring scales,

1. **Demographic Sheet:** Demographic sheet contains data related respondents' age (age group from 15 to 25, 26 to 35 and above 35) gender (male and female), family type (joint and nuclear), location (urban and rural), income status (below 15,000 INR as Low, 15,001 to 30,000 INR as Middle and above 30,001 as high) in semi-structured questionnaires.
2. **Body Mass Index:** It is an anthropometric measurements to access amount of fat deposition in body and where calculated from weight and height of an individual. Body mass index (BMI) above 30 kg/cm² denotes obesity. It has three sub-classes as Class I (30 to 34.9 kg/cm²), Class II (35 to 39.9 kg/cm²), and Class III (above 40 kg /cm²).
3. **Multi-Dimensional Perceived Social Support scale (MDPSS):** It was developed by Zimet et al (1988) with 12 items as seven point Likert type scale with responses from very strongly disagree to very strongly agree. It measures perceived social support related family support, friend support and significant other. Recent study by Wittenborn et al (2020) reported very high Cronbach's α value (0.92 and 0.93).
4. **The Psychological Resilience Scale (PRS):** it was developed by Rizwan Hasaan Bhat and Shah Mohamed Khan (2018) based resilience scale of Wagnild and Young (1993) which has 25 items in 7 point Likert scale. Bhat and Khan (2018) reduced it into 21 items in five-point Likert type with responses in strongly disagree to strongly agree as 'strongly disagree', 'Disagree', 'Uncertain', 'Agree', and 'strongly Agree'.

Results and Discussions

In order to check pattern of data distribution, the test of normality were performed in latest version SPSS. It revealed data distribution were not in normal pattern. Thus, the researchers were used non-parametric test such as Man-Whitney test and Kruskal Wallis test to find out age, gender, family, location and income difference among obese people. While the influence of social support on resilience were carried using multiple linear regression analysis.

Social Support:

This study aimed to investigate the influence of social support on psychological resilience among obese people. Further to find out age, gender, family, location and income difference in said variables.

The level of social support among obese people is also investigated. The findings of the above cited objectives are given in following tables.

Table 2, *Descriptive statistical details of social support among obese (285).*

Social Support	Range	Obese	
		Frequency	Percentage
Low	12 - 33	17	6
Moderate	34 - 60	49	17
High	61 - 84	219	77
Total		285	100

Table 2 described the level of social support among 285 obese with 77% of obese people have perceived high social support, while 17% moderate and only 6% have perceived low social support. This finding goes in line by line with previous studies as there was relationship between obesity and high social status (Vartanian & Silverstein, 2013), social support structure have positive relationships with high BMI (Shenk et al., 2021), perceived social support creates higher chance for obesity due to possibilities to get easy access towards abnormal food behaviour due over parental care and easy food access (Iguacel et al., 2020), and high social ties in obesigenic environment give room for obesity risk (Christakis & Fowler., 2007).

Table 3, *Age difference in social support by using Mann-Whitney test among obese people*

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig.(2-tailed)
15 to 25 years	46	112.59				
26 to 35 years	87	150.42	66.63	14.10	8.213	.016
Above 35 years	152	147.96				
Total	285					

Table 3 described age difference in social support with Kruskal-Wallis test among obese people and stated presence of statistical significant age difference with respect to different age group showed significant high social support among age group 26 to 35 years with mean rank 150.42 and among age group above 35 years with mean rank 147.96 than age group 15 to 25 years with mean rank 112.59, N= 285, Kruskal Wallis H = 8.213, p = .016. This findings goes with previous studies as older people have better social support with good mental health than young one (Tyler & Hoyt, 2000), Aged people in secured family showed better social support in same family (Wojszel & Politynska, 2021), experienced older staff have showed good social support (Cai et al., 2020), while young employee who have better education and high quality lifestyles might perceive good social support than others (Alcañiz & Solé-Auró, 2018).

Table 4, Gender difference in social support by using Mann-Whitney test among obese people

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Male	81	141.68	11476.00	Mann-Whitney U	8155.000	
Female	204	143.52	29279.00	Wilcoxon W	11476.000	.859
Total	285			Z	-.178	

Table 4 described gender difference of social support among obese people using Mann-Whitney test. It showed social support have no significance gender difference. The mean rank for female was 143.52, the mean rank for male was 141.68, N=285, Mann-Whitney U is 8155.000, Wilcoxon W is 11476.000, Z = -.178, p = .859. These findings goes opposite from statistical significance with past studies as female showed high perceived social isolation (Neil-Sztramko et al., 2020), perceived support especially in female acted as buffering effect on mental health (Alsubaie et al., 2019), expressive trait type female showed better social support than male in same traits (Matud et al 2019).

