

**ANALYSIS OF ACCIDENT SURVEY ON PEDESTRIANS ON NATIONAL HIGHWAY -16 USING STATISTICAL METHODS**

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**ABSTRACT**

*In India where 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*

*This work is mainly focused on facilities provided and safety for the pedestrians on National Highways. Accident is Collected & Various surveys are carried and analysed for the better safety to pedestrians on the study stretch. The study area is so selected that it is a highway and also consists of residential and non-residential areas connecting to it. This new work can help to decide how to enhance pedestrian safety by giving more detailed information about where the enhancements are best applied. This study can also have applications towards general travel demand forecasting by providing insight in how to better predict the choice of walking as travel mode.*

**Keywords:** Surveys, facilities, pedestrian safety, behaviour.

**1. Introduction**

Pedestrian are facing lot of problems on the expressways. Crossing the road is one of the major problems. 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. Road traffic accidents are considered one of the most important problems facing modern societies.

It is estimated that India loses around Rs. 3000 crores annually due to road accidents. Of all the deaths in India, road accidents constitute the highest percentage around 22 percent. Pedestrians having highest percentage in accident rate compared to other vehicular traffic. Pedestrians and bicyclists are the most vulnerable road users. In this scenario, pedestrian safety should be given prior importance.

**2. Pedestrian Crossing**

Pedestrian crossings are of two types:

1. At grade pedestrian crossing

2. Grade separated pedestrian crossing

At grade pedestrian crossing can be controlled or uncontrolled. Uncontrolled pedestrian crossings are marked by studs or paint line. Controlled pedestrian crossing can be zebra crossing, police controlled crossing and signal controlled crossing. . Control measures at mid – block crossings are provided when peak hour volumes of pedestrians (P) and vehicles (V) are such that  $PV^2 > 108$  for undivided carriageways and  $PV^2 > 2 \times 10^2$  for divided carriageways, approach speed of vehicles exceed 65kph and waiting time of pedestrians is too long

Grade separated crossing facilities are provided when the vehicular and pedestrian traffic is much higher such that providing an exclusive pedestrian phase may increase the delay, vehicular traffic needs uninterrupted flow in major arterial roads and expressways i.e., high speed roads. Grade separated pedestrian crossing facilities can be subways or foot over bridge.

### 3. Objectives:

- To study the needs & facilities provided for pedestrian movement is sufficient or not
- To determine the traffic volume data and pedestrian accident data and enlighten the various reasons for the cause of pedestrian accidents.
- To identify the experience views 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.

### 4. Methodology:

The methodology proposed to be followed for establishment of norms for identification of ‘Accident black spots’ and formulation of appropriate safety, improvement schemes for the stretch national highway -16 Visakhapatnam.

### 5. Data Collection:

Data is collected by using the different types of surveys which are listed below

- Accident data collection
- Traffic volume survey
- Pedestrian volume survey
- Identification of Black Spots

#### 5.1 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

#### 5.2 Traffic Volume And Count Survey

Knowledge of the traffic volume its characteristics on a road stretch is important to understand the efficiency at

which the system works and the general quality of service offered to road users. Knowing the flow characteristics it would be easily decided whether a particular section of the road is handling traffic at, above or below its capacity.

#### 5.3 Pedestrian Survey

Pedestrians are an important component of road users. Pedestrian volume survey will be carried out at the selected accident-prone locations, where high pedestrian activities are observed. Based on the analysis of this data, suitable proposals will be formulated to improve the safety of pedestrians.

#### 5.4 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

The various accident data collected as listed below.

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

### 6. Location Black Spots in the Study

#### Area

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.

#### 6.1 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.

### 5.2 Traffic Volume Survey Data

Knowledge of the traffic volume its characteristics on a road stretch is important to understand the efficiency at which the system works and the general quality of service offered to road users. Knowing the flow characteristics it would be easily decided whether a particular section of the road is handling traffic at, above or below its capacity. Traffic volume count survey will be carried out at sections in the selected locations to know the total volume of traffic, composition of traffic etc.

### 6. Analysis of Accident using Statistical Methods

The cause for accidents being interplay of a variety of factors, the analysis of accident data presents formidable problems. Qualitative methods of analysis of accidents can provide insight into the causes that contributed to the accident and often help to identify the black spots on the street system. More recently, the emphasis has shifted to the application of statistical techniques in planning and analyzing experiments into the effectiveness of accident prevention measures. The data gathered on accidents can be purposefully interpreted and used only if modern statistical methods are employed.

