

Study of Pedestrian Accidents on National Highway-5 using Police Station Survey in Visakhapatnam

K.SWETHA

*MTech., Department of Civil Engineering
GMR Institute of Technology, Rajam, Srikakulam District, Andhra Pradesh, India*

K.S.B. PRASAD

*Asst. Prof, Department of Civil Engineering
GMR Institute of Technology, Rajam, Andhra Pradesh, India*

Abstract- In India pedestrian fatalities constitute around 50-60% of total fatalities and 30-40% of all reported road accidents occur on National Highways. Pedestrian safety study would provide a useful input to design roads accordingly so as to prevent pedestrian fatalities at urban areas in India. In comparison with other road user groups, pedestrians are involved in a significant number of fatal and injury accidents due to various reasons. Today with new appreciation for the value of a balanced transportation system, planners and designers are paying more attention to pedestrian travel. Walking is the glue that holds our urban transportation system together. It is a necessity to take care of pedestrian safety in a fully fledged way rather than controlling the pedestrians. It is more accurate to assess pedestrian safety by how many people actually walk on streets and what factors improve or worsen pedestrian safety. The present study is based on the accident data collected from three police stations into which the whole study stretch comes under. This paper focuses on the number of pedestrian accidents occurring in these five years for the whole study stretch for each and every area on highway. The area has been categorized for its accident proneness based on the number of accidents occurring in each area. Various general reasons for the causes of pedestrian accidents have been found for the reason behind pedestrian accidents. The paper has been concluded with simple basic reasons behind these pedestrian accidents.

Keywords – Pedestrians, pedestrian safety, facilities, behavior, surveys.

I. INTRODUCTION

Pedestrian are facing lot of problems on the expressways. Crossing the road is one of the major problems. Pedestrians cross the road an average of two to three times on every walking trip. Accident rate of pedestrians is more when compared with other modes of traffic. Due to the increase of fast moving vehicles on the road, pedestrian has to suffer more to cross the road, which may lead to accidents. Accidents are also due to lack of facilities, geometric features and guidelines. A multi-disciplinary approach is needed in understanding the problems and to suggest solutions. It is very much necessary for a traffic engineer to have a clear picture about the major causes of the accidents, which creates the problem.

Pedestrians and bicyclists are the most vulnerable road users. Pedestrian accidents are mainly due to driver inattention, struck while crossing an intersection, motorist exceeding safe speed, struck from behind while using the carriageway for walking. In this scenario, pedestrian safety should be given prior importance. To minimize risk and severity of accidents and to inculcate the important of safety in expressway design, safety study on roads is necessary.

OBJECTIVES

- To investigate facilities provided for pedestrian movement is adequate or not.
- To analyze the traffic volume data and pedestrian accident data and enlighten the various reasons for the cause of pedestrian accidents.
- To enlighten the experience of pedestrians while moving and crossing in the study stretch and to investigate the draw-backs.
- To analyze and identify data to suggest best practices to improve the pedestrian safety under suggested guidelines and standards.
- To enhance walkability of local districts and create safe comfortable welcoming environment for pedestrians.

STUDY AREA

- The area proposed for the study of pedestrian safety is in Visakhapatnam.
- **Visakhapatnam** is the largest city in the Indian state of Andhra. It is the third largest city on the east coast of India (after Chennai and Kolkata). It is a port city on the southeast coast of Bay of Bengal and often called as "The Jewel of the East Coast" and the "City of Destiny".
- The study area is a part of Asian Highway-45, National Highway-5 and also acts as a Major District Road connecting to various main parts of the city.

The following are the concerned study stretches to list out the accident data and traffic volume data. Relative methods are applied to find out the highest priority accident stretches and to list out the preventive measures.

- Akkayapalem to 4th town
- 4th town to Gurudwara
- Gurudwara to Satyam junction
- Satyam junction to Maddilapalem
- Maddilapalem to Isukathota
- Isukathota to Venkojipalem
- Venkojipalem to Hanumanthawaka
- Hanumanthawaka to Dairy Farm
- Dairy Farm to Endada
- Endada to P.M.Palem
- P.M.Palem to Madhurawada

METHODOLOGY

The methodology is proposed to be followed for establishment of norms for identification of 'Accident black spots' and formulation of appropriate safety, improvement schemes for the stretch Akkayapalem to Madhurawada in Visakhapatnam.