Table 5, Family difference in social support by using Mann-Whitney test among obese people

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Joint	88	142.81	12567.00	Mann-Whitney U	8651.000	
Nuclear	197	143.09	28188.00	Wilcoxon W	12567.000	.978
Total	285			Z	-.028	

Table 5 described family difference of social support among obese people using Mann-Whitney test. It stated there was no statistical significance in family difference among obese with average similar mean rank as 143.09 in nuclear and 142.81 in joint family, N=235, Mann-Whitney U is 8651.000, Wilcoxon W is 12567.000, Z = -.028, p = .978. This finding goes towards significance family difference with previous studies as there was no gender difference in social support but it enhance treatment adherence (Miller and Dimatteo, 2013), cancer patient from middle class family have perceived family support irrespective of family type (Taylor et al., 1986), and close family support played as main support structure apart from family type (Shanas 1979),

Table 6, Location difference in social support by using Mann-Whitney test among obese people

	<i>N</i>	<i>Mean Rank</i>	<i>Sum of Ranks</i>	<i>Test</i>	<i>Social Support</i>	<i>Asymp. Sig. (2-tailed)</i>
Urban	96	124.85	11985.50	Mann-Whitney U	7329.500	
Rural	189	152.22	28769.50	Wilcoxon W	11985.500	.006
Total	285			Z	-2.769	

Table 6 described location difference of social support among obese people using Mann-Whitney test and stated social support have statistical significance location difference with high mean rank among rural as 152.22, than urban with mean rank as 124.85, N=285, Mann-Whitney U is 7329.500, Wilcoxon W is 11985.500, Z = -2.769, p = .006. This finding was supported in line by line with past studies as gap in adult child caregiver relationship have significant role with social support (Li

et al., 2021) and emotional and social loneliness which was high among urban showed significant association with social support (Labrague et al., 2017).

Table 7, Income difference in social support by using Mann-Whitney test among obese people

	<i>N</i>	<i>Mean Rank</i>	<i>Mean</i>	<i>Standard Deviation</i>	<i>Kruskal-Wallis H</i>	<i>Asymp. Sig.(2-tailed)</i>
Low income	218	161.78				
Middle income	43	94.06	66.63	14.10	55.435	.000
High income	24	60.13				
Total	285					

Table 7 described income difference of social support among obese people using Mann-Whitney test and stated that social support have statistical significance income difference with high mean rank among low income people as 161.78, than middle income with mean rank 94.06 and high income with mean rank 60.13, $N = 285$, $Kruskal-Wallis H = 55.435$, $p = .000$. This finding was supported in line by line with previous studies as there was significant relationship between social support and income of family especially among low income people (Carlson et al., 2019), in low income people social support played mediator role with mental health than high income people (Ashley et al., 2020), and high social support among low income people significantly helped to avoid unintentional pregnancy (Feld et al., 2020),

Psychological Resilience:

As discussed earlier psychological resilience plays as prime protective action in terms of body mass index. The researchers also aimed to examine age, gender, family, location and income difference and the level of psychological resilience. The findings of the above cited objectives are given in following tables.

Table 8, Descriptive statistical details of resilience among obese people

<i>Resilience</i>	<i>Raw Score</i>		<i>Obese</i>	
	<i>Range</i>	<i>Z-Score Range</i>	<i>Frequency</i>	<i>Percentage</i>
Extre. Low	21 - 50	-2.01 & below	15	5
Low	51 - 61	-2.00 to -1.26	25	9
Below.Ave	62 - 71	-1.25 to -0.51	27	10
Average	72 - 85	-.050 to 0.50	175	61
Above Ave	86 - 95	0.51 to 1.25	22	8
High	96 - 105	1.26 to 2.00	21	7
Extre.High	106 & above	2.00 & above	-	-
Total			285	100

Table 8 described frequency distribution related to level of psychological resilience based on z-score calculations with respect to study population and showed 61% of obese people were in average level, while 24% were from lower level and only 15% from higher level in resilience. This finding goes

in line side by side with previous studies as resilience showed protective role with mental health especially among obese people Luthar et al., 2000), high BMI student have better resilience than low BMI student (Secer and Yildizhan., 2020), and aged obese people with optimum health have showed high resilience than unhealthy aged obese (Lutz et al., 2016).

Table 9, Age difference in resilience by using Kruskal-Wallis test among obese.

Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	46	91.26				
26 to 35 years	87	150.25	80.14	12.48	25.661	.000
Above 35 years	152	154.51				
Total	285					

Table 9 described age difference in resilience among obese people using Kruskal-Wallis test and showed resilience have statistical significant age difference with respect to different age group and it increases with age, N= 285, Kruskal Wallis H = 25.661, p = .000. This finding goes in line by line with previous studies as adult with age above 40 years have better psychological resilience than people with age below 40 years (Cohen et al., 2014), adult with better resilience have good quality of life (Yazdi-Ravandi et al., 2012), and experience person have real resilience with an increase in age (Syed et al., 2020).

Table 10, Gender difference in resilience by using Kruskal-Wallis test among obese.

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	81	152.16	12325.00	Mann-Whitney U	7520.000	
Female	204	139.36	28430.00	Wilcoxon W	28430.000	.199
Total	285			Z	-1.284	

Table 10 described gender difference of resilience among obese using Mann-Whitney test and stated that resilience have no statistical significance gender difference. The mean rank for female was 139.16, the mean rank for male was 125.16, N= 285, Mann-Whitney U was 7520.000, Wilcoxon W is 28430.000, Z = -1.284, p = .199. This finding goes in line by line for significance gender difference with previous studies as in 21st century especially socio-cultural conditions help female population to handle challenging situations (Jordan 2018), female showed good disaster resilience than male (Chisty et al., 2022), while male showed better resilience in trauma (Portnoy et al., 2018).

