

**A DEEP LEVEL INVESTIGATION OF ROAD ACCIDENTS ON  
PHAGWARA TO JALANDHAR NH-1**

**A RESEARCH REPORT**

Submitted by

**Mumtaz Mohammad Jahangir**

**11600748**

**RC1612A03**

In partial fulfillment for the award of the degree of

**MASTERS OF TECHNOLOGY**

IN

**TRANSPORTATION ENGINEERING**



**L** LOVELY  
**P** ROFESSIONAL  
**U** NIVERSITY

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*Transforming Education Transforming India*

Under the guidance of

**Mr. Waseem Bhat**

**Assistant Professor**

**School of Civil Engineering**

**LOVELY PROFESSIONAL UNIVERSITY**

**Phagwara–144411, Punjab (India)**

## **CERTIFICATE**

It is certified that this project report entitled “A DEEP LEVEL INVESTIGATION OF ACCIDENTS ON PHGWARA TO JALANDHAR NH-1” submitted by “Mumtaz Mohammad Jahangir”, bearing Registration no. 11600748 in partial fulfilment of the requirement for the award of degree M.Tech in Transportation Engineering to Lovely Professional University, Phagwara, Punjab is a record of the candidates own work carried out by him under my supervision. The matter embodied in this thesis is original and has not been submitted for the award of any other degree.

Approved as to style and content by:

Mr. Waseem Akram  
Assistant Professor  
Transportation Engineering

Ms. Mandeep Kaur  
Department Head  
Transportation Engineering

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**Mumtaz Mohammad Jahangir**

**11600748  
RC1612A03**

## **ABSTRACT**

The road mishaps are the major problem for the pathetic countries like India, Pakistan and Bangladesh due to ignorance and now becoming a mass health problem. India is suffering from huge loss of deaths specially youth in the age frame of 16-30 due to road accidents .road accidents are the major human error issue. It is involvement of different causes like human physiological or psychological ,vehicular characteristics, environmental effects and road characteristics ahead or following accident or even during the road accidents, several modified and modern techniques and methodologies are important for minimizing the accidents upto large certain degree. The Administration single-handedly cannot block road misfortunes difficulties. There is necessity of energetic participants to endorse execution of road wellbeing measures. The association of different organizations like traffic police, health sectors and other government and private agencies for giving attention to road safety is necessary. In this fast developing country India the vehicle registration is going high at fast speed with the increase in population and with the increase in economy as well and there is no cap on bank loans from the government to decrease the vehicle registrations. Simple reason is as the number of motor vehicles increase the increase in accidents are common to happen as these two are directly proportional to each other. The contemporary study provide the scale and numerous proportions of road accident in India. The investigation regards this study will support to build attentiveness, strategies and assist in informed decision making on road safety and root of accidents.

The valuable data is used which is taken from different agencies like hospitals, police sources and other shopkeepers those who act as eye witness during the accidents in this region of 23 km of Jalandhar –Phagwara. ), Once accumulating the records, the deep level investigation of blackspots (where extreme road accidents

occur) and other imperfections like unevenness, lack of rumble strips and dreadful conditions in road superficials and deficiency of engineering in design parameters of public road highway from that we can interpret the reason of accidents.

The region on which the investigation is done is from Phagwara to Jalandhar that is of having distance of 23.1 km with high traffic volume all time with great number of accidents as it is corridor to Indian state Jammu and Kashmir and rest of Punjab. The investigation was deep or micro level so that we could get root cause for accidents to be analyzed which involves the pavement design considerations, Vehicle characteristics, Driver characteristics and lastly Environment factor which is essential these days.

Keywords: accidents, asphalt pavement, investigation, vehicle, fatal, Non-fatal

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**1. INTRODUCTION**

In india the vehicle registration rate is very fast as compared to other countries in the world it is not only because India is developing country it is due to the reason that india is highly populated country ranks at second in the world with the population of 1.34 billion as on 30 April 2017. Every day the new vehicles hit the road the number is huge near about 54000 per day and in overall upto 2015 it was almost 1.96 crores that is all time high. It was seen that the annual registration was less than 10 lac in 1993 but suddenly it going on high rate in 2014 that is 1.94 crore and still increasing. It has been also observed the two wheeler registrations are more than others as it fits the common man’s pocket as it also gives good mileage [1].It is noted that in lone 2015 year witness highest number of accidents in India approximately 6 lack which cost 1.5 lack people to be killed and 4.5 lack injured that is record. India sign a pact to Brasilia declaration that India will try to reduce 50% of the accidents by 2020.since the 2000 in India the vehiles increase by 158% and the road length by 39% which is of great difference of ratio between these two.

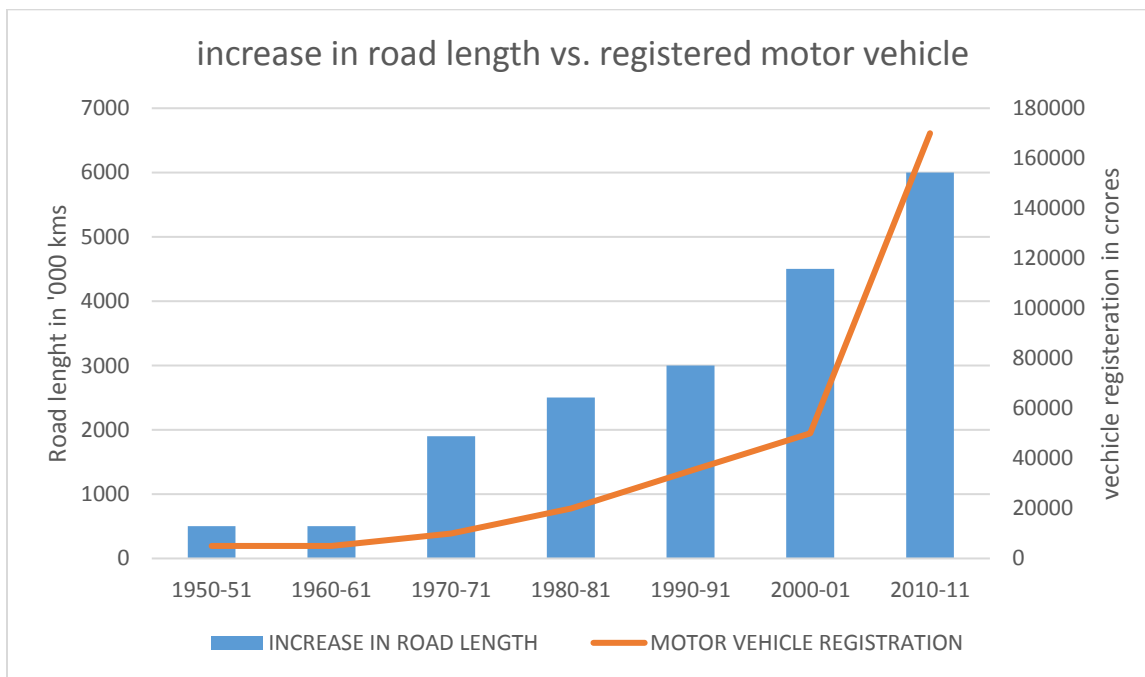


Chart 1-1: Increase in road length vs. registered motor vehicle

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As we can see from the graph that there is 39% in road length but since 2000 the vehicle registration got hiked and upto 158% which is too high it is clear now that the road network cannot be extended due to some physical constraints and less monetary expenditure by government.

It is known factor that the national highways and state highways compromise only 5% of the total road network but consists of 52% of the road accidents what it indicates the high speed from vehicles surpassing the limits and high volume [2].

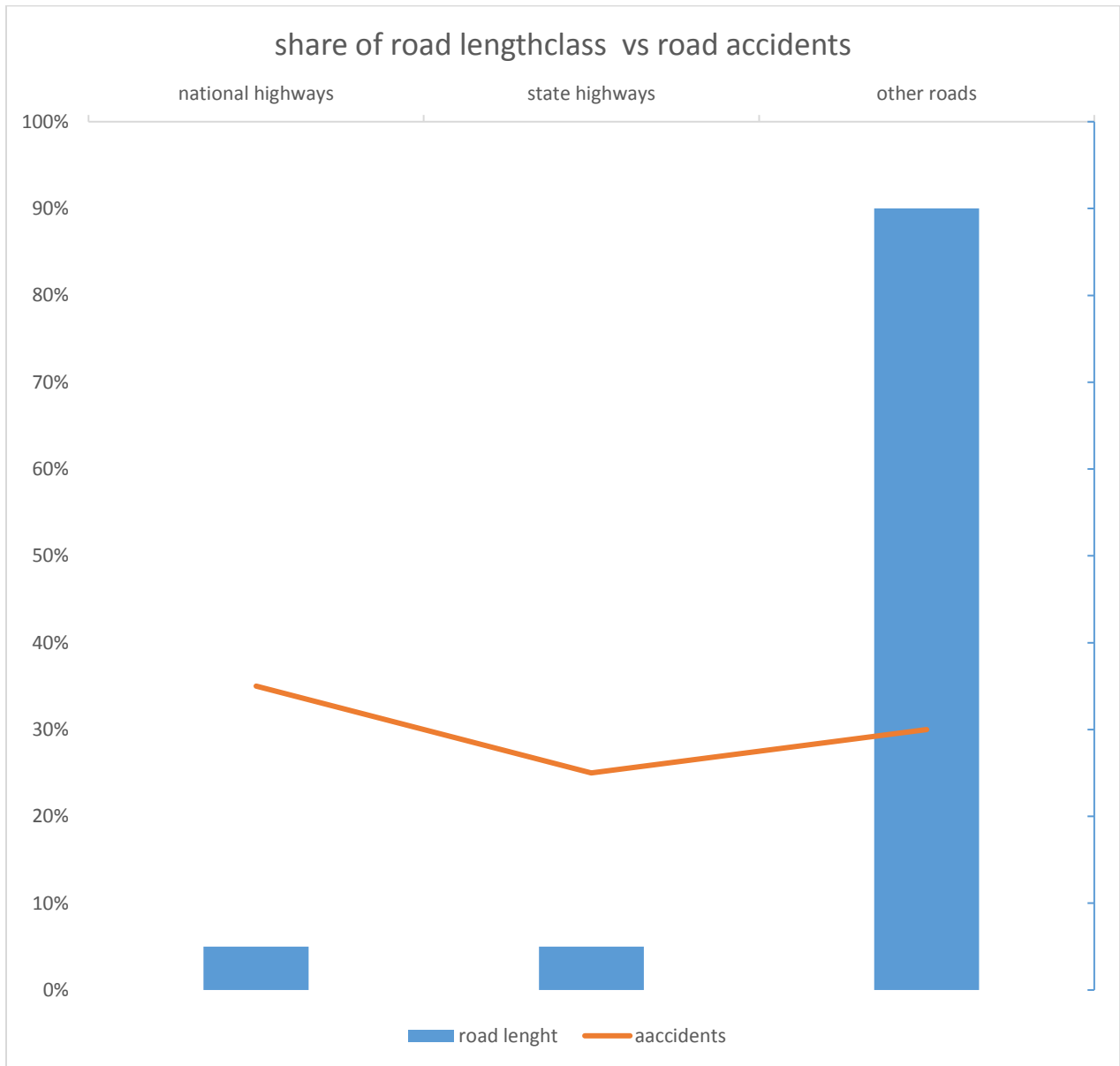


Chart 1-2: Share of road length class vs road accidents

## 2. ACCIDENT SCENARIO IN INDIA

As per records of World Road Statistics 2015 issued by Worldwide Road Federation, Geneva, there is lesser rate of demises per one lack in the countries developed countries like U.S.A, France, Portugal, Australia, Japan, Canada, , Germany, Republic of Korea Japan, Republic of Korea, , Poland, etc. except Russian while linking it with republic of India. Occurrence of accident linked deaths were greater in Russian as in assessment to India during the calendar year 2013.