DATA COLLECTION

An effective and reliable accident database is considered to be of paramount importance for any road safety planning study. As the design of various road safety parameters are based on the accurate assessment of prevailing conditions, collection of reliable data is an important part in the study. The accident data for the past five years from 2010-2014 were collected from police stations falling under the jurisdiction of the project road.

Details of accident Data collected include the following

- Date of accident
- Location wise details of accident
- Total number of accidents
- Total number of injuries and fatalities

4.2 Selection Procedure

The selection of 11 study stretches will essentially be based on:

- Number of accidents method
- Accident rate method
- (i) Number of accident method

Number of accident method is the simplest. In this method locations are ranked according to number of accidents experienced at each location, say for the year. The one having the highest number of accidents is listed first, the one with next highest second etc. locations having fewer accidents are omitted. This method is an acceptable one to begin with and will serve the purpose of initial screening of locations for detailed accident study.

- (ii) Accident rate method

A more useful method of ranking locations according to accident experience is accident rate method. A road location may have numerous accidents because it is much used rather than because it is especially hazardous. Thus, the location having the most accidents is not necessarily the most dangerous to use; conversely, lack of reported accidents for a specific period does not necessarily mean that there is less risk.

After the initial screening of location, by number of accident method, the accident rate method could be used for final selection of stretches for detailed study.

For the purpose of the study only accidents resulting in casualties and not property damage will be considered.

DATA COLLECTION AND ANALYSIS

Since the main objective of the study is to identify the accident-prone locations and to improve it on priority basis, a cursory look at the existing accident situation, traffic flow parameters and geometric data becomes a prime necessity. Accident data will be collected from the police stations falling under the jurisdiction of the project road and some geometric data were also collected. Various traffic surveys were carried out during the study.

The various surveys carried are:

- Accident data
- Traffic volume counts
- Pedestrian volume counts
- Questionnaire survey
- Identification of Black Spots

Accident Data

The accident data for the past five years from 2010-2014 were collected from the police stations falling under the jurisdiction of the project road in the city of Visakhapatnam (i.e., from Akkayyapalem to Madhurawada). The various accident data collected as listed below.

- Distribution of accidents according to severity
- Month wise variation of accidents
- Location wise distribution of accidents

Year	Died	Grievous injury	Injured
2010	26	28	36
2011	23	22	32
2012	20	22	28
2013	15	18	20
2014	11	13	18

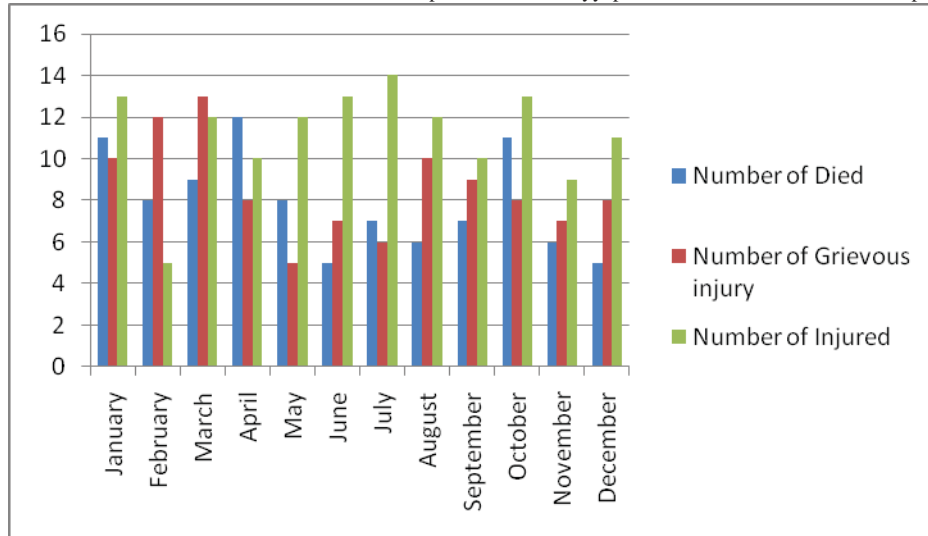
Table 1.1-Year wise distribution of accidents from Akkayypalem to Madhurawada in Visakhapatnam according to severity type.