Table 11, Family difference in resilience by using Kruskal-Wallis test among obese

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Joint	88	147.51	12980.50	Mann-Whitney U	8271.500	
Nuclear	197	140.99	27774.50	Wilcoxon W	27774.500	.503
Total	285			Z	-.670	

Table 11 described family difference of resilience among obese people using Mann-Whitney test and showed resilience no statistical significance family difference. The mean rank for nuclear family type was 140.99, the mean rank for joint was 147.51, N=285, Mann-Whitney U is 8271.500, Wilcoxon W is 27774.500, Z = -.670, p = .503. This finding goes in line by line with significance family difference in previous studies as there was significant relationship between resilience and familial factors (Hawley & DeHaan, 1996), resilience in family decides resilience of an individual (Dong et al., 2020), resilience also depended on family finance, culture, parenting, home life (Graber et al., 2015).

Table 12, Location difference in resilience by using Kruskal-Wallis test among obese

	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Urban	96	124.85	11985.50	Mann-Whitney U	7257.500	
Rural	189	152.22	28769.50	Wilcoxon W	11913.500	.003
Total	285			Z	-2.996	

Table 12 described location difference of resilience among using Mann-Whitney test and showed resilience have statistical significance location difference with significantly high mean rank in rural than urban people. The mean rank for rural was 152.22, the mean rank for urban was 124.85, N=285, Mann-Whitney U is 7257.500, Wilcoxon W is 11913.500, Z = -2.996, p = .003. This finding goes in line by line with previous studies as resilience was correlated with social ties with in relation to location (Wells 2010), there was relationships between the dimensions of psychological resilience such as risk perception and perceived hazard knowledge with demographic location (Chen et al., 2021), and community size have significant correlation with resilience (Kimhi et al.,2020).

Table 13, Income difference in resilience by using Kruskal-Wallis test among obese

	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig.(2-tailed)
Low income	218	162.49				
Middle income	43	81.02	80.14	12.48	61.173	.000
High income	24	77.02				
Total	285					

Table 13 described income difference of resilience among obese using Mann-Whitney test and stated resilience have statistical significance income difference with respect to different income status from low income to high income in which low income have significantly high mean rank which as 162.49, than middle income with rank 81.02 and high income with rank 77.02, N=285, *Kruskal-Wallis H* = 61,173, p = .000. This finding goes in line by line with previous studies as income status played as prime decider of resilience (Bonanno et al., 2007), there was positive associations between income status and resilience (Kimhi et al.,2020), and married earning person have significant high resilience than un-earning person (Gruebner et al., 2015).

Influence of social support on resilience:

Further, the researcher aimed to analyse prediction of psychological resilience by social support

among obese people which can be analysed using multiple linear regression analysis in latest version SPSS as follows.

Table 14, *Regression analysis shows the influence of social support, and self-esteem on Mental Health among obese (203) populations.*

Predictor Variable	Criterion Variable	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value
Social Support	Resilience	.602	.362	.360	9.986	.532	.042	.602	12.676	.000

Table 14 represented multiple linear regression analysis among obese people to identify influence of social support on resilience using SPSS latest version. The predictor variable have statistically significant influences over criterion variable as social support have significant positive influence over resilience, $p = .000$, $R = .602$, $R^2 = .362$, $adjusted R^2 = .360$. The co-efficient (B) for social support was .532, which stated an increase in one part of social support will increase mental health with .532 points. The R^2 value showed co-efficient of determination and denoted social support contributed 36.2% in determination of psychological resilience. This finding goes in line side by side with previous studies as social support from parent provided protective role from bullying and weight victimization (Yourell and Doty., 2021), Abnormal food behaviour can be controlled by resilience with high social support and less social stress (McGarritty et al., 2022), there was positive relationships between family support and child resilience (Rollins et al., 2022), and resilience and social support negatively associated with food addictions (Li et al., 2021),

Conclusion:

Obesity are becoming as major challenges in era of 21st century due to its impact on physical, social and psychological health of an individual. Each one of obese people in world population are either affected with any one of consequences such as physical, social or psychological. Irrespective of biological or genetic causes of obesity, we can manage and avoid consequences of obesity toward physical, social or psychological one through appropriate social support and enhancing psychological resilience. These variables help obese person in their behavioural intervention against physical, social and psychological consequence of obesity.

Present study stated obese people were in healthy and comfortable state with high perceived social support and high psychological resilience. Both social support and resilience acted as key factors in mediating and preventing action against physical, social and psychological consequences of obesity. This exploratory study further revealed social support showed presence of significant age difference (p value = .000) as age increases social support also increased, significant location difference (p value = .006) in which rural obese have better social support than urban obese people, and significant income difference (p value = .000) means low income obese have high perceived social support than middle and high income people. Similarly resilience have showed significant age difference (p value = .000), location difference (p value = .003), and income difference (p value = .000) as same as perceived social support. Thus, adult people with age above 35 years old, rural and low income people irrespective of gender and family type have high perceived social support and high resilience. Further, social support

have significant positive influence over resilience, $p = .000$, $R = .602$, $R^2 = .362$, $adjusted\ R^2 = .360$ and the co-efficient (B) for social support was .532. It denoted an increase in one part of social support will increase mental health with .532 points. The R^2 value showed co-efficient of determination and denoted social support contributed 36.2% in determination of psychological resilience. Thus, perceived social support plays direct as well as indirect role over body mass index especially obese. These research outputs help policy maker and makes room for further researches in order to identify the dimensions of resilience with their prediction over mental health and body mass index.