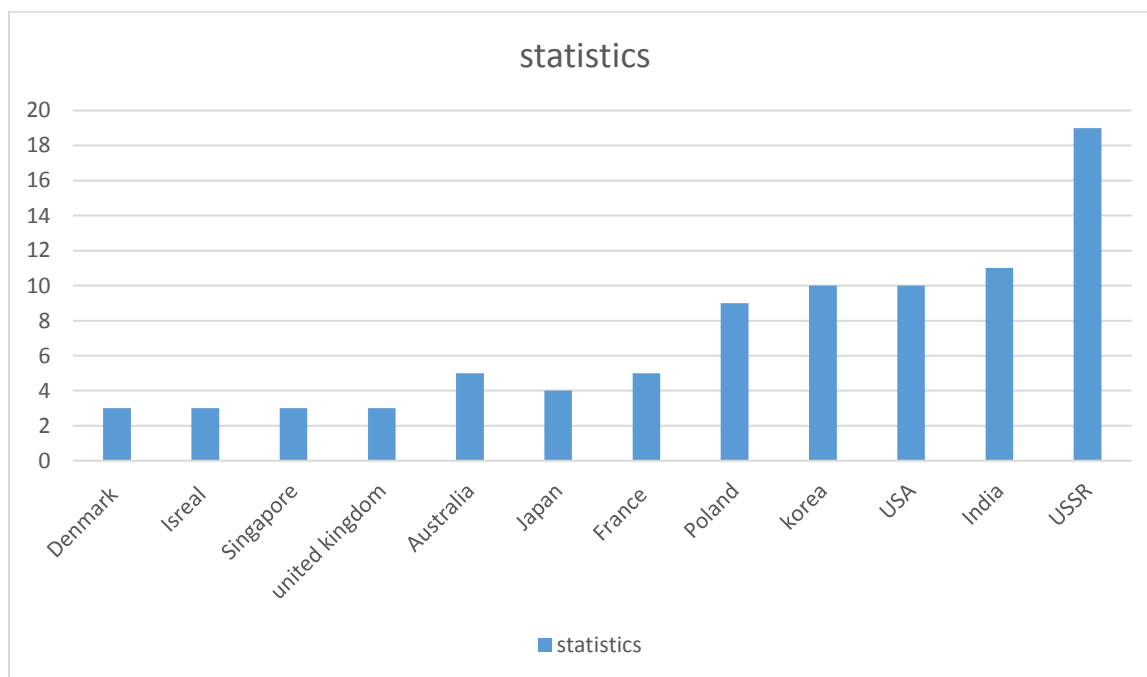


Chart 1-3: Country-wise Figure of Personnel Exterminated for each 100,000 Population

It is assessed that in the U.S.S.R, about 45000 persons are fatal and 3 million non-fatal every year. This amount is shocking. The accident circumstances is graver in India because of the speedy development of automobiles in the previous years and insufficiency of several of our roads to manage with this road traffic volume. The heterogeneous traffic environment in India make the problem much inferior.

From decades 1995 to 2005 and 2006 to 2016 the percentage of accidents and the non-fatal accidents decrease from 2.9% to 1.4% from 4.0% to 0.8%. But the fatal accidents increase from 3.8% to 4.5% during the same time frame. This is shown in chart 3.

Goa had the determined portion in total road accidents/ lakh population upto 2015 for the consecutive fourth year in a row (244 accidents/ lakh persons) and then Kerala (112 accidents/ lakh persons), and Tamil Nadu (100 accidents/ lakh persons).if we talk about fatalities the Tamil nadu leads the list followed by Haryana and Karnataka shown in figure 1 & 2 by having 25 fatalities/ lakh persons, 19 fatalities/ lakh persons, 19 fatalities/ lakh persons [3].

