ACCIDENT STUDY ON IDENTIFIED ROADS OF KURUKSHETRA

Naveen Kumar[1], Vishal Kumar Chaurasia[2]

[1]Assistant Professor, Hindu College of Engineering, Sonepat, Haryana, India

[2]Assistant Professor, Poornima College of Engineering, Jaipur

Abstract:-Transportation is vital for overall development of country but in India it is very critical problem because every year with increase in population, traffic volume also increases on road. Unfortunately, inadequate attention to safety several people loss of live, wealth and health. Here, a survey is performed on past road accidents for a selected stretch of Saharanpur-Yamuna Nagar-Pipli-Kurukshetra road at state highway 6 passing through Kurukshetra city from Pipli to 3rd Gate of Kurukshetra university for last 6 years from year 2007 to 2012 in Kurukshetra (state Haryana, India).After analysis of data various indices like Accident prone areas, Accident severity index, Total number of accidents, Total number of male, female and children involved in these road accidents, Peak hour time of accident and type of vehicle involved in road accident have been studied. Depending upon that accident prone areas are highlighted and suggestions for required provisions are provided to reduce the number of accidents in accident prone areas.

Key Words: Accident Prone areas; Accident Severity Index; Peak Hour time of Accident; Total Number of Accident per Year; Weighted Accident Severity Index.

Introduction

Road traffic accidents and their causalities on human being has been the major scourge in both developed and developing societies in the latter half of the twentieth century (Dhamaniya, 2013, Baguley, 2003). Traffic accidents are one of the major social problems adversely affecting the welfare and prosperity of developing countries. Urban Transport facilities in most of the Indian cities are inadequate and deteriorating over the years. The development of public transport system has not kept pace with the traffic demand both in terms of quality and quantity. As a result, the use of undesirable modes such as personalized transport, mainly two-wheelers and intermediate public transport, mainly three-wheelers, is growing at rapid speed. Roads and footpaths today are heavily encroached by parked vehicles, hawkers, and roadside business forcing pedestrians to walk on the road (Singh, 2004). As per data registered by the World Health organization, nearly 12 lakhs people are known to die each year in road accidents globally out of which more than 83,000 people are killed in India while roughly 5 times of this number(about 4 lakhs) are seriously injured in India (Desai, 2011). The total cost of losses due to road accidents are in the range of ₹400- 500 crores a day. The estimated cost includes compensation, asset loss, time and energy spent on police, hospital and court cases etc. (WHO, 2000). On the basis of number of road accident per lakh population, Haryana was ranked 14th among all state and union tertiaries in 2012 (MORTH, 2012). A study has been taken up on a selected stretch of SH-6, the Saharanpur-Kurukshetra road, between Pipli to 3rd Gate of Kurukshetra University in Haryana to find out accident severity index, weighted accident severity index, accident prone areas, peak hour time of accident, total number of accident per year and involvement of different type of vehicles and pedestrians.

Methodology

Study Area Profile

Kurukshetra is a land of historical and religious place. Kurukshetra is Located in Haryana state of India. Due to historical reasons of this place, peoples from different corners of India as well as world come here to visit these places thereby increasing the traffic volumes. A study has been taken up on a selected stretch of SH-6, the Saharanpur-Kurukshetra road, between Pipli to 3rd Gate of Kurukshetra University in Kurukshetra from year 2007 to 2012. The current population of Kurukshetra city is 19, 65,781. The distance of selected stretch is 8.6 km, it consists of 8 intersections, 1 over-bridge, and 19 T- points.

Data Collection and Analysis

All the accident related data are collected from Haryana police records for the analysis of accident scenario of selected stretch, Accident severity index, weighted accident severity index, peak hours' time of accident and high number of accidents at particular location considering them accident prone locations.

From the collected data, an excel sheet is prepared including all terms like time of accidents, location of particular accident, type of vehicle, death, major injuries and minor injuries etc. Through analysis of a data sheet to find all indices.

In the accident scenario of the selected stretch, three cases are shown namely total number of death, major injuries and minor injuries on the basis of data collected. The number of male, female and children involved in all three cases are shown in all cases. These data are shown on the yearly basis with total number of accidents. The percentage involvements of different type of vehicle are also calculated.

The numbers of accident are calculated with respect to time provided by the police record of different location. The data are plotted on hourly basis showing the total number of accidents during the period of 2007 to 2012.

As per data records of accident at different location during the years 2007 to 2012, the top five places having the maximum number of accidents are considered as accident prone areas (only top five places are shown in table).

The accident severity index measures the seriousness of an accident. It is defined as the number of persons killed per 100 accidents.