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mental health through social stigma, teasing, bullying, weight stigma, body dissatisfaction, low social support and low self-esteem (Puhl & Heuer, 2010). A community-based review study stated that around 80% of studies related to obesity revealed presence of depression, but only 53% studies in depression defined about obesity (Faith et al., 2011). Thus, obesity acts as main causation for poor mental health. Obesity have strong correlation with emotional disorder especially with women (Scott et al., 2007; Simon et al., 2006). National Health Insurance Database of Korea showed unhealthy obese people with metabolic disease and healthy obese female with metabolic disease have strong relationship with depression (Seo et al., 2020).

OBJECTIVE OF THIS STUDY

1. To find the influence of social support on mental health among obese people.
2. To investigate gender difference in social support and mental health among obese people.
3. To investigate age difference in social support and mental health among obese people.
4. To know the level of social support and mental health among obese people.

METHODOLOGY

Present study is an exploratory, quantitative, non-experimental, survey type study with descriptive in nature.

VARIABLE

Social support and mental health are psychological variables in which mental health is dependent variable (criterion variable) while social support as independent variables (predictor variables). The demographic variables defined in this study are age and gender.

SAMPLING

This study were carried as community study in which prime focus of data collection is from public people. The researchers have performed this proposed study in Cuddalore district of Tamil Nadu, India. Research design includes purposive sampling technique and the criteria for selection of sample are obese people above 15 years old, from Cuddalore district, and belonging to urban and rural areas.

Table 1: Descriptive statistical details with respect to age, gender, social support, self-esteem and mental health among obese (203).		
	Frequency	Percentage
Age Group		
15 to 25	49	24
26 to 35	72	36
Above 35 years	82	40
Gender		
Male	84	41
Female	119	59
Total	203	100

Table 1 described frequency of observation in each subgroup with respect to age and gender among obese. The prevalence of obesity is much higher among people above 35 years old. This prevalence was supported by one previous study carried based on Niyantrita Madhumeha Bharata Data in project Control of Diabetes in India during 2017 stated that obesity prevalence gets increase in greater extent among people in age group above 40 years old (Venkatrao et al., 2020). The prevalence of obesity with respect to gender have showed women population has higher percentage than men population as seen in present study in which 59% female have in obese than 41% male obese. This findings were supported by many previous studies as seen in Dwivedi et al., 2019; Lartey et al., 2019; Al-Raddadi et al., 2019; Andoy-Galvan et al., 2020; Djalalinia et al., 2020; and Adeloeye et al., 2021.

Measuring Tools:

In this study, the researchers used the following measuring scales,

1. **Demographic Sheet:** It includes questionnaires related to participants' personal information.
2. **Body Mass Index:** It is a calculation to identify level of fat deposition based on weight and height of participant (weight of an individual in kilogram divided by square of height of an individual in centimeter). WHO classified it as underweight, normal weight, overweight and obese
3. **Multi-Dimensional Perceived Social Support Scale (MDPSS):** It is used for measuring perceived social support especially family support, friend support and significant other. This scale was constructed by Zimet et al (1988) and has 12 items as likert type scale with seven responses 1 to 7 (Very Strongly Disagree to

Very Strongly Agree). It have showed very high Cronbach's α value which is in between 0.92 and 0.93 for 12 items in recent study by Wittenborn et al (2020).

4. **The Mental Health Inventory (MHI-38):** It is developed by Veit & Ware (1983) and used for measuring mental health of an individuals. It consist of 38 items in 6 point likert type responses and it has two global scale namely psychological well-being and psychological distress. It also have six subscales as anxiety, depression, behavioural control, positive affect, emotional ties and Life satisfaction.

RESULTS AND DISCUSSIONS

The present study aimed to predict the influence of social support on mental health. Further to investigate gender and age difference in said variables. The level of social support and mental health among obese people is also investigated. The findings of the above cited objectives are given in following tables.

Table 2: Descriptive statistical details of social support among obese (203).			
Social Support	Range	Obese	
		Frequency	Percentage
Low	12 - 33	14	7
Moderate	34 - 60	40	20
High	61 - 84	149	73
Total		203	100

Table 2 showed descriptive statistical details of social support among 203 obese. It revealed 76% of obese people have scored high social support, while 20% have scored moderate social support and only 7% have low social support. This finding goes in line side by side with previous studies as obesity was associated with high social status (Vartanian & Silverstein, 2013), support system have positive correlation with overweight and obesity (Shenk et al., 2021), high social supports brought to obesity through easy access to social vulnerable environment like over parental care and easy food access (Iguacel et al., 2020). Thus, emerging prevalence of obesity as seen oin present study may be due to high perceived social support from family, friend, social structure or social relations.