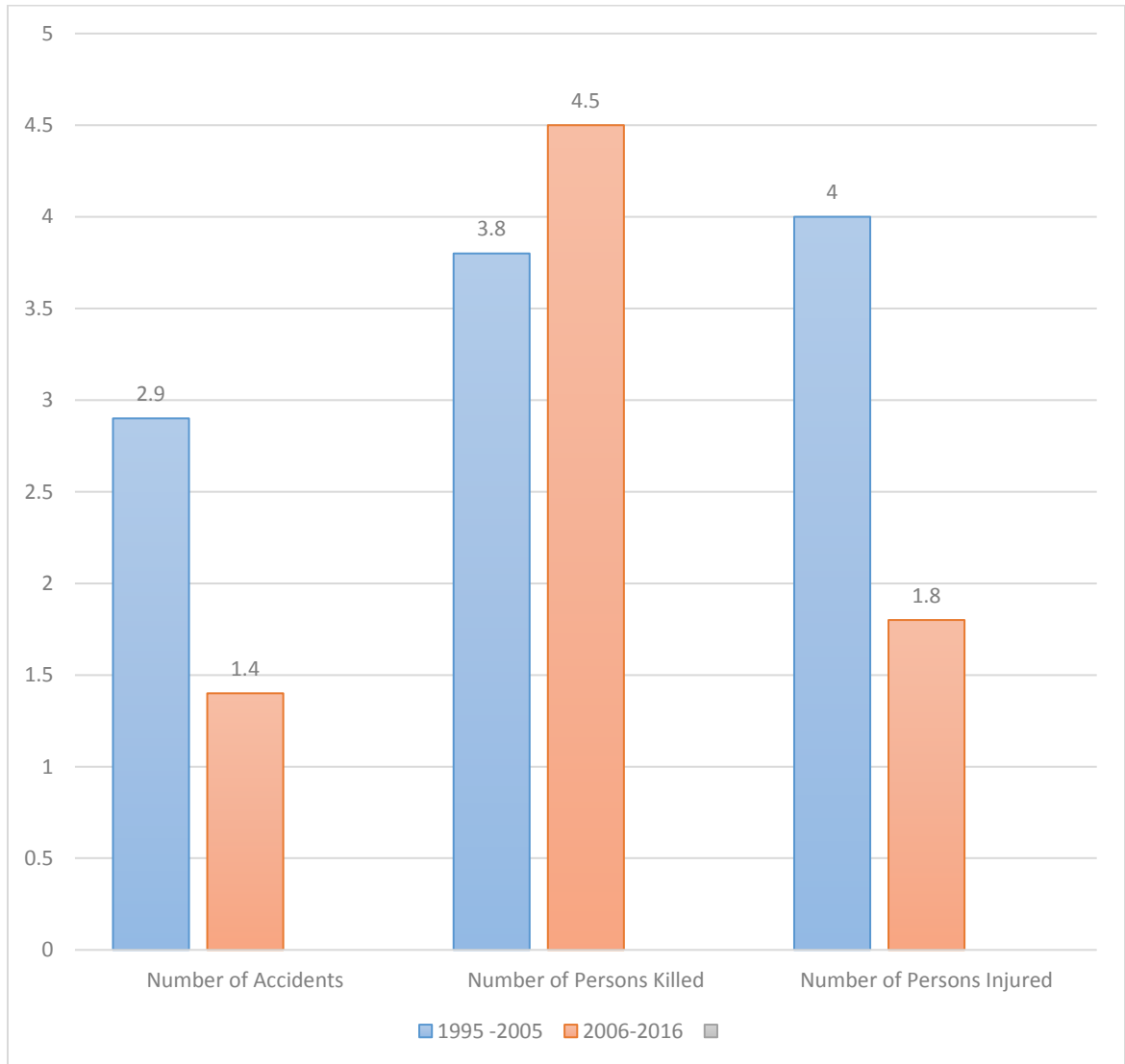


Chart 1-4: Compound Annual Growth Rate 1995 - 2005 and 2006-2016

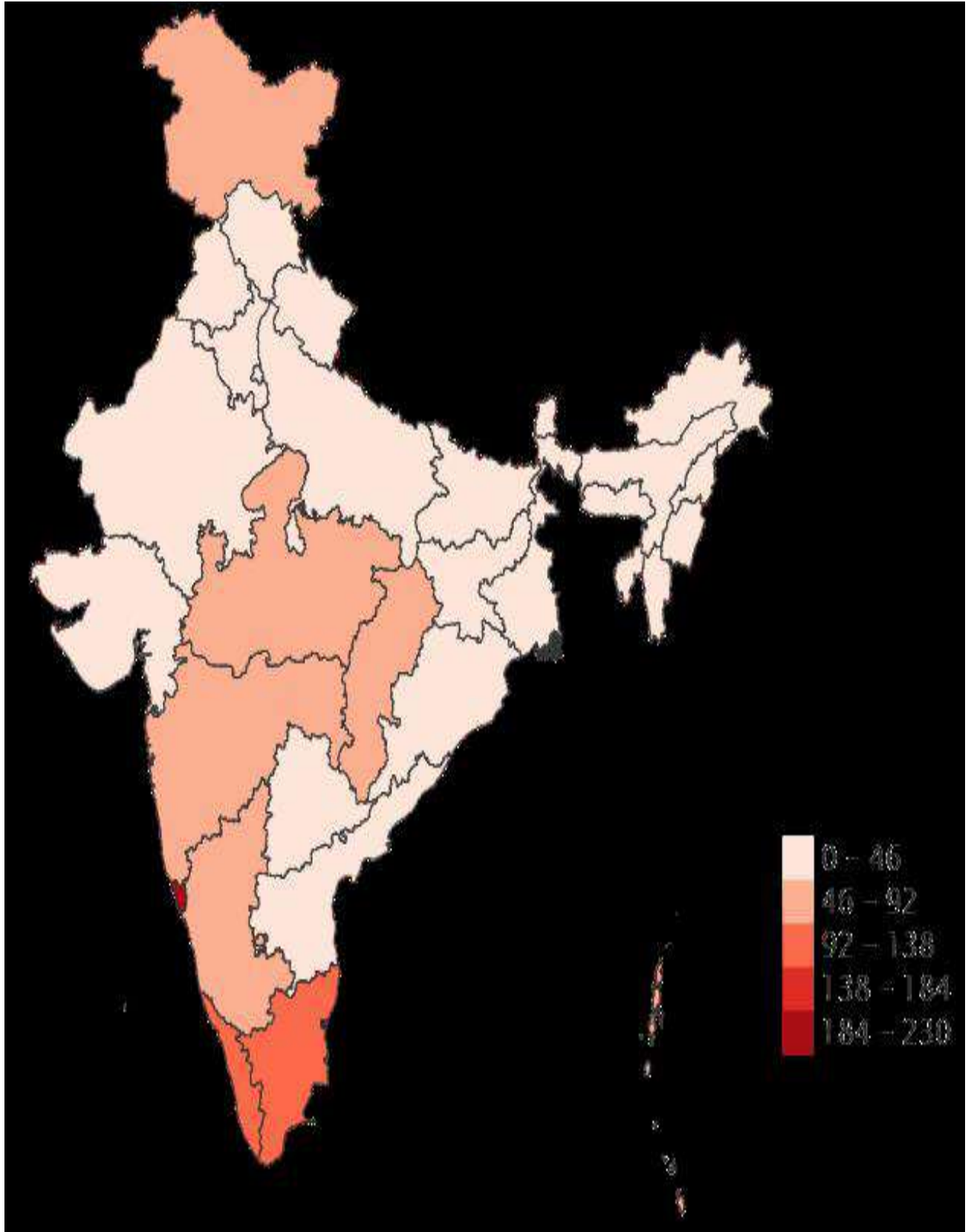


Figure 1-1:- Number of road accidents/ lakh population

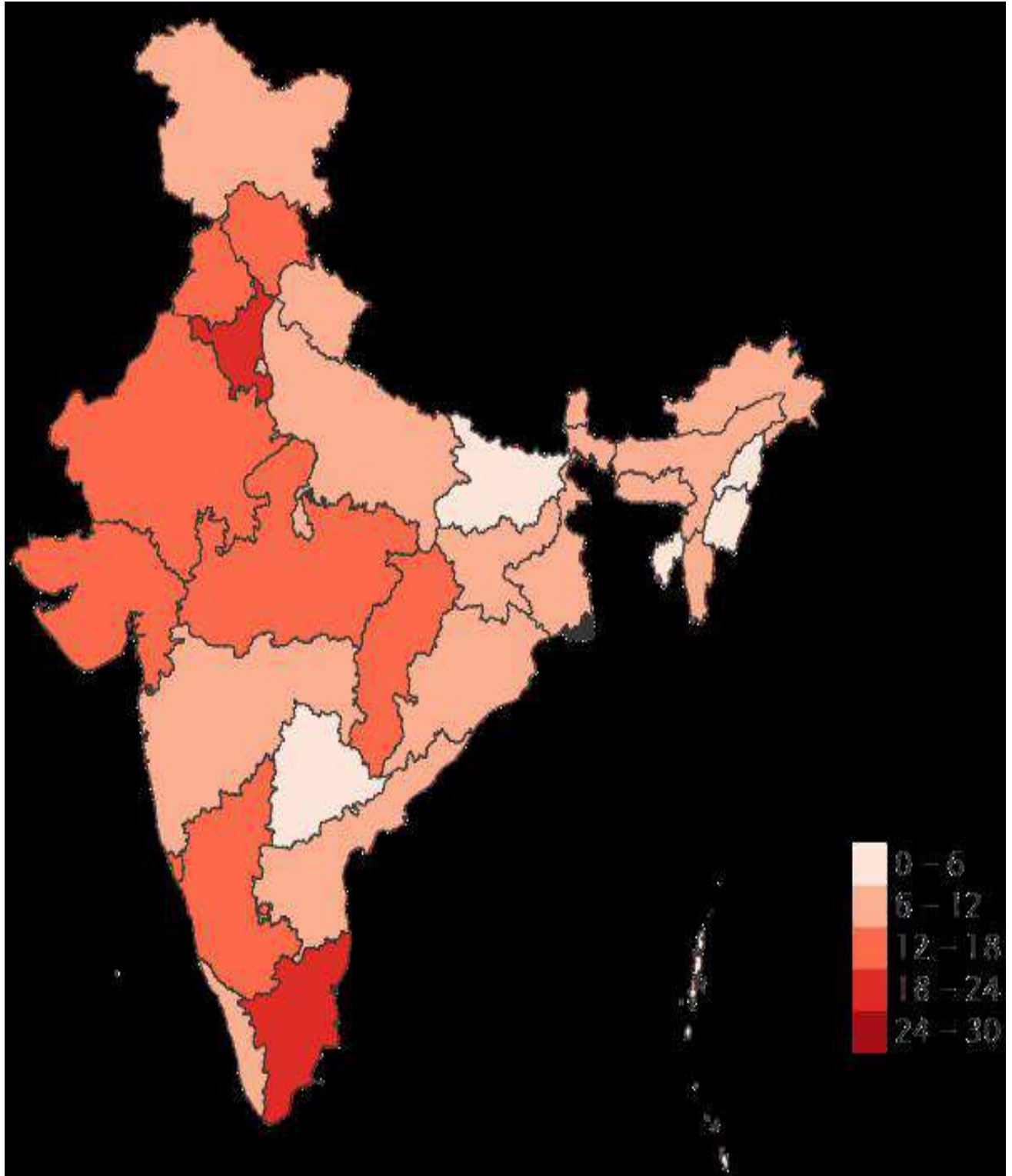


Figure 1-2:- Number of persons killed in road accidents/ lakh population

### 3. ROAD ACCIDENT PROFILE

The figure of highway accidents, road accident death rate and personnel injured in road mishaps in India during 2006 to 2016 is depicted in Table 1

Table 1-1: Showing rate of accidents

Number of Road Accidents and Number of Persons affected: 2006-2016					
Year	Number of Accidents		Number of Persons		
	total	Fatal	Killed	Injured	Accident Severity
2006	4,39,257	83,491 (19.0)	92,968	466,982	21.6
2007	4,60,980	93,917 (20.4)	105,759	487,781	22.9
2008	4,89,216	1,01,161 (21.1)	114,544	513,340	23.5
2009	4,84,804	1,06,591 (22.0)	119,860	522,993	24.7
2010	4,86,784	1,10,993 (22.8)	125,760	515,458	25.6
2011	4,99,728	1,19,558 (23.9)	134,513	527,512	26.3
2012	4,97,986	1,21,618 (24.4)	1,42,795	5,16,494	29.6
2013	4,90,389	1,23,093 (25.1)	1,38,378	5,09,667	28.6
2014	4,86,478	1,22,589(25.2)	1,37,682	495,993	28.4
2015	4,99,400	1,25,828(25.7)	1,39,781	4,92,774	28.1
2016	5,01,463	1,31,726(26.3)	1,46,253	5,00,279	29.8



#### 4. AGE GROUP AND GENDER (MALE/FEMALE)

In 2007 a report survey was conducted to which age group and which gender is getting involved in accidents more and more and it was found that 17% sufferers were women. This is due to the reason of less experience and demonstration of females in transportations. Youngsters and 16 years negotiate only 8% of the mortalities, however their part in the inhabitants is 32%. The death toll in the age sets 15-32 and bigger than 60-65 years is representing the similar share in the population, however the intermediate aged groups 33-59 are over signified by about 71%. The less demonstration of children (1 to 3 fatalities per one lac person) is inquisitive because they don't go for walk and didn't use vehicles for roaming purpose.