Weighted accident severity index is given to each accident on the basis of scale 1 to 5 on the basis of type of accident as follows:

  a. For death=5
  b. For major injuries=3
  c. For minor injuries=2
  d. For property damage=1

The equation used for finding accident severity index (WASI) is:

$$\text{WASI} = \frac{(A \times 5 + B \times 3 + C \times 2 + D \times 1)}{X}$$

A = Total death
B = Total major injuries
C = Total minor injuries
D = Property damage

Results and Discussion

In selected stretch SH 6 total accident decrease after 2009. The total number of accidents in 2007 is 40 and reduces to 36 in 2008. After that there is an increase in the number of accidents in 2009, beyond that in 2012 the number of accidents are 24 which clearly indicates that number of accident rate decreased.

Total number of death in 2007 is 6 and decrease in 2008 up to 2 but it continuous increase in 2009 and 2010 is 7 and 10 respectively. After that total number of death is reduced in 2011 is 5 and increased to 8 in 2012.

The Total number of major injuries is 45 in 2007. The decreasing number of major injuries is 42, 40, 39, 27 and 19 in year 2010, 2009, 2008, 2011 and 2012 respectively. In the same manner the total minor injuries are 15, 14, 5, 5, 4 and 3 in year 2007, 2008, 2009, 2012, 2010 and 2011 respectively.

Also form the analysis of data very common thing is seen that in all cases the number of males (M) involved is higher than the females (F). The children (C) involvement is only seen in major and minor injuries. The total number of death, major injuries, minor injuries and accidents per year is given in table 1.

Table 1: Total No. of Accidents, Deaths, Major and Minor Injuries Gender wise.

Year	Total Accident	Deaths		Total death	Major injuries			Total Major injuries	Minor injuries			Total Minor injuries
		M	F		M	F	C		M	F	C	
2007	40	5	1	6	35	6	4	45	13	2	0	15
2008	36	2	0	2	29	9	1	39	13	1	0	14
2009	41	5	2	7	31	9	0	40	5	0	0	5
2010	36	9	1	10	38	5	1	42	4	0	0	4
2011	27	3	2	5	19	6	2	27	3	0	0	3
2012	24	6	2	8	15	3	1	19	3	0	2	5

Percentage involved and affected in accidents

The motor vehicle and cars have maximum involvement in accidents having a percentage of 32% and 28% respectively, which is more in comparison to other type of vehicles. The percentage of accidents by bus and trucks are 10% and 11%. The minimum involvement of taxies and tractors have a minimum percentage of 4% and 5%. The remaining 10% vehicles are unidentified or unclassified vehicle.

The pedestrians and the two wheelers sections are seen to most affected sections having a percentage of 39 and 43. The bi-cycles and cars are equally affected by the accidents. Their percentage is 5. 4% taxies are also affected. The rest 4% are counted in others. Both datas are shown in figure 1.
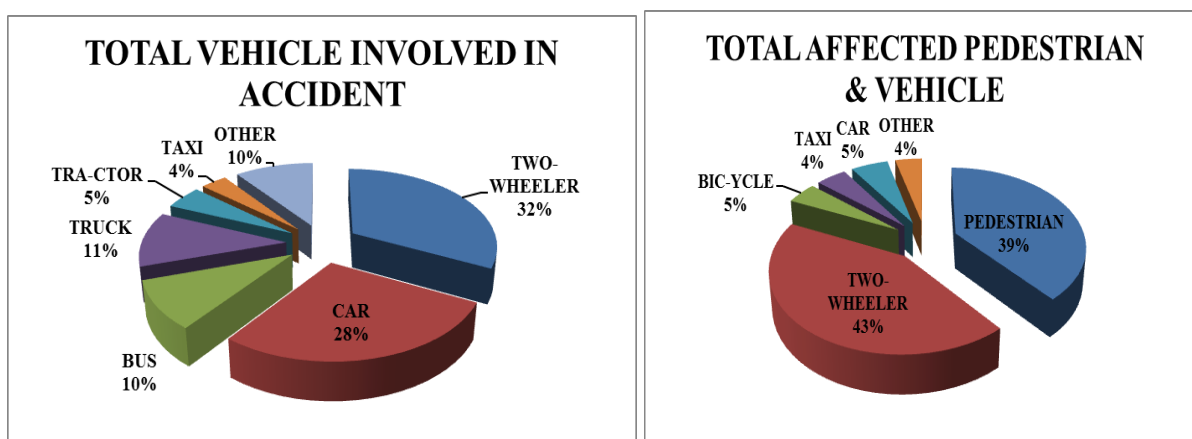

Figure 1: Total %age of vehicles involved and Total Affected Pedestrian & Vehicles