Table 3: Descriptive statistical details of mental health among obese (203).				
Mental Health	Raw Score Range	Z-Score Range	Obese	
			Frequency	Percentage
Extremely Low	38 - 104	-2.01 & below	7	3
Low	105 - 115	-2.00 to -1.26	12	6
Below Average	116 - 127	-1.25 to -0.51	22	11
Average	128 - 144	-.050 to 0.50	112	55
Above average	145 - 155	0.51 to 1.25	34	17
High	156 - 167	1.26 to 2.00	13	6
Extremely High	168 & above	2.00 & above	3	2
Total			203	100

Table 3 stated descriptive statistical details of mental health among 203 obese people. It revealed around 55% of them have scored average level of mental health, 25% of them in above average and high mental health, while only 20% were from below and low mental health. The level of mental health among obese were prepared based on z-score calculation in which majority of obese people were scored mental health in average and below average level. only 6% of them have scored high and 2% in extremely high level of mental health. This finding further supported by many previous studies as there was strong relationships between mental health and obesity as obesity acted as risk factor for anxiety, depression, and stress (AlQahtani et al. 2015). Patient with obese have greater chance to get depression (Milano et al., 2020). Perceived physical health acted as the strongest predictor of mental health among obese people (Knoesen et al. 2010). Further, it is stated that within obese people women population have high mental health issue like emotional instability, anxiety and depression than men (Sharafi et al. 2020).

Table 4: Regression analysis shows the influence of social support, and self-esteem on Mental Health among obese (203) populations.										
Predictor Variable	Criterion Variable	R	R ²	Adjusted R ²	Std Error of Estimate	B	Std. Error	β	t-value	p-value

Social Support	Mental Health	.356	.127	.122	14.879	.395	.073	.356	5.400	.000

Table 4 showed linear regression analysis to know influence of social support on mental health among obese people using SPSS latest version. The predictor variable social support have statistically significant influences over criterion variable mental health. Social support have significant positive influence on mental health, $p = .000$, $R = .356$, $R^2 = .127$, adjusted $R^2 = .122$. The regression co-efficient (B) for predictor variable social support is .395, which revealed an increase in one part of perceived social support will increase the criterion variable mental health with .395 points. The R^2 value denoted co-efficient of determination which means social support contributed 12.7% in prediction of mental health. This finding is in line side by side with many previous studies as social support with pampered parenting have higher obesity rate (Yoshida et al., 2020), social support has buffering action on mental health and body mass index (Xie et al., 2005), mental health issues depend on perceived social support and self-acceptance (Hwang et al., 2016) and Social support shapes exercise and food behaviours among obese people (Guevara-Valtier et al., 2021).

Table 5: Gender difference in social support among obese by using Mann-Whitney Test						
	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	84	106.82	8973.00	Mann-Whitney U	4593.00	.313
Female	119	98.60	11733.00	Wilcoxon W	11733.00	
Total	203			Z	-1.008	

Table 5 revealed that gender difference in social support among 203 obese people using non-parametric test Mann-Whitney test. Even though male obese have scored higher mean rank than female obese people, it showed there is no significant gender difference between male and female among obese people. Social support have statistically insignificant higher mean in male obese (mean rank = 106.82) than female obese (mean rank = 98.60) with $U = 4593.00$, Wilcoxon $W = 11733.00$, $Z = -1.008$, $p = .313$. These findings goes in line with previous studies with significant output as female have significant high perceived social loneliness and isolation (Neil-Sztramko et al., 2020), perceived support among female helps to buffer their mental health (Alsubaie et al., 2019), women people have perceived high social support only in expressive trait while other traits men have high perceived social support (Matud et al 2019).

Table 6: Gender difference in mental health among obese by using Mann-Whitney Test.						
	N	Mean Rank	Sum of Ranks	Test	Social Support	Asymp. Sig. (2-tailed)
Male	84	106.76	8967.50	Mann-Whitney U	4598.50	.332
Female	119	98.64	11738.50	Wilcoxon W	11738.50	
Total	203			Z	-.970	

Table 6 revealed that gender difference in mental health among 203 obese people using Mann-Whitney test. Even though male obese have scored higher mean rank in mental health than female obese people, it showed that there was no significant gender difference in mental health between male and female among obese people. Mental health have statistically insignificant higher mean in male obese (mean rank = 106.76) than female obese (mean rank = 98.64) with $U = 4598.50$, Wilcoxon $W = 11738.50$, $Z = -.970$, $p = .332$. This finding goes in line with previous studies as mental health have showed mean difference based on social type and not by gender (Kiely et al., 2019), and mental health have no significant gender differences among students (Liu et al., 2020), gender differences in mental health have as conflicting evidence due to psychopathology within women (Dhejne et al., 2016), gender differences in mental health also change with age groups like conduct disorder were common in boy in childhood (Scott 1998).