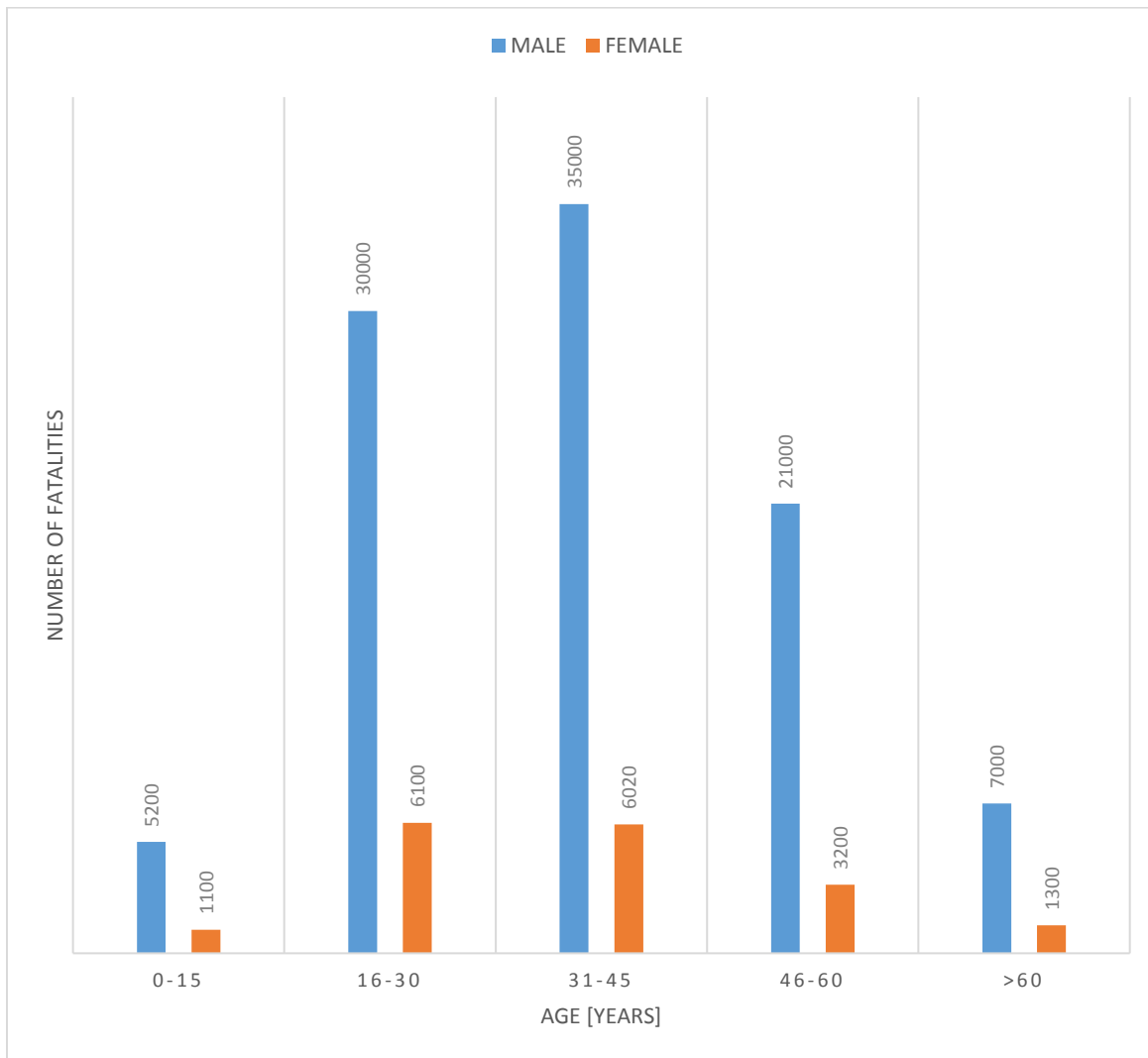


Chart 1-5: Road traffic movement death toll in by age group and gender (male/female)

### **2. Scope of the Study**

A distressed pavement requires maintenance when failures are severe. Maintenance measures constitute fresh material installation over the pavement to rectify the existing problem. When a pavement is properly designed keeping in consideration future distresses that may occur due to various reasons, the life cycle cost of pavement reduces and it behaves well during its service life, The wear tear of the vehicles will be decreased which results in safe vehicle movement and the pavement surface will be so good that uneven pot holes ,longitudinal cracks and many more defects results in sudden braking application , tilting of speedy vehicles, causing mishaps on roads and results in Fatal and Non- Fatal Accidents.

Possible surface maintenance measures for some pavement failures are as under:

- Block cracking: Application of new bituminous coat
- Corrugation : Scarification of elevated part by use of mechanical blades and rolling
- Depression : To apply profile corrective course
- Hungry surface : Application of slurry seal or fog seal
- Loss of aggregates : Application of seal coat, surface dressing or fog coat
- Pot hole : Patching or partial re-construction when pot holes are severe
- Rutting : Milling of protruded portion and profile corrective course laying
- Stripping : Replace the affected part with new one i.e. fresh mix

This research project will be focusing on

- 1) Rehabilitation measures needed to be implemented to increase the service life of a particular pavement (Jalandhar to Phagwara), so that it gets resistant to early deterioration.
- 2) Quantifying its structural and functional distresses through appropriate indices.
- 3) Prioritization and maintenance needs to particular stretch as compared to the rest.
- 4) Future performance of the road under consideration will be assessed and forecasted.
- 5) Behavior and performance of road with and without maintenance will be assessed.
- 6) All above mentioned factors will eventually affect the allocation of funds for maintenance measures in different pavement stretches.

### **3. LITERATURE REVIEW**

- 1. A. K. Patnaik, A. K. Das, U. Chattraj, *Accident Analysis and Modeling on NH-55(India)* [4]**

The focus of this article agreeing to MORTH-2013 that India has the maximum no of road accidents in the Worldwide. The Accident Severity has been growing by each year. Hence Road Care is a main apprehension. In this paper case study was engaged on NH-55 that connects to numerous most important manufacturing industries, factories and mines. This study demonstrates that main cases of fatalities in road accidents are outstanding by trucks. The foremost reason of mishaps are due to high density, volume, non-restriction of speediness, On road car parks, shoulder drop-off, kerb edge drop, ancient circumference trees on shoulder, conspicuousness constraints etc..

- 2. By Max Cameron, Monash University Accident Research Centre, *Accident Data Analysis to Develop Target Groups for Countermeasures* [5]**

A vital concern which arose all through the improvements of the 1991 Road Care Strategy for Victoria was the essential for innovative and well designations of target groups for counter measures. Investigation were conducted to define original objectives has not reserved up with the fast execution of countermeasures. This Testimony calls a major project that is meant to extra developed approaches of recognising target groups, & to prove those procedures by using these to a different number of important road safety glitches. Mass accident data were used to discuss the problems and to find different groups of road handlers, vehicles and different portions appropriate objectives for countermeasures the threats.

- 3. Sanjay Kumar Singh, Ashish Mishra, *Road Accident Analysis of Patna city* [6]**

Inner-city transportation services are worsening from last few of years in India. The public transportation deficiencies in excellence and capacity as per traffic mandate, this is the reason of rise in private transportation viz two wheelers vehicles and IPT is growing rapidly. Roads and Paths nowadays are heavily intruded by parked vehicles, vendors, hawkers, making foot-travelers to tread on road ensuing their natural life in danger of misfortune, moreover this the infrastructure roads of

Indian towns are deficient, lane design and traffic signs are typically absent, and connexions often necessitate geometric alterations. As we know that capital of Bihar is highly populated and poorest cities and characteristically disordered. The present Road System in city is poor. The roads are worthless and do not have proper grading and hierarchy as single road varies its features after a little distance. At existing stage only 4.6 % of road are considered as developed which as per IRC norms are much beneath the preferred level. However the Vehicle Growth is quite extraordinary high, with just 4385 listed vehicles in 1981 in government records and now upto 294165 in 2001, and increase in 67% in a time span of only two- decades. Additional the non-existence of actual quantity of government transport system has given rise in great rise in IPT Prototypes and Modified Vehicles.

#### **4 Srinivas Rao, E. Madhu, Santosh Jalihal, T.S reddy *Accident Study On National Highway-5 Between Anakapalli To Vishakhapatnam* [7]**

In a region of transportation care 'Accidents are not regular but they are human errors' is a common saying. Accordingly, if the mishaps are caused by some deficiencies, confidently remedial of procedures can be settled and applied to the cover the feasible. Investigation Of earlier accidents data spectacles that 67% of accidents occur due to human mistake and 33% happen due to road considerations such as road and vehicle dealings, other road handler and surroundings factors. Republic of India has set up of 3.3 million kilometres road network involving of all types of roads. National Highway organises 2% of the total road length which transmits 40% of vehicles and 85% of goods and chattels carrier, compromises 20% more accidents chances then other roads. Accidents, sadly are not regularly due to ignorance, but are due to inaccuracy carelessness and arrogance. William Haddon said that road accidents are linked with various kind of problems each of them should be separately addressed. Human Vehicle & Surroundings elements composes essential roles earlier, throughout and afterwards the accidents happen. Accidents so can be intentional in terms of mediator masses and environmental elements and categorized into phase, habitation and individual distribution.

#### **5 Hendre Rajesh war Wamanrao, *Examining Determinants of accident/Injury Rates: A Micro Level Study in Automobile Industry* [8]**

This Research looks at commitment of determinants touched base from obligations of different partners and writing audit in anticipating mishaps/wounds. There has been central move in

security administration look into did in numerous nations and crosswise over differing businesses, which means to quantify the effect of extra measurements on word related wellbeing. The customary approach centers of the specialized parts of building framework and procedures. Many investigates in the wellbeing administration presume that 80% mischances and wounds are ascribed to dangerous human factor and staying 20% to the innovative factors and working conditions. National approach of Labor suggests leading the looks into in the field of security, wellbeing and condition at work environment in view of social and mental variables which will help in setting up benchmarks.

**6. C. Vigneshkumar, *Fatal Road Accident Characteristics in Metro-Plus Cities of India* [9]**

Quick development of populace and expanding financial exercises have brought about the colossal development of engine vehicles which is viewed as one of the essential variables in charge of expanding street mishaps in numerous metropolitan urban communities of India. Through this paper an evaluation of the present level of street wellbeing in metro urban communities in India is made using information got from auxiliary sources. The street wellbeing level in metro urban communities is surveyed considering parameter mishap seriousness record. The investigation is fundamentally restricted to the mishap qualities of traveler vehicles in metro in addition to urban areas. This paper can be utilized to gauge the adequacy of future wellbeing upgrades executed in the urban areas.