### 7.1 Regression Method

The regression model is of the following form:

$$Z = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + \dots + \alpha_n x_n$$

Where  $Z$  = accident rate

$\alpha_1, \alpha_2, \dots, \alpha_n$  = regression coefficients

$x_1, x_2, \dots, x_n$  = independent variables

$\alpha_0$  = regression constant.

The regression equation is easy to determine by means of a computer program by the method of least squares.

### 7.2 Poisson Distribution

The mathematical formula for the Poisson distribution is

$$P(r) =$$

Where  $P(r)$  = Probability of occurrence of  $r$  events

$m$  = average rate of occurrence of events

$E$  = base of Napierian logarithms.

### 8. Conclusions:

- Nearly half of all travel trips taken in the US are 3 miles or less in length; 28% are less than 1 mile. By converting short automobile trips to bicycling and walking, communities can get benefits from healthier air and reduced traffic congestion.
- The American public saves from 5 to 22 cents for every automobile mile displaced by walking and bicycling through reduced pollution, oil import costs, and costs from congestion such as lost wages and time on the job.
- Approximately 160 million tons of pollution is emitted into the air each year. Air pollution contributes to the deaths of 70,000 people each year.
- Short auto trips produce far more pollution per mile than longer trips.
- Increased levels of bicycling and walking can reduce air pollution.

- Pedestrians add to the ambience and security of streets

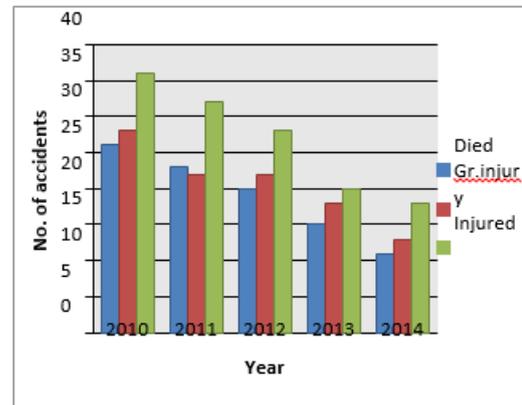
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## 9. References

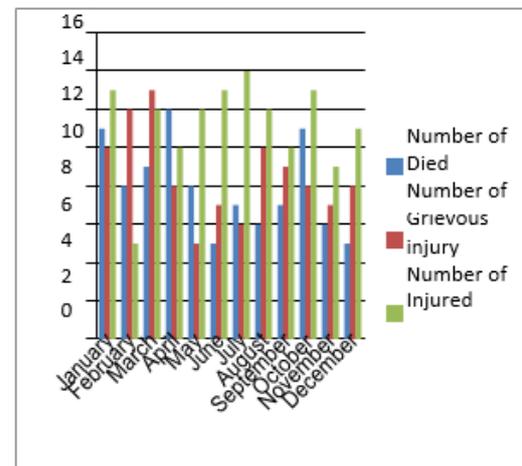
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## LIST OF FIGURES IN THE STUDY