Table 7: Age difference in social support among obese by using Kruskal-Wallis Test.						
Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	49	89.49	65.31	14.32	6.044	.049

26 to 35 years	72	97.51				
Above 35 years	82	113.41				
Total	203					

Table 7 stated that age difference in social support among 203 obese people using Kruskal-Wallis test which revealed that there is significant mean difference in social support among different age groups with 49 observations from age group 15 to 25 years old, 72 observations from age group 26 to 35 years old and 82 observations age group above 35 years old, Kruskal Wallis $H = 6.044$, $p = .049$, with a mean rank social support score of 89.49 for 15 to 25 years, 97.51 for 26 to 35 years and 113.41 for above 35 years. Comparatively age group above 35 years took higher social support mean rank than 26 to 35 years and 15 to 25 years old. The overall mean and standard deviation of social support is 65.30 and 14.31 respectively. This finding goes in line with previous studies as aged people have good social support than young to prevent their mental abnormalities (Tyler & Hoyt, 2000), older people with secured family have high perceived social support than young people from same family (Wojszel & Politynska, 2021), experienced aged staff have high social support than new one (Cai et al., 2020), but young employee with good education and healthier lifestyles may perceive better social support than other employees (Alcañiz & Solé-Auró, 2018).

Table 8: Age difference in mental health among obese by using Kruskal-Wallis Test.						
Age	N	Mean Rank	Mean	Standard Deviation	Kruskal-Wallis H	Asymp. Sig. (2-tailed)
15 to 25 years	49	87.86	135.96	15.882	9.390	.009
26 to 35 years	72	94.51				
Above 35 years	82	117.03				
Total	203					

Table 8 stated that age difference in mental health among 203 obese people using Kruskal-Wallis test which revealed that there is statistically significant mean difference in mental health among different age groups with 49 observations from age group 15 to 25 years old, 72 observations from age group 26 to 35 years old and 82 observations age group above 35 years old, Kruskal Wallis $H = 9.390$, $p = .009$, with a mean rank in mental health score of 87.86 for 15 to 25 years, 94.51 for 26 to 35 years and 117.03 for above 35 years. Comparatively age group above 35 years took higher self-esteem mean rank than 26 to 35 years and 15 to 25 years old. The overall mean and standard deviation of social support is 135.96 and 15.88 respectively. This findings goes in line with previous studies there was change in mental health disorders with respect to age like conduct disorders more in childhood, while anxiety and substance use was high in adolescence and psychotic disorders was more common in early adulthood (de Girolamo et al., 2011), mental health issues were high in childhood or adolescents and gets decrease as age proceeds (Kessler et al., 2007), mental health have significant age difference only based on category distribution and not merely by age (Li et al., 2021), and older age peoples gets mental health issues based on their parenting social involvement or marital life (Becker et al., 2018).

CONCLUSION

Obesity is becoming as emerging health problem throughout world population due to its nature of consequences towards medical problem and psychosocial disturbances (Kopelman et al., 2010). Indian datasets in obesity also revealed harmful nature of obesity especially among young population (Luhar et al., 2020). Mental health and obesity have bidirectional correlation between them as obesity increases mental health decrease, similarly low mental health acted as risk factor for obesity. Thus, maintaining mental health as well as body mass index is very important in order to avoid mental health issues and obesity. Social support have major role in controlling mental health and obesity. Social support mediate or enhance mental health through perceived support structure, healthy self-esteem favours optimum mental health. In obese people, social support promotes health behaviours like increasing physical activity and healthy food habits to maintain body mass index in normal by shifting energy balance either in neutral or negative side. The researches recommended policy maker in mental health and obesity to consider social support as main contributing performer in weight reduction program. Few previous studies revealed low social support acted as causation for obesity, but present study revealed prevalence of high perceived social support have seen among obese people. These facts suggested that emerging obesity issue is due to improper and unhealthy lifestyle with high social support which give path to further research in mental health and obesity.

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AUTHOR DETAILS:**¹M. YOUSUF ADAM AND ²DR. MOHAMMAD AMIN WANI**¹Ph.D Scholar and ²Assistant Professor Psychology, Lovely Professional University, Punjab

Appendix-06

LIST OF CONFERENCES

No	Title of paper presentation	Name of conference	Present -ed date	Mode of Conference	Organized by
1.	Role of Health Psychology in School Based Centred Care as Path to strengthen Physical, Social and Mental Health	International Conference on Making Psychology Deliverable to the Society	20 - 22nd December 2019.	International Conference on Psychology (Offline)	Pondicherry University & National Academy of Psychology (NAOP)
2.	Projective Techniques in Obesity Prevention and Control –A Review Study	International conference on Projective Psychology	30th Jan - 1st Feb 2020.	International conference on Projective Psychology (Offline)	SGT University & Somatic Inkblot Society
3.	ABC Policy to Food Policy on Climate change and Obesogenic Environment	International Conference on Media, Environment & Politics	4th - 6th March 2020.	International Conference on Media, Environment & Politics (Offline)	Pondicherry University & German Universities
4.	What Is There In Women Distress? Did They Be In Safety During Covid-19 Pandemic And Post Covid-19 Periods	12th International Conference on “Safety and Security of Women in the Contemporary World: Issues and Challenges	4 th Dec- 2020.	International Conference (Online Mode)	Punjabi university, Patiala
5.	Beware: The Most Serious Issues Happened Due to COVID-19 and Lockdown	ICBPO 2020,	7 th Nov- 2020.	International Conference (Online Mode)	CHRIST (Deemed to be University) Delhi NCR