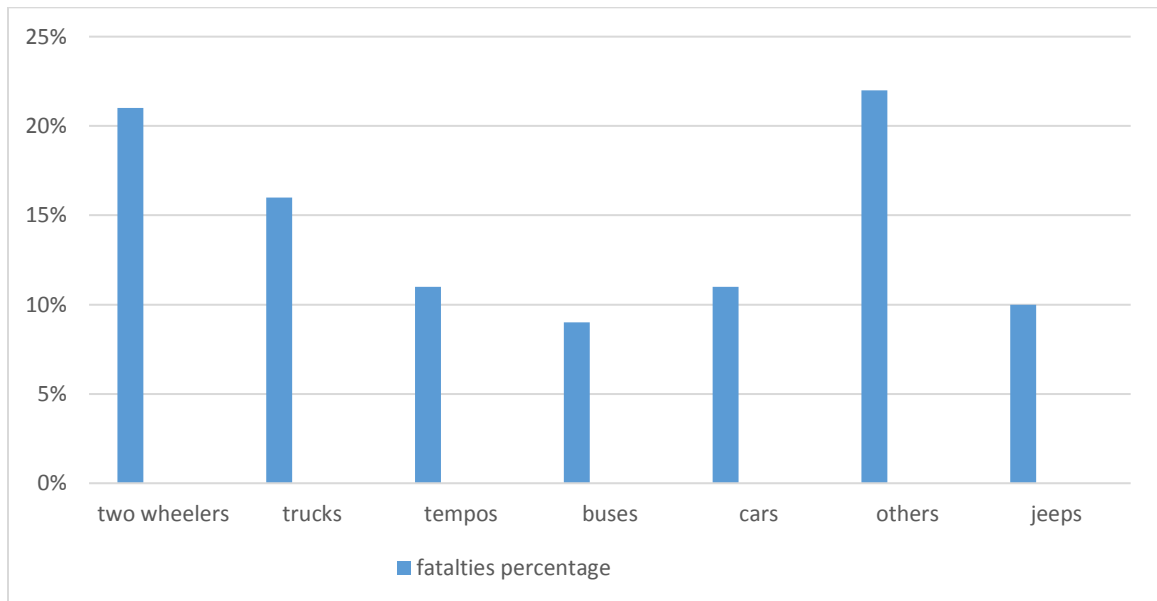


Chart 3-1: Percentage of different classes of vehicles

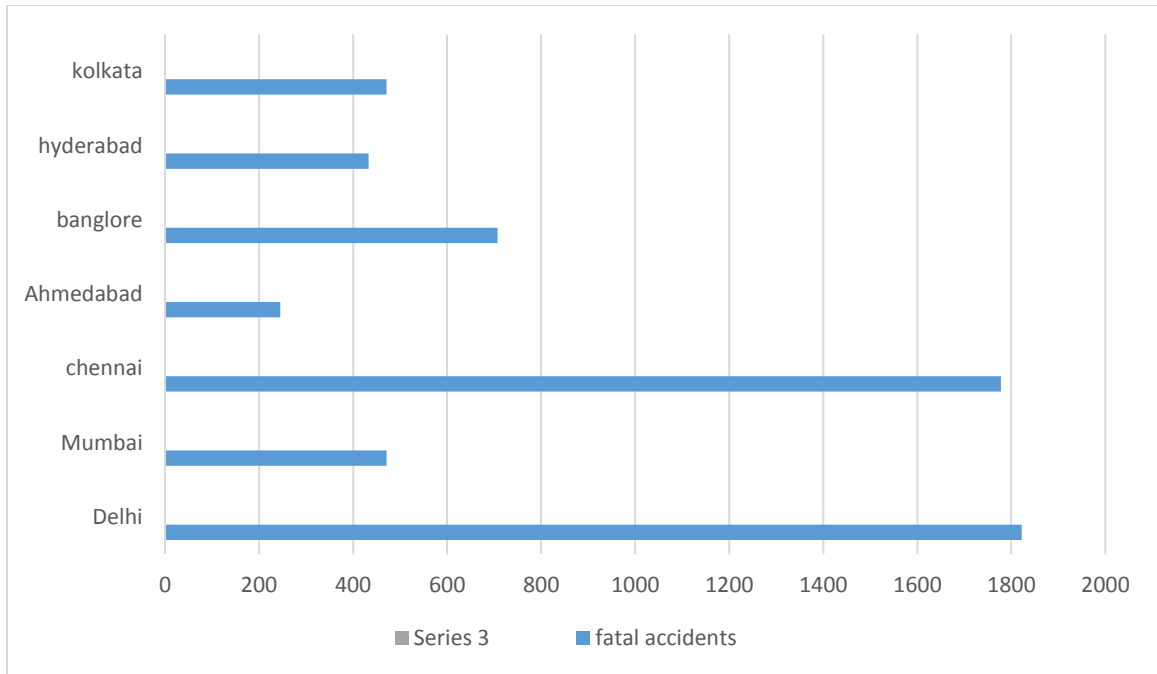


Chart 3-2: Fatality distribution of different cities 2012

When all is said in done, the quantity of lethal mishances in Delhi, Mumbai what's more, Hyderabad diminishes step by step. This shows movement operation administration in these may have moved forward. In Chennai, Kolkata, Bengaluru and Ahmedabad there is increment of lethal accidents in a few years and reduction of lethal mishances in a few years. This shows the security change measures embraced in the city have been inadequate. The mishance seriousness Index of Delhi has higher rate took after by Hyderabad, Chennai and Ahmedabad. Mumbai has the most reduced mishance seriousness rate in 2012. It is watched that among all classifications of vehicles, trucks, rhythms and tractors included the most astounding offer of association in deadly mishaps. This recommends a few studies ought to be embraced later on to examine the conceivable reasons for inclusion of trucks, beats in deadly mishaps to discover fitting therapeutic measures. This would thus enhance the general street wellbeing circumstance in India.

### **4. RESEARCH METHODOLOGY**

#### **4.1 HIGHWAY AND ITS EFFECTS ON ROAD ACCIDENTS PAVEMENT CHARACTERISTICS**

Accidents remain utmost common in this period of time due to outstanding growth of transportation and carriageways are unable meet the burden of this heavy traffic, Taking the note of all characteristics for the investigation of road mishaps are carry throughout on the Section from (Phagwara to Jalandhar highway on NH1), in addition to it before beginning our work we concentration on the Road surface and revision the imperfections and then testing the material Used in this pavement, Following below mentioned defects were found and analysed ,further the Outcomes and Consultations were done on this for future better of road.

- a) Development of Potholes
- b) Corrugation
- c) Damage of Aggregates
- d) Depressions
- e) Fatigue Cracking due to stress
- f) Block Cracking
- g) Hungry Surface
- h) Fatty surface or Bleeding
- i) Stripping
- j) Reflection Cracking
- k) Raveling
- l) Frost Heaving
- m) Divider cuts

##### **a. Development of Potholes:**

At the point when the material breaks down locally bowl molded openings of unpredictable dimensions on the pavement are made generally mentioned as Pot holes. Occasionally reaches upto the base course. It is tough to conserve the equivalent level of consistency even though the asphalt

pavement because of variation of large figure of factors considered amid asphalt pavement development. The confined fragmentation begins from those spots that are the fragile spots in the bitumen pavement extent

Potholes occur due to some of the following reasons

- Poor quality of material used during construction
- Entry of liquid water like rain,dew,snow
- Reveling and aging

These Potholes can be fixed by patchwork and by a good link amongst the prevailing pavement and newly laid pavement that is necessary. The level of fix is kept marginally above than existing bituminous asphalt pavement to permit its further compaction by activity stack of wheel load.



Figure 4-1: Pot Holes



**b. Corrugation:**

It is the plastic distortion of upper layer of bituminous surface of the asphalt pavement along the even course. It look as waves or ripple developments on the top layer of the asphalt. Layering happens because of absence of strength of black-top blends when climate is very warm. This corrugation happens due to lack of firmness during the asphalt mixes during hot weather. If by chance the corrugation is thin then the surface is re-laid. The raised spots are cut by utilizing a mechanical cutting edge blade, with or without warming and afterward the surface is taken off..



Figure 4-2: Corrugations

### c. **Damage in loss of Aggregates:**

The loss of aggregate is that type of imperfections for the most part happen resulting to shedding and raveling or aging of pavement. The conceivable explanations behind loss of totals from the asphalt are as under:

- When the top layer Surface dressing is improperly designed.
- When the design mix is not perfectly done.
- Gently sloping in other words rolling is poor.
- Movement of traffic is endorsed to ply on road before the pavement sets.

This can be dealt with by including a coating of slurry or seal coat or by supplanting of crumbled film with new fresh mixes.



Figure 4-3: Loss of Aggregates



**d. Depression:**

Its name itself shows, it is the limited region where the asphalt surface goes down a little regarding the completed surface. The depression in asphalt pavement happens because of the differential settlement of insufficiently compacted sub-base because of wheel loads. Water begins to gather on this zone after precipitation, which step by step permeates and makes additionally harm the pavement around there. Depressions arises in pavements due to improper compaction of sub-grade due to wheel load. These can be repaired by filling the depressed portion with premix fine or coarse aggregates.



Figure 4-4: Depression

#### e. **Fatigue Cracking due to stress**

The basic sort of imperfection found in flexible pavements is fatigue breaks. This kind of fault is because of relative development of asphalt layer constituents. At the point when an asphalt is subjected to frequent use of heavyweight wheel stacks in the long run prompting course wear failure or dampness content dissimilarity happen above or beneath passable esteem value bringing about swelling/shrinkage of sub-base constituents or any other asphalt constituents. Infrequently feeble base course may likewise prompt breaks in asphalt surface.

Following outline will delineate fatigue cracking in pavement.



Figure 4-5: Fatigue Cracking



**f. Block Cracking:**

These are roughly rectangular splits framed on the top layer of the bituminous asphalt pavement. These depict temperature shrinkage breaks, which are produced because of day by day varieties in temperature, and on a very basic level are of non-activity beginning. The traffic activity loads increment the sternness of slab splits. As the splits begin on the asphalt pavement surface because of solidifying of bitumen utilized, utilization of new layer of appropriate bituminous layer goes about as a tonic to piece breaks.



Figure 4-6: Block Cracking

### **g. Hungry Surface**

It is the situation just reverse of fatty surface. If the rate of bitumen distribution is lower than the design value, small cracks develop on the surface and loss of aggregates starts taking place from the wearing course due to traffic. On the other hand a hungry surface may also develop if the absorption affinity of aggregates is strong towards bitumen. Fog seal or slurry seal can be used as a remedy material to avoid hungry surface situation.



Figure 4-7: Hungry Surface

#### **h. Fatty surface or Bleeding**

Greasy surface or Bleeding is a surface imperfection identified with bituminous asphalt as it were. It is the amassing of bitumen at the surface of asphalt which happens because of ascend in temperature and typically happens amid daytime when temperature is high. At high temperature bitumen gets delicate and possesses the accessible void space in totals. In the event that the space offered by totals is deficient, bitumen extends out onto the surface and structures a sticky sparkling surface over the asphalt known as draining or greasy surface. It is an irreversible procedure and the bitumen content that has seep out won't backpedal into the asphalt void space amid winter season or because of variety in temperature. Legitimate blend outline and determination of suitable review of bitumen and furthermore arrangement of imperative void space can go about as a solution for this sort of disappointment. Other conceivable reasons of draining are loss of total cover, substantial prime coat and non-uniform use of fastener. On the off chance that draining is uniform and with no sort of surface inconsistencies, little size, spotless, precise sand or other little size totals can be utilized over the surface and is especially known as sand smudging or sand blinding. In any case, if the seep out surface unpredictable it regards expel the influenced bit and transfer it with appropriate blend plan.



Figure 4-8: Bleeding

### **i. Stripping**

It is the procedure in which isolation of bitumen and totals happens in nearness of dampness. The loss of holding amongst totals and bitumen causes loss of totals and which prompts invasion of water bringing about loss of quality and resulting disappointment of the asphalt. The stripping marvel might be a result of following reasons:

- When hydrophilic totals are utilized as a part of asphalt development.
- Mix configuration is uncalled for with overabundance fines.
- Exposure to dampness or collected water consistently.
- Allowing the activity to stream before the cover gets legitimately set.
- Aging of cover utilized.