Month	Number of			Total
	Died	Grievous injury	Injured	
January	11	10	13	34
February	8	12	5	25
March	9	13	12	34
April	12	8	10	30
May	8	5	12	25
June	5	7	13	25
July	7	6	14	27

August	6	10	12	28
September	7	9	10	26
October	11	8	13	32
November	6	7	9	22
December	5	8	11	24

Table 1.2-Month wise distribution of accidents reported from Akkayapalem to Madhurawada in Visakhapatnam during last five years.



S.No.	Location	No. of accidents			Total
		Simple	Grievous	Fatal	
1	Akkayyapalem – 4 th town	15	9	7	31
2	4 th town – Gurudwara	18	12	13	43
3	Gurudwara – Satyam Jn.	13	8	9	30
4	Satyam Jn. – Maddilapalem	12	10	8	30
5	Maddilapalem – Isukathota	21	15	12	48
6	Isukathota – Venkojipalem	13	7	10	30
7	Venkojipalem - Hanumanthawaka	15	8	13	36
8	Hanumanthawaka– Dairy Farm	11	9	6	26
9	Dairy Farm -Endada	12	7	8	27
10	Endada –P.M.Palem	20	14	15	49
11	P.M.Palem –Madhurawada	15	13	9	37

Table 1.3 Location wise distributions of accidents (Akkayyapalem to Madhurawada)



The stretches are numbered accordingly

- Stretch 1: Akkayyapalem – 4th town
- Stretch 2: 4th town – Gurudwara
- Stretch 3: Gurudwara – Satyam jn.
- Stretch 4: Satyam jn. – Maddilapalem
- Stretch 5: Maddilapalem – Isukathota
- Stretch 6: Isukathota - Venkojipalem
- Stretch 7: Venkojipalem – Hanumanthawaka
- Stretch 8 : Hanumanthawaka – Dairy Farm
- Stretch 9 : Dairy Farm – Endada
- Stretch 10: Endada – P.M.Palem
- Stretch 11: P.M.Palem - Madhurawada

IDENTIFICATION OF ACCIDENT BLACK SPOTS IN THE STUDY AREA STRETCH

Analysis of existing accident scenario is required for the identification of accident-prone locations on the selected stretch. There are several methods, which have been applied in developed countries to determine accident-prone locations. However, in the present study, two methods of accident-prone locations analysis were considered for identifying and prioritizing the accident-prone locations.

Quantum of Accident Method

Higher the number of accidents on any stretch, higher would be the accident proneness of the stretch. It has been put forward that two accidents in a year may be due to minor design defects while three or more accidents in a year definitely indicate serious deficiencies in geometric of road stretch. Therefore all the stretches with 11 or more accidents during five-year period were considered accident-prone stretches. Table 1.3 gives the list of total accidents within the study corridor.

Based on the Quantum of accident method the above nine are the accidents prone stretches with total accidents for the five years greater than 11 were selected for detailed investigation. The accident-prone locations identified for detailed investigation are listed below in the order.

- P.M.Palem – Endada
- Maddilapalem - Isukathota
- 4th town – Gurudwara
- Akkayyapalem – 4th town
- P.M.Palem - Madhurawada
- Isukathota – Venkojipalem
- Gurudwara – Satyam junction
- Satyam junction – Maddilapalem
- Dairy Farm – Endada
- Hanumanthawaka – Dairy Farm

Accident risk index (ARI):

Under the ARI method following three components of accidents was considered:

1. Consistency
2. Tendency and
3. Level

The above three components of accidents have been formed into four groups. Each component and group have been assigned certain points as explained in the table below:

Each stretch of the road was analyzed by using the above three components. Total score or each stretch was computed and compared. Higher the total score, higher is the accident proneness, which varied between 0 and 100. Road stretches having a score more than 90 have to be given priority in improvement.

From the above computed values, accident proneness locations were listed below.

- Endada - P.M.Palem
- Maddilapalem - Isukathota

4th Town - Gurudwara
 P.M.Palem - Madhurawada
 Venkojipalem – Hanumanthawaka
 Akkayyapalem - 4th Town
 Isukathota – Venkojipalem
 Gurudwara – Satyam junction
 Satyam junction – Maddilapalem
 Dairy Farm – Endada
 Hanumanthawaka – Dairy Farm

Accident Components	Points
1. Consistency (max points 30) One or more than one accident every year	30
2. Tendency (max points 30) No increase	10
3.Level (max points 40) Number of accidents in three years is 6 or more than 6	40
Total	80

IV.CONCLUSION

Based on the Accident survey from police stations and the analysis carried out using Quantum of Accident method and Accident Rate Index the Black spots in the study stretch were identified and listed according to their rate of accidents. Further surveys are to be conducted to identify the reasons behind the accidents in the black spots and analysis is to be carried out to find out the major cause of accidents in these stretches. Various other methods can also be used to identify the rate of accidents in these areas and to mitigate the accident rate.