6.	Obesity: Social Etiological Factors and Social Issues in Society	Two Day National Colloquium on Good Health and Well-Being	17th - 18th Oct 2019	National Seminar (Offline Mode)	University of Madras & RC 12: Sociology of Health, Ageing and Well-Being, Indian Sociological Society
7.	Internet Addiction: Impacts on Physical, Social and Mental Health	Impress-ICSSR Sponsored Two Days National Seminar	18th - 19th Oct 2019	National Seminar (Offline)	Annamalai University
8.	Connectionist paradigm as an essence of artificial intelligence in linguistics	International Seminar on Challenges for Language Technology (ChaLT – 2020)	6th - 7th Feb 2020	International Seminar	Annamalai University
9.	Mental health issues and consideration in post covid-19 era	National E-conference on Education and Development: Post Covid-19	26th September 2020	National E-conference	Lovely Professional University

INTERNATIONAL CONFERENCE ON POLITICS, MEDIA AND ENVIRONMENT: INDIAN AND EUROPEAN EXPERIENCE

04 - 06 March, 2020

Certificate

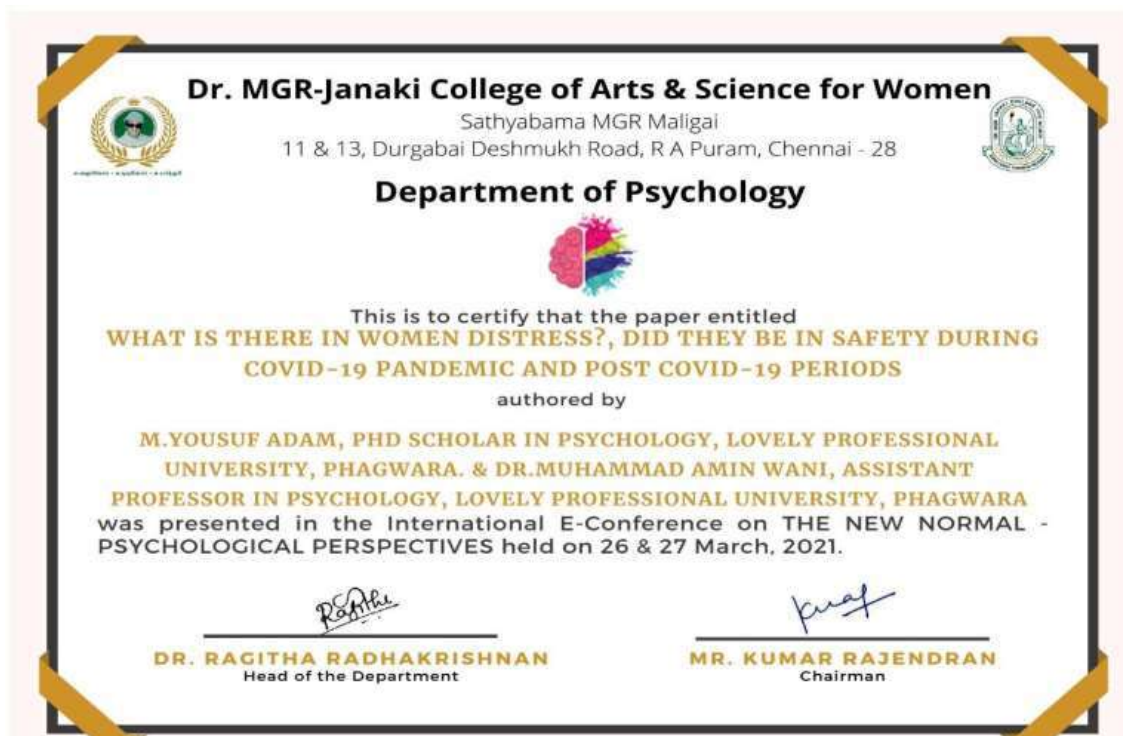
This is to certify that Shri. M.Yousuf Adam, Research Scholar, Department of Psychology, Lovely Professional University, Punjab has actively participated at the International Conference on Politics, Media and Environment: Indian and European Experience, organised by Pondicherry University, India in collaboration with Heinrich-Heine University Dusseldorf, Ruhr University Bochum and Justus-Liebig University, Giessen, Germany during 04-06, March 2020 at Pondicherry University, Puducherry- 605 014, India and presented a research paper entitled ABC Policy to Food Policy on Climate Change and Obesogenic Environment.



Prof. Dettlef Briesen
Principal Conference Organizer

Prof. Gurmeet Singh
Vice-Chancellor
Pondicherry University





This is to certify that DR./MR./MS. Mr. Yousuf Adam of _____
 _____ has participated/presented
 a paper entitled/acted as: WHAT IS THERE IN WOMEN DISTRESS?, DID THEY BE IN SAFETY DURING COVID-19 PANDEMIC AND POST COVID-19 PERIODS
 _____ in the 12th International Conference on "Safety and Security
 of Women in the Contemporary World: Issues and Challenges" held at Punjabi university, Patiala on December 4, 2020

Prof.(Dr.) Ritu Iehal
 Conference Directorate

LOVELY FACULTY OF BUSINESS AND ARTS

[Under the Aegis of Lovely Professional University, Jalandhar-Delhi G.T. Road, Phagwara (Punjab)]

Certificate No. 208571

Certificate of Presentation

This is to certify that Dr./Mr./Ms. M.Yousuf Adam
of Lovely Professional University, Phagwara
presented a paper entitled Mental Health issues and consideration in post covid-19 era
in **National E-Conference on Education and Development : Post COVID-19** organized on 26th September 2020 by School
of Education, Lovely Professional University, Punjab.