It is important to check the stripping capability of total cover as a preventive

### **j. Reflection Cracking**

At the point when bitumen is overlaid over the current bond solid asphalt, a similar example of splits which were in existing asphalt surface proliferate upwards and come up to the best surface of recently overlaid asphalt. This is known as reflection splitting in light of the fact that it shows up, as though the breaks on the current asphalt surface have been reflected onto the highest point of recently overlaid surface. Reflection breaks happen because of the relative development of existing splits in the first asphalt. In the event that the breaks in the current asphalt are checked reflection splits can be consequently controlled. As a preventive measure to check reflection splits stretch alleviation layers, geo-materials, or overlay fortification are given as between layers between the current asphalt and the overlay. Stress alleviation layers are for the most part open reviewed total layers which don't enable splits to proliferate upwards. Then again geo-materials or overlay support bear strain themselves and don't enable the splits to engender further.





Figure 4-9: Reflection Cracking



**k. Raveling**

The steady wearing of the best top surface of bitumen predominantly because of weathering is known as raveling. The binding materials turns out to be hard because of weathering activity and loses its coupling property bringing about dislodging of totals from the asphalt surface, when movement streams on it. In the event that the degree of raveling is low it can be corrected with one layer of slurry seal, or mist seal. Generally a recharging coat ends up plainly vital



Figure 4-10: Raveling

### **1. Frost Heaving**

Ice hurls are generally misjudged with shear and other kind of disappointments. In shear disappointment the change of asphalt is taken after with a sorrow and shear disappointments are related with inalienable shortcoming of asphalt blends. In ice hurling generally a confined hurling up asphalt divide is there relying on the atmosphere and ground water conditions.



Figure 4-11: Frost Heaving



### **m. Divider cuts**

The main and important is the divider cuts people used to cut the divider in between the highway we have observed this not only at one place it has been observed at Wahid sugar mill, viva collage near lovely professional university and many more places where the rickshaw men and biker cross the highway from these divider to join the traffic of that side this is the most critical way for accidents sometimes it has been observed during survey and investigation that bikers ply bikes on dividers to reach the spot which is destroyed by the people .



Figure 4-12: Biker crossing the divider



Similarly the rikshaw walas also cross these dividers which are vulnerable not only to rikshaw but to the people who are riding on it without even concerning that it is highway and main corridor for the state of Jammu and Kashmir, Himachal Pradesh and rest of punjab.



Figure 4-13: Rickshaw Wala crossing the highway illegally

## 4.2 VEHICLE CHARACTERISTICS AND ITS OUTCOME ON ACCIDENTS

The vehicle characteristics and its outcome on accidents is depend on different factors are as under

- a) Accelerating and deaccelerating System of vehicles i.e. braking
- b) Wagon Body
- c) Lighting System of wagon
- d) Tires
- e) Vehicle Inspection and Maintenance
- f) Dimension and weight of vehicles

### **a. Braking Coordination of vehicle:**

Brakes are expected to convey the vehicles to stop at whatever point a driver understands impending risk or threat. To avoid directional mechanism on the vehicle a decent stopping mechanism ought to accomplish. The communication between the tire and the street surface represents to a great extent a definitive braking execution of vehicles, despite the fact that elements, for example, the stopping mechanism itself are huge. A point by point treatment of the subject of the collaboration between the tire and the street surface is given under area of Skidding.

### **b. Vehicle Body and its features:**

The main focus during the manufacturing of the vehicle is given on the body of the vehicle which shows the stream line of the car that also provides the safe driving. The main aspects which are taken under consideration are as follows:

- a) The location of meters like fuel meter, speedometer etc on the dash board should be easily arrangement.
- b) The noise level that is created by the engine of vehicle.

- c) The nature of the proportions of the driver's seating arrangement
- d) The seat should be located on the position that all things should be visible.
- e) The Controls positioning in relation with the driver's seat
- f) The Carbon monoxide effect inside the car.

**c. Vehicle lighting arrangements:**

The lighting arrangement of vehicles comprise of headlights, (driving primary bar or a scoop bar), side lights, stopping lights, raise lights, bearing markers and stop lights. A productive and solid arrangement of lighting the vehicle is alluring for deflecting misfortunes. Glare is a significant issue when two automobiles approach each other and can dazzle the driver's vision. It ought to be stayed away from by legitimately outlining the scoop sided bar light. Captivated headlights offer fascinating leap forward in such manner. The headlights ought to perform two capacities: to give a primary shaft of light to empowering the driver to see the street ahead for adequately long separation and to give a scoop shaft which must keep away from glare to the contradicting movement, while in the meantime giving adequate deceivability to the driver. Back lights offer sign to the driver streaming an automobile about the nearness of a vehicle in front him. There productive plan and working can turn away front to back accidents. The indicators give satisfactory notice of the intensions of the driver to swing or to stop. The typical kind of bearing markers are the glimmering sort. The position, sort and shade of the indicator ought to be, for example, too obvious to the streaming drivers effectively. The course markers are generally golden in shading, and ideally they ought to be located along the edge of the vehicle around at the level of the driver's eye. Semaphore arms may not be completely reasonable to vast vehicles, and in such cases additional golden lights might be introduced at the back.

**d. Tires:**

Tires are an essential part of vehicle outline from the perspective of wellbeing. The execution of tires in respect to cuts, tears, weakness, to harm by sharp things on road, braking and street surface attributes are territories where extensive research has occurred. Slipping is a occurrence which is administered by communication of the tire, brakes, street surface, speed and the wetness of

pavement. On account of its outrageous significance in auto collision anticipation, in this manner perspective is dealt with in more noteworthy arrangement somewhere else.

**e. Vehicle Inspection and Maintenance:**

The main important point is the automobile Inspection and these periodic tests the malfunctioning of automobiles that is premier part. In India people prefer to use the old vehicles and lasted upto unless and until they give their last breath. Braking, lightings, steering, gear boxes, windows are used in inspection .the most important part is tires that needs regular check up to get best results. Few nations have made necessary for testing the vehicle occasionally, U.K being one of them. A few states in USA has additionally arrangement for necessary intermittent testing. The Motor Vehicles Act in INDIA contains arrangement for the states to institute principles to require periodical testing and examination of vehicles but is not executed properly.

**f. Dimension and weight of vehicles:**

The dimension and weight are important aspect of the automobile, they decide the control to accommodate vehicle of designated type, the dimensions gives idea about the radii, width parking dimensions. The weight affects the structural design of pavement and structures and operating characteristics of vehicles on grades.

### **4.3 DRIVER CHARACTERISTICS AND ITS CONSEQUENCE ON ROAD ACCIDENTS**

**a. Driver:**

The driver is the key factor in the vast majority of the mishap. Driver is the human component in authority for the vehicle. He pushes the automobiles, steers it, quicken it, decelerate it, brakes it and stop it. All things considered an investigation of drivers conduct offer a profound understanding in the reason for mishaps and gives a profitable direction to evasion of mischances.

**b. Driver judgment, Skill and Emotional Behavior:**



At the point when a driver sees a threat, he promptly responds to it. The time it takes to understand the risk relies on his individual mental cosmetics and is called observation time. Once the data is nourished to him, Sometime should slip by before he can respond to the jolt. This time is called its response, the recognition time and response time differ from driver to driver.

**c. Age of Drivers:**

It is for the most part observed that youthful drivers because a greater number of mishaps than that would be caused by develop various with extensive driving background. Likewise, Old drivers additionally appear to cause more mishap than moderately aged driver. The base mishap are caused by moderately aged gathering, say 40-50 years, while naiveté is reason for higher mischance rates among the more youthful age gathering, physical sickness prompts higher mishap among to seniority gathering.

**d. Sex of the Drivers:**

It is by and large observed that guys have more mishap and conviction than females, however when miles driven are considered this distinction basically vanishes.

**e. Marital Status:**

Male and female who are married are noticed to be better drivers.

**f. Alcohol and Drugs and the Drivers:**

When the studies has been carried out it has seen that road safety has made large attention because outcome of alcohol and drugs on the driving ability. The decision and measure of the driver can be work out only so extensive as he is clever faculties are functioning unaffected. Alcohol and drugs are known to be completely hazardous in this deference.

**5.1 RESULTS AND DISCUSSION**

**a. Aggregate Crushing Value Test:**

Overall mass of the sample (X) taken for test= 4.1kg

Mass of the sample (Y) passing through 2.36 mm sieve after application of load=0.50kg

The Aggregate Crushing Value = $X/Y \times 100$

$$=0.50/4.1 \times 100$$

$$=0.12$$

**DISCUSSION**

BIS and IRC take confirmation on devastating estimation of totals to be utilized as a part of bond solid asphalt pavement ought not to surpass 30%. The regular size totals to be utilized squashing quality test is the division going through 12.5 mm strainer and held on 10 mm sifter. At the point when totals having size bigger than 12.5 mm are utilized, it will give higher pounding quality esteem and utilization of totals having size under 10 mm will give low total pulverizing esteem.

**b. Penetration Test:**

The contrast amongst beginning and last entrance perusing is taken as infiltration esteem. The mean estimation of at the very least three predictable infiltration measures is accounted for as penetration rate.

Table 5-1: Penetration values

Bitumen Sample	Initial Reading	Final Reading	Penetration (mm)
Test 1	210	272	62
Test 2	272	340	68
Test 3	340	404	64
		Mean	65

## ***DISCUSSION***

It is concluded that penetration value is influenced by various factors such as:

- Temperature at which sample is poured
- Size of the penetration needle
- Weight to be placed on the needle
- Temperature at which test is to be performed
- Period of cooling the sample

In the event that the temperature at which test is being performed is higher than 25°C, the entrance esteem acquired will be considerably higher. In the event that the heaviness of needle get together is higher than the predetermined estimation of 100g, at that point the entrance esteem so got will be higher. Higher pouring temperature may make solidifying of bitumen and lead bring down infiltration esteem. The length of discharging infiltration needle ought to be equivalent to 5 seconds.

### **c. Los Angeles Abrasion Test:**

Mass of aggregate sample booked for test (a) = 2.5kg

Mass of aggregate sample taken (b) = 1.60kg

Weight of aggregates transient through 1.70 mm IS mesh =W1-W2

=0.9kg

Los Angeles Abrasion Value =  $(a-b)/a \times 100$

=  $0.9/2.5 \times 100$

=36%

## ***DISCUSSION***

The constitutes of aggregates required to be castoff in top surface course of Water Bound Macadam infrastructures that must be have supreme 40% Los Angeles Abrasion value. This test is used to identify the quality of aggregates to be used in construction of a particular pavement. It

is a suitable test to check the hardness of aggregates. This is the test where resistance to abrasive action and impact can be determined simultaneously, due to presence of abrasive charge.