Total number of accident with respect to time

It can be seen that accident time also has the characteristics of two peaks and a trough. That is, the afternoon rush hour appears in 12:00PM-02:00PM, 04:00PM-06: 00PM is the evening peak but 00:00AM-08:00AM is constant in a day. This phenomenon is in good consistency with the characteristics

of the time distribution of traffic, showing that the frequency of traffic accidents have a high frequency and relevance with the Traffic.
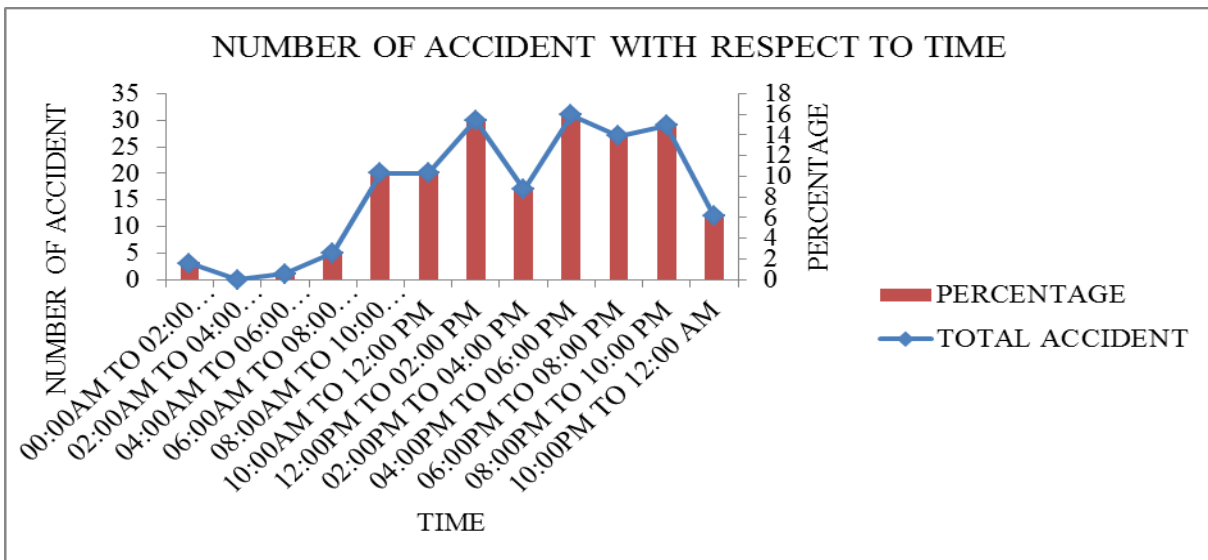

Figure 2: Graph for Number of Accidents Vs Hourly Time.

Accident prone areas

Out of all the locatios the top five locations having maximum average number of accidents per year are considered to be accidents prone locations. rest of datas in not shown in the table 2. From table the mohan nagar chowk have 4.33 number of average accidentsn per year. The other four identified location are LNJP hospital, Gurudwara Intersection, Over bridge and Old bus stand having 3, 2.5, 2.33 and 2.16 average number of accidents per year respectively.

Table 2: Areas Having Maximum Average Numbers of Accidents Per Year.

Location/ Year	2007	2008	2009	2010	2011	2012	Average Number of Accident per year
Mohan Nagar Intersection	7	2	6	4	3	4	4.33
LNJP Hospital	6	5	2	3	0	2	3.0
Gurudwara Intersections	1	3	3	3	3	2	2.5
Overbridge	3	5	2	2	2	0	2.33
Old bus stand	1	2	5	1	0	4	2.16

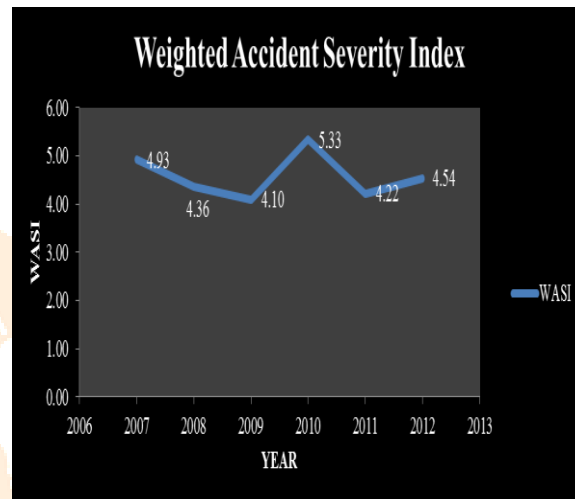*Accident Severity Index (ASI)*

Table 2 presents accident severity index for selected stretch in Kurukshetra city from 2007 to 2012. It is seen from the table that the accident severity index has gradually increased from 15.00 in 2007 to 27.78 in 2010 thereafter it decreases to 18.52 in2011. In 2012, the number of ASI increased up to 33.33, nearly double than 2011. The year wise accident severity index is also shown in figure 3 and calculations in table 3.