Date of Issue : 05-10-2020
Place of Issue: Phagwara (India)


Prepared by
(Administrative Officer-Records)


Organizing Secretary


Conference Director



ANNAMALAI UNIVERSITY

(Accredited with NAAC, 'A' Grade)



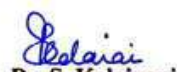
DEPARTMENT OF EDUCATION
(UGC - SAP - DRS - II Approved Department)
IMPRESS - ICSSR SPONSORED
Two Days National Seminar
on

EDUCATION ON ONLINE RESOURCES AND ONLINE SCAMS

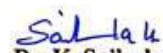
CERTIFICATE

This is to certify that Dr. / Mr. / Mrs. / Ms. **Dr. M.YOUSUF ADAM**, PhD Scholar in Psychology, Lovely Professional University-Punjab has participated / presented a paper entitled **INTERNET ADDICTION: IMPACTS ON PHYSICAL, SOCIAL AND MENTAL HEALTH** in the IMPRESS-ICSSR sponsored National Seminar, **EDUCATION ON ONLINE RESOURCES AND ONLINE SCAMS** organized by the Department of Education, Annamalai University, Annamalainagar 608 002, Tamil Nadu, India on 18th & 19th October, 2019


Prof. R. Babu
Head, Dept. of Education


Dr. S. Kalaivani
Organising Secretary


Prof. R. Gnanadevan
Dean, Faculty of Education


Dr. K. Saileela
Organising Secretary


Prof. N. Krishnamohan
Registrar i/c



ANNAMALAI UNIVERSITY



(Accredited with "A" Grade by NAAC)

CENTRE OF ADVANCED STUDY IN LINGUISTICS

UGC-SAP-V

**International Seminar
on**

**Challenges for Language Technology
(ChaLT - 2020)**

Certificate

This is to certify that Dr./Mr./Ms. *yousuf Adam . M.*

*has participated and
presented a paper entitled Connectionist Paradigm plays as an example
of Artificial Intelligence in Linguistics in the
International Seminar on "Challenges for Language Technology (ChaLT - 2020)" held
at the Centre of Advanced Study in Linguistics, Annamalai University on
06th and 07th February, 2020.*


Prof. R. SARANYA
Director, CAS in Linguistics &
Co-ordinator, UGC-SAP-V
Annamalai University


Prof. N. KRISHNAMOHAN
Registrar &c
Annamalai University

Appendix-07

LIST OF WORKSHOPS

No	Title of Workshops	Date	Mode of workshops	Organised by
1.	BCL2019: Brain, Computation and Learning	24 th July to 29 th July, 2019	BCL2019 one week Workshop	Indian Institute of Science (IISc) Bengaluru
2.	Covariate Based Structural Equation Modelling and Partial Least Squares (SEM-PLS)	19 th December 2019	Pre-conference workshop	Pondicherry University & National Academy of Psychology (NAOP) in International Conference on Making Psychology Deliverable to the Society
3.	Applying SPSS for Educational and Psychometric Data Analysis	17 th July to 21 st July, 2020	5 Days National Level Online Workshop	National Psychological Corporation, Agra (UP)
4.	Construction of Psychological Tools	24 th July to 28 th July, 2020	5 Days National Level Online Workshop	Abhilashi University, Chailchowk, Mandi (UP) & National Psychological Corporation, Agra (UP)
5.	Structural Equation Modelling (SEM) using AMOS & Smart PLS	14 th to 19 th July, 2020	One Week Online Faculty Development Program	CMR College of Engineering & Technology



XXIX Annual Convention of
National Academy of Psychology, (NAOP), India
&
International Conference on
"Making Psychology Deliverable to the Society"
(Pre-Conference Workshop)

Organized by
Department of Applied Psychology, Pondicherry University

Certificate

This is to certify that Prof. / Dr. / Mr. / Ms. M. YOUSUF ADAM participated successfully
from LOVELY PROFESSIONAL UNIVERSITY
in the pre-conference workshop titled "COVARIANCE BASED STRUCTURAL EQUATION MODELING
AND PARTIAL LEAST SQUARES (SEM-PLS)" on 19th December, 2019.


Prof. Surendra Kumar Sia
Organizing Secretary, NAOP-2019


Prof. Damodar Suar
Resource Person of the Workshop





CMR College of Engineering & Technology

(Autonomous), * Approved by AICTE * Affiliated by JNTUH

Accredited By NBA & NAAC with A-Grade

Kandlakoya (V), Medchal Road, Hyderabad – 501401



Department of Master of Business Administration

One Week Online Faculty Development Program on

Structural Equation Modelling (SEM) Using AMOS & Smart PLS

Certificate of Participation

This is to Certify that Dr. M.Yousuf Adam
From Lovely Professional University has participated in One

Week Online Faculty Development Program on “*Structural Equation Modelling (SEM) Using AMOS &*

Smart PLS” held from 14th to 19th July, 2020.

Dr. A. Kotishwar
Head of the Department

Major Dr. V.A. Narayana
PRINCIPAL