**d. Usual Causes of Pavement Failure:**

- Imperfect constituents are used in building of pavement overall by companies.
- Deprived class mechanism and unsuitable technique of creation off pavements.
- Accumulation of water in subgrade due to scanty drainage systems.
- High traffic volume in surplus of strategic condition.
- Wrong Settlement of foundation.
- Environmental aspects like heavy shower, erosion, high ground water table.

**6.1 Data collection**

The accident Mishap information examination for the period 2010-2016 (6 years) from Phagwara to Jalandhar has been done in existing contemplate, accident information examination has been gotten to from Phagwara to Jalandhar, the region goes under PS, Sadar, Phagwara and fatalities and mishap time recurrence appeared in charts . The information broke down is completely in light of police records, with expansion to these essential overview has been done on this extend to break down the street conditions, vehicle condition and driver conditions.

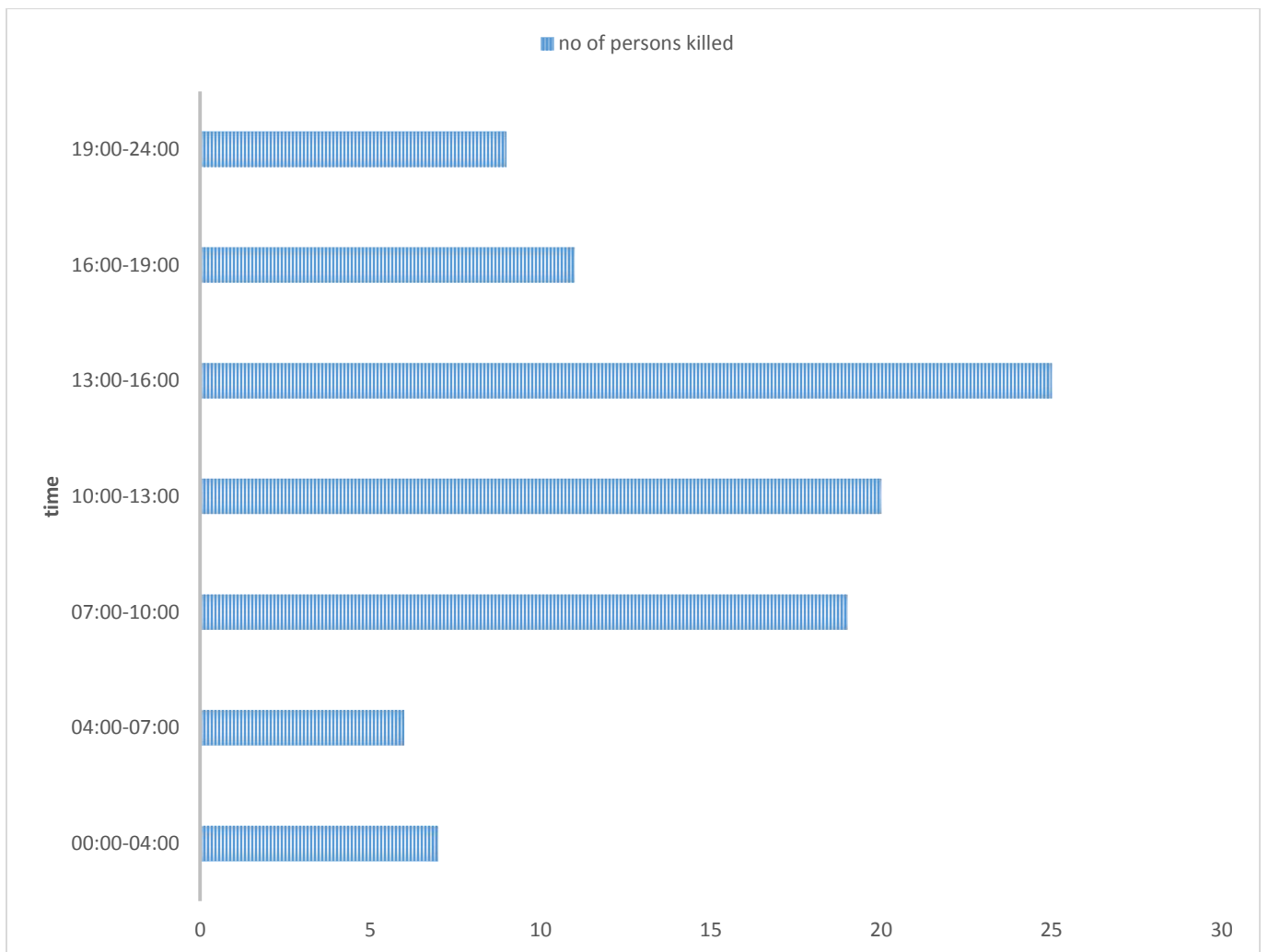


Chart 6-1: Timely factor denoting fatalities

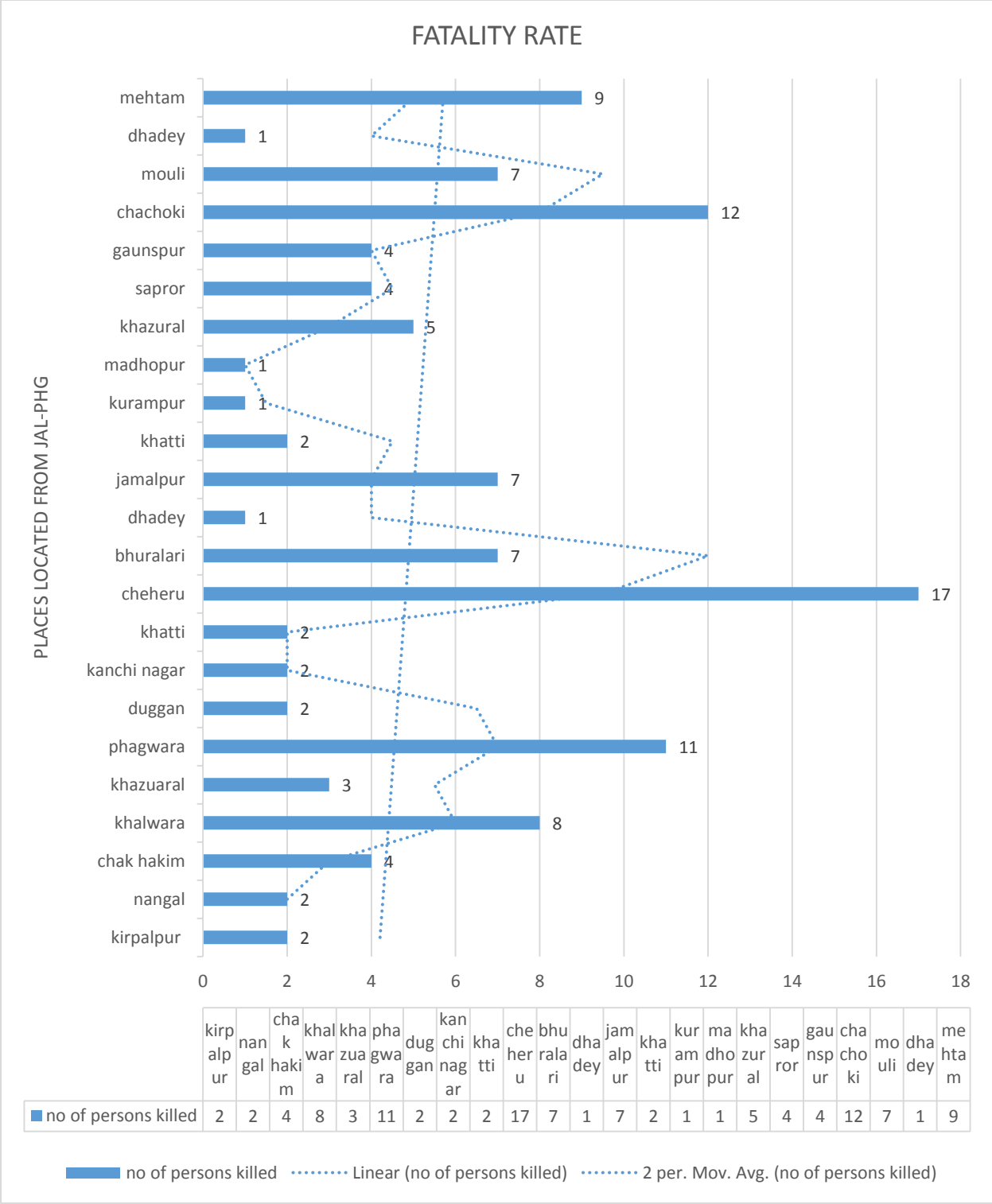


Chart 6-2: No of persons killed during the tenure of 2010-2016

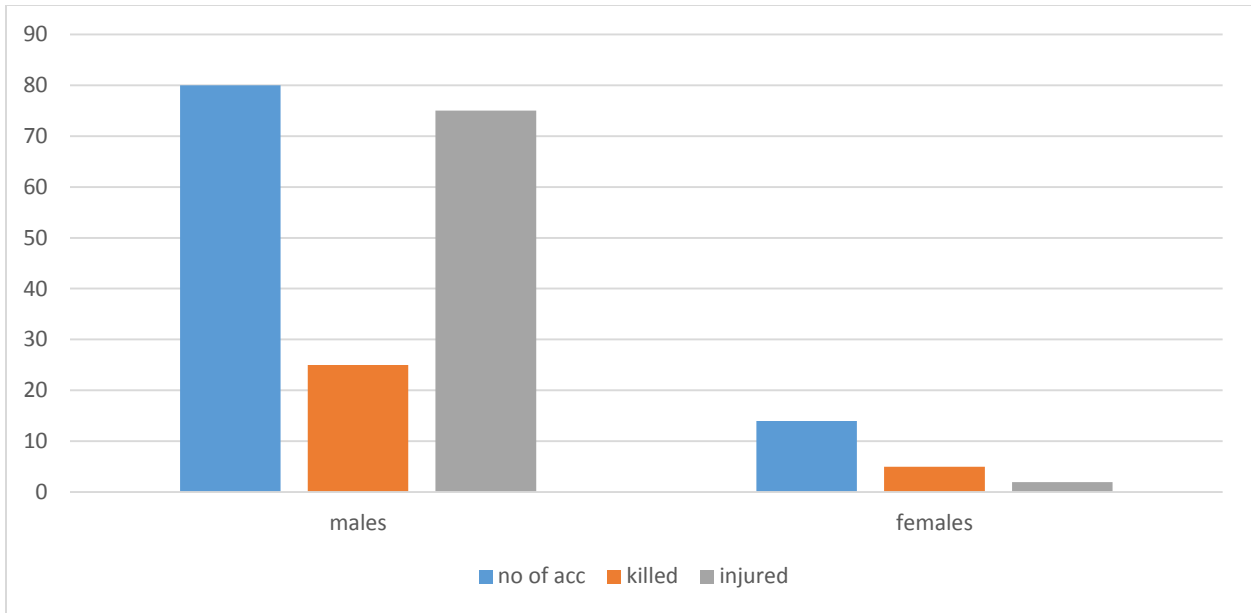


Chart 6-3: Gender based accidents

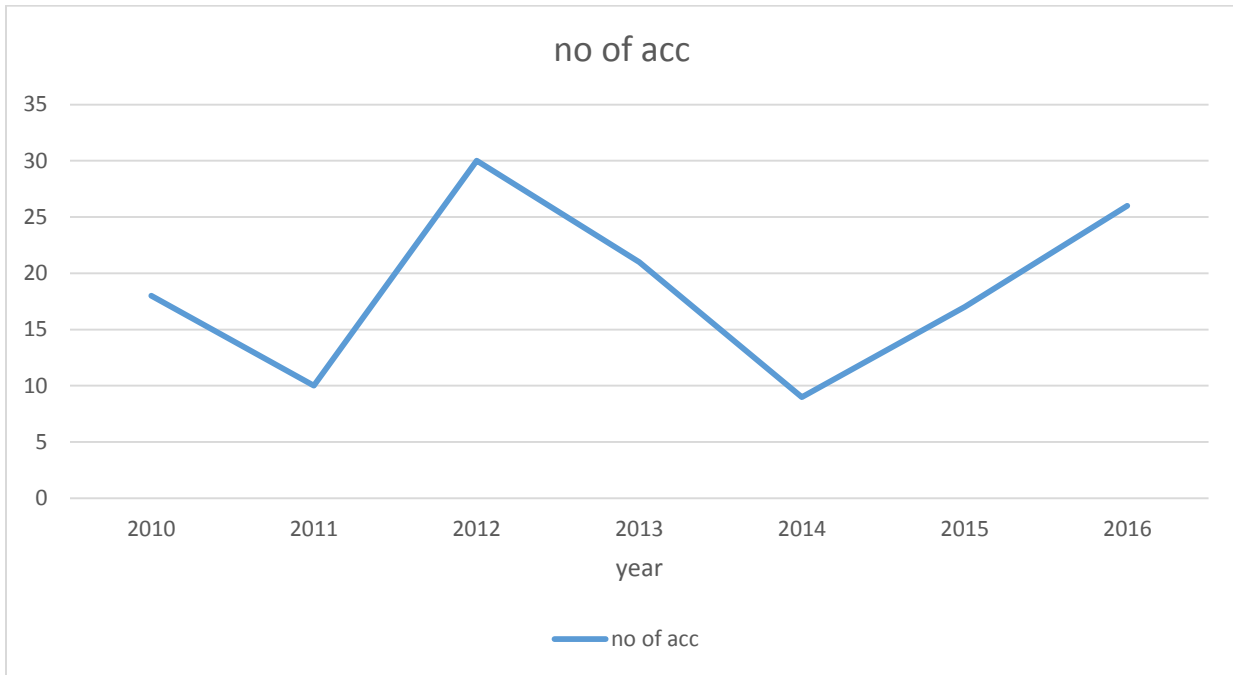


Chart 6-4: Yearly based accidents

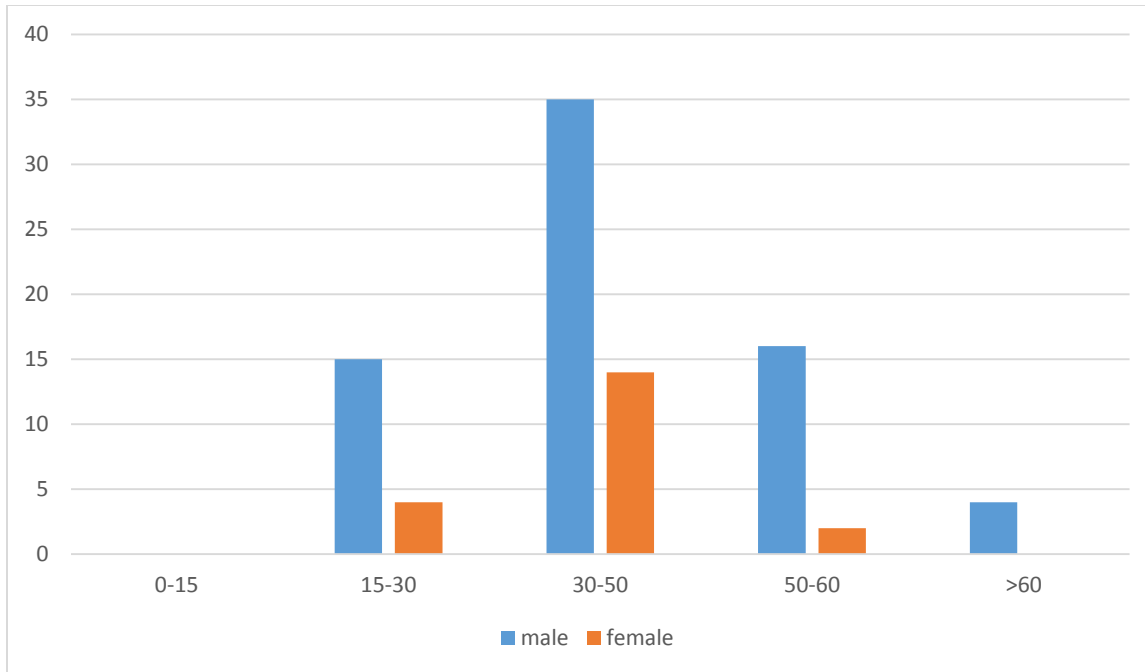


Chart 6-5: Gender based fatalities

Table 6-1: Accident data form different police stations

Sr. no	Police Station	Victim	Accused	Place of occurrence	Present Position of case
1	P S Sadar Jalandhar	Pedestrian	Truck	Kot kalan	TC 18/11/13
2	P S Sadar Jalandhar	Cycle	Car	GT Road Khambara	UT 3/12/13
3	P S Sadar Jalandhar	Cycle	Bus	Maan Medicity Khambara	TC 14/5/15
5	P S Sadar Jalandhar	Toyota Qualis	Truck	Partapurra	TC 16/5/15



6	P S Sadar Jalandhar	M/C	Unknwn Vehicle	Partapurra Gate	UI
7	P S Sadar Jalandhar	M/C	BUS	LOHARA	UI
8	PS Jalandhar Cantt	UNKNOWN	Camper	Rama Mandi	TC 14/05/13
9	PS Jalandhar Cantt	UNKNOWN	UNKNOWN VEHICLE	GT Road opp Railway station` CANTT	UT 5/8/13