The safety measures can be covered stretch wise individually based on the problem in that particular stretch. It is not necessary that the safety measures are alike for all the stretches in the study area. Some of the various reasons for accidents may be

- Pedestrian negligence
- Vehicle user mistake
- Climatic conditions
- Geometric draw-backs

It is observed that the rate of occurrence of accidents reduced compared to each year though the population and the number of vehicle users increases every year. In the accident prone areas it has been observed that pedestrian negligence placed a minor role compared to other reasons like proper road geometrics, improper lighting, vehicles not following traffic rules etc.

REFERENCES

- [1] NATPAC (June 2007), "Identification and improvement of accident prone locations on NH 47 in Alappuzha town in Kerala state".
- [2] "Identification and improvement of accident prone locations on MDR in Rajam".
- [3] Khanna and Justo, "Highway engineering".
- [4] Nishi Mittal(2010), PEDESTRIAN SAFETY AT URBAN INTERSECTIONS IN DELHI, INDIA : (Indian Journal Of Transport Management)
- [5] B. Srinivas rao, E.Madhu, Santosh Jalihal and T.S. Reddy (2005), ACCIDENT STUDY ON NATIONAL HIGHWAY - 5 BETWEEN ANAKAPALLI TO VISAKHAPATNAM: Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 1973 – 1988.
- [6] Dinesh Mohan, Omer Tshimhoni, Michael Shivak, Michael J. Flannagan(2009),

- [7] ROAD SAFETY IN INDIA : CHALLENGES AND OPPURTUNITIES : The University of Michigan Transportation Research Institute – 2009-1.
- [8] CHARLES V. ZEGERER AND MAX BUSHELL (2010), PEDESTRIAN CRASH TRENDS AND POTENTIAL COUNTERMEASURES FROM AROUND THE WORLD: University of North Carolina Highway Safety Research Center.
- [9] Dan Nabors, Robert Schneider, Dalia Leven, Kimberly Lieberman, Colleen Mitchell, (2008), PEDESTRIANS SAFETY GUIDE FOR TRANSIT AGENCIES.
- [10] Indian Road Congress, IRC : 103-1988.
- [11] Barni M., Bartolini F., Piva A., Multichannel watermarking of color images, *IEEE Transaction on Circuits and Systems of Video Technology* 12(3) (2002) 142-156.
- [12] Kundur D., Hatzinakos D., Towards robust logo watermarking using multiresolution image fusion, *IEEE Transacions on Multimedia* 6 (2004) 185-197.
- [13] C.S. Lu, H.Y.M Liao, "Multipurpose watermarking for image authentication and protection," *IEEE Transaction on Image Processing*, vol. 10, pp. 1579-1592, Oct. 2001.
- [14] L. Ghouti, A. Bouridane, M.K. Ibrahim, and S. Boussakta, "Digital image watermarking using balanced multiwavelets", *IEEE Trans. Signal Process.*, 2006, Vol. 54, No. 4, pp. 1519-1536.
- [15] P. Tay and J. Havlicek, "Image Watermarking Using Wavelets", in *Proceedings of the 2002 IEEE*, pp. II.258 – II.261, 2002.
- [16] P. Kumswat, Ki. Attakitmongcol and A. Striaew, "A New Approach for Optimization in Image Watermarking by Using Genetic Algorithms", *IEEE Transactions on Signal Processing*, Vol. 53, No. 12, pp. 4707-4719, December, 2005.
- [17] H. Daren, L. Jifuen, H. Jiwu, and L. Hongmei, "A DWT-Based Image Watermarking Algorithm", in *Proceedings of the IEEE International Conference on Multimedia and Expo*, pp. 429-432, 2001.
- [18] C. Hsu and J. Wu, "Multi-resolution Watermarking for Digital Images", *IEEE Transactions on Circuits and Systems- II*, Vol. 45, No. 8, pp. 1097-1101, August 1998.
- [19] R. Mehul, "Discrete Wavelet Transform Based Multiple Watermarking Scheme", in *Proceedings of the 2003 IEEE TENCON*, pp. 935-938, 2003.