Table 3: **Calculation of ASI**

Year (1)	Total number of accident (2)	Number of persons killed		Total death (5)	ASI (6)=(5/2)*100
		Male (3)	Female (4)		
2007	40	5	1	6	15.00
2008	36	2	0	2	5.56
2009	41	5	2	7	17.07
2010	36	9	1	10	27.78
2011	27	3	2	5	18.52
2012	24	6	2	8	33.33

Table 4: Weighted Accident Severity Index (WASI)

Year (1)	Number Of Accident (2)	Total Death (3)	Total Major Injuries (4)	Total Minor Injuries (5)	Property Damage (6)	Death *5 (7)	Major Injuries *3(8)	Minor Injuries *2(9)	Property Damage *1(10)	WASI= (7+8+9+ 10)/(2)
2007	40	6	45	15	2	30	135	30	2	4.93
2008	36	2	39	14	2	10	117	28	2	4.36
2009	41	7	40	5	3	35	120	10	3	4.10
2010	36	10	44	4	2	50	132	8	2	5.33
2011	27	5	27	3	2	25	81	6	2	4.22
2012	24	8	19	5	2	40	57	10	2	4.54

Figure 3: ASI and WASI.

Weighted Accident Severity Index (WASI)

Initially the weighted accident severity index (WASI) is found to be 4.93 in 2007 and which decrease to 4.10 in 2009. Thereafter there is a sudden increase and decrease in the value of WASI from 4.10 to 5.33 and 5.33 to 4.22 in year 2010 and 2011 respectively. In the last year i.e., 2012, finally the WASI is found to be 4.54. The calculations of WASI are shown in the table 4 & the graph plotted between WASI/ Year is shown in figure 3.

Conclusion and suggestions

The following points are concluded on the basis of study:
- There is continuous decrease in number of accidents from 40 in 2007 to 24 in 2012.
- The maximum no of vehicles involved in the accidents are motor vehicle (two wheelers) and car.
- The peak accident time of accidents noticed at 12:00PM-02:00PM, 04:00PM-06:00 PM due to heavy rush in traffic.
- The top five areas having the maximum average accidents over 6 years which are identified as accident prone locations are Mohan Nagar Intersection, LNJP Hospital, Gurudwara Intersection, Over Bridge and Old Bus Stand.
- On the basis of calculation year 2012 has maximum ASI of a value 33.33.
- The WASI is maximum is seen in 2010 having a value of 5.33. In 2012 it reduces to 4.54.

The main causes of these accidents are lack of traffic signals, parking areas, markings and geometric designs of road. Some suggested preventive action in terms of vehicle, driver, and engineering factors are as following:
- List of safety features for vehicle design (e.g. safety belt, air bags, collapsible steering, braking performance etc.).
- Maintenance of vehicles.
- Road design and geometric improvements to compensate for inadequacies of road users such as:

- o Designing of road profile network
- o Stopping sight distance
- o Overtaking sight distance
- o Pavement width
- o Footpath & Shoulder
- o Hump near the college and other place and using reflectors on dangerous zone

- Accident black spot investigation and rectification through road design. By providing Traffic signal for controlling the traffic movement as per requirement at black spot point and control the road accident in Kurukshetra.
- Traffic police for controlling the traffic
- Design of road junctions,
- Traffic guidance, road signs, speed limit posts, and other traffic control devices and Warning signs for road users
- Road pavement markings, construction of footpaths/cycle tracks, bus bays, truck parking complexes, and other way side amenities, etc.
- Traffic education and campaign on traffic discipline
- Enforcement of maximum speed limits, and campaign on helmet use and seat belt use, curbing alcohol consumption among drivers, etc.
- Emergency medical service with emphasis on saving the lives of victims etc.

References

Baguley, C. J. 2003. Road accident modelling for highway management and management in developing countries. *Transportation Research Laboratory*, Ed. B. L. Hills, 269-319.

Desai, M. M. 2011. Safety measures for Controlling Road Accident. *National Conference on Recent Trends in Engineering & Technology*, Ed. A. K. Patel, 1-8.

Dhamaniya, A. 2013, Development of Accident Prediction Model under Mixed Traffic Conditions: A Case Study. *Urban Public Transportation System*, 124-135.

Haryana police, FIR of vehicle accidents <http://haryanapolice.nic.in/police/fir_query_Acc.asp> (Sep 2013).

MORTH, 2012, Road Accidents In India 2012. *Minister of Road Transport & Highway*. New Delhi: Transport Research Wing, 1-55

Singh, K. S. 2004. Road Accident Analysis: A Case Study of Patna City. *Urban Transport Journal,* Ed. A. Mishra, 2(2), 60-75.

WHO, 2000, The World Health Report*: Health* Systems – Improving Performance (2000). World Health Organization, Geneva.