**Fig 1 : shows the Year wise Distribution of Accident Data**



**Fig 2. Month wise distribution of accidents reported in Visakhapatnam during last five years.**



**Fig 3. Location wise distribution of accidents reported in Visakhapatnam during last three years**

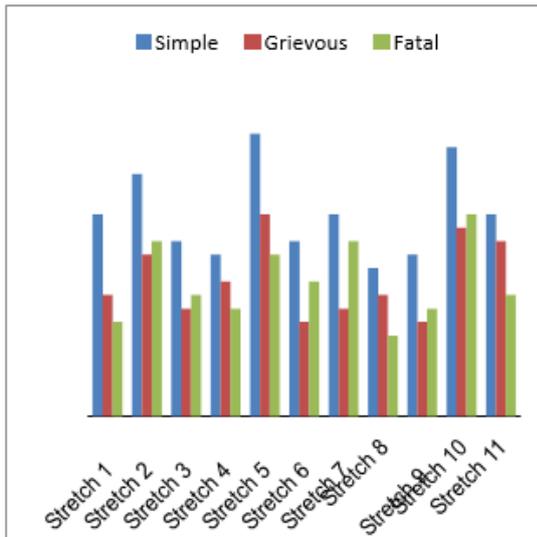


Fig 4. Shows the peak hour flow in the morning 8-9 am

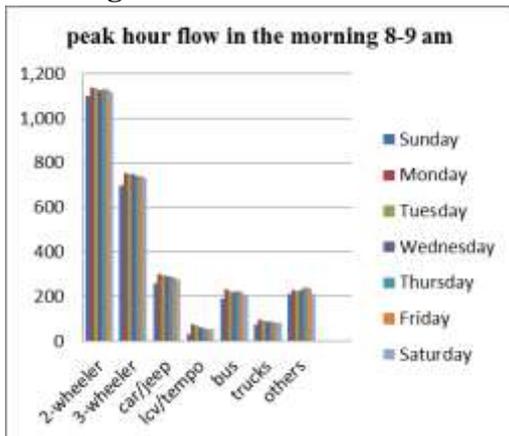


Fig 5. Shows the peak hour flow in the evening 5-6 pm

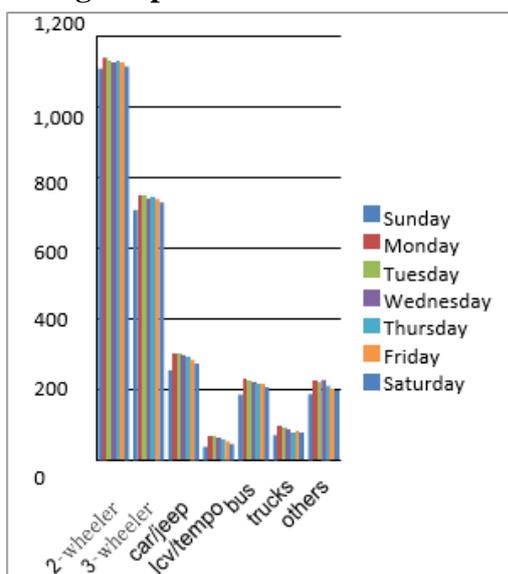


Fig 6. Shows the Pedestrian Volume Survey Data

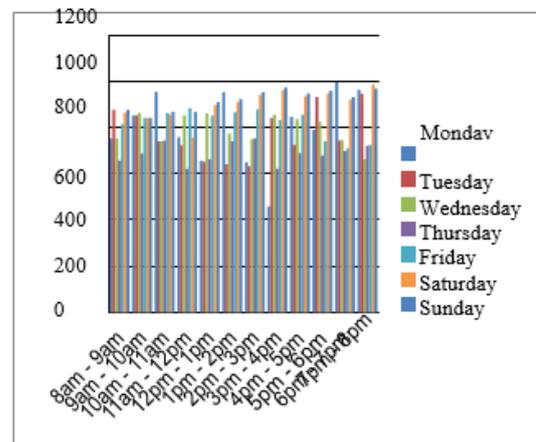


Fig 7. Data of purpose of walk of people

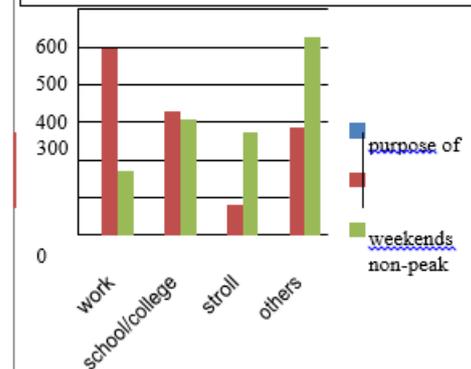
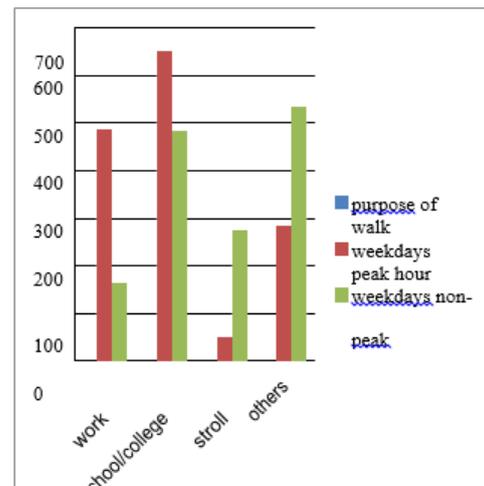
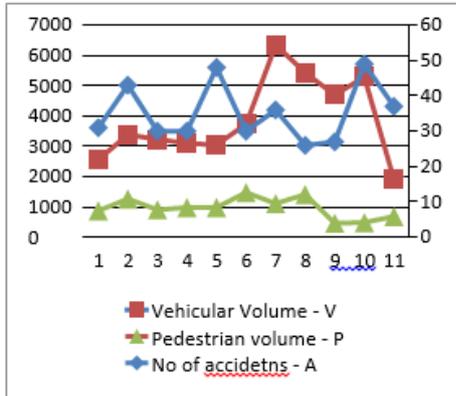


Fig 8. Purpose of walk on weekdays



**Fig 9 .Relation between vehicular and pedestrian volume showing relative accident rates**



**Fig 10. Probability rate of accident occurrence**