10	PS Jalandhar Cantt	Activa	Army Vehicle	Rama Mandi Chowk	TC 27/08/13
11	PS Jalandhar Cantt	Car	Unknown Vehicle	Pap Gate no 1 Cantt	UT 3/06/14
12	PS Jalandhar Cantt	M/C	TRUCK	Rama Mandi Chowk	TC 01/05/15
13	PS Jalandhar Cantt	M/C	UNKNOWN	Rama Mandi Jalandhar	UT 24/08/15
14	PS Jalandhar Cantt	Car	Canter	Rama Mandi Jalandhar	TC 9/10/14
15	PS Jalandhar Cantt	Army Vehicle	Canter	Rama Mandi Jalandhar	TC 25/11/14
16	PS Jalandhar Cantt	Truck	Trala	Rama Mandi Jalandhar	Under Investigation
17	PS Jalandhar Cantt	Car	Truck	Rama Mandi Jalandhar	TC 27/11/14
18	PS Jalandhar Cantt	Unknown	Truck	Rama Mandi Jaladhar	TC 28/01/15
19	PS Jalandhar	M/C	Trala	Rama Mandi	TC

	Cantt			Jalandhar	26/02/15
13	PS Jalandhar Cantt	Activa	Bus	Rama Mandi Jalandhr	TC 30/04/15
14	PS Jalandhar	Unknown	Bus	Rama Mandi	Under Investigation
15	P S Div 8 Jal	M/C	Cycle	Lamaba Pind	CAN 16/04/15
16	P S Div 8 Jal	Trala	M/C	Lamba Pind Flyover	TC 21/02/15
17	P S Div 8 Jal	Trala	Car	Pathankot Chowk	ACQ 29/04/14
18	P S Div 8 Jal	Truck	Cycles	Lamba Pind Flyover	UT 09/04/15
19	P S Div 8 Jal	Car	Auto Rikshaw	Pathankot Chowk	TC 29/03/2014
20	P S Div 8 Jal	Truck	Cycles	Focal Point	ACQ 16/07/2014
21	P S Div 8 Jal	Unknown Vehicle	Scooter	Pathankot Chowk	UT 09/04/15
22	P S Div 8 Jal	Truck	M/C	Focal Point	TC 17/07/2014
23	P S Div 8 Jal	Truck	Walking	Pathankot Chowk	TC 06/09/2015
24	P S Div 8 Jal	Truck	Cycle	Pathankot Chowk	CH 17/10/2014
25	P S Div 8 Jal	Truck	Cycle	Focal Point	TC 13/01/2015
26	P S Div 8 Jal	M/C	Cycle	GT Road Lamba pind	UT 25/01/2015
27	P S Div 8 Jal	Unknown	Pedistrian	Focal Point	TC

		Vehicle			17/11/2014
28	P S Div 8 jal	CRV	Innova	Lamba Pind Flyover	TC 14/10/2014
29	P S Div 8 Jal	Truck	M/C	Pathankot Chowk	TC 12/12/2014
30	P S Div 8 Jal	Canter	Tractor	Pathankot Chowk	TC 29/11/2014
31	P S Div 8 Jal	Truck	Scooter	Sodal Road	TC 28/04/2014
32	P S Div 8 Jal	Unknown Vehicle	Car	Pathankot Chowk	TC 30/12/2014
33	P S Div 8 Jal	Three wheeler	Cycles	Trnasport Chowk Flyover	ACQ 03/03/2015
34	P S Div 8 Jal	Honda City	Car	Pathankot Chowk	UT 19/03/2015

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