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Impacts of Roadway Traffic and Man-Made Features on Road Safety

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ABSTRACT

The accident rate and severity of accidents is increasing due to increase in vehicle population, high accident rate is largely attributed to the inadequacy of the highways and other main roads to meet the traffic demands, road user behaviour, vehicle defects, poor road geometrics and visibility. The road accident situation in India is alarming as records shows that on an average of 17 lives were lost every hour in road accidents in the country, which inflict heavy economic loss to the country. Road Safety is necessary to reduce accidents involving both human and vehicles there by making the road more safe and user friendly to traffic. The location in a roadway where the traffic accident often occurs is called a black spot Connectivity plays a decisive role in the development and sustainability of any city. Hyderabad, probably the only city in India with web connectivity, has an extensive transport network, for this study Outer Ring Road (ORR), Hyderabad has been selected for accident study. Road accidents are typically analysed to address influences of human, vehicle, and infrastructure factors.

Keywords: black spot, road safety, accidents, Outer Ring Road(ORR)

I.INTRODUCTION

Every year 1.2 million of people are killed and between 20 and 50 million people are injured in road accidents. If current trends continue road traffic accidents are predicted to be third leading contributor to the global burden of disease and injury by 2020. Road safety is emerging as a major social concern around the world especially in India (Shivkumar and Krishnaraj 2012). Accidents are a drain on the national economy and may lead to disablement, death, damage to health and property, social suffering and general degradation of environment. Accidents and the fatalities on road are the result of inter-play of a number of factors. Road users in India are heterogeneous in nature, ranging from pedestrians, animal- driven carts, bi-cycles, rickshaws, hand carts and tractor trolleys, to various categories of two or three wheelers, motor cars, buses, trucks, and multi-axle commercial vehicles etc. Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, and passengers of on-road public transport, mainly buses and trams. Best practice

road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicle speeds will be within the human tolerances for serious injury and death wherever conflict points exist. The various causes of accidents may be due to drivers, environment and vehicles.

II. OBJECTIVE AND SCOPE OF THE WORK

The broad objective of this study is to identify the factors affecting the traffic safety along outer ring road of Hyderabad by analysing the data and identify the courses of action that will lead to improved road safety.
The Scope of the work includes the following:

- To study the annual, monthly, daily variation in accident rate on selected Stretch of ORR.
- To study the causes of accidents and suggest corrective measures at potential location.
- To find whether accidents are uniformly distributed over the year 2014 that is whether all the accidents occur with equal frequency.
- To identify the Black spot and to suggest alternatives.

III. REVIEW OF LITERATURE

Bhuyan (2003) indicated that many factors may exhibit a measurable influence on driving behaviour and traffic safety on highways. These include, but are not limited to, Human factors such as improper judgment of road ahead and traffic, driving under the influence of alcohol or drugs, driver education and experience, young driver, age and sex. Anne et al. (2010) summarized those fatalities during a crash rises when drinking age is lowered and fatalities decreases when drinking age is raised. He showed a relationship between minimum legal drink age and highway crash relationship. He concluded that lowering drinking age to eighteen will increase fatalities rate among young people. Lee (2006) developed a real- time crash prediction model by taking total travel time and Crash potential reduction. The study result indicated the variable speed limit could reduce crash potential by 5-17%. Tornros and Boiling (2005) conducted an experiment with 48 drivers by covering a distance of 15 Km on a rural two-lane road. They concluded that driving performance reduced by dialling hand held phone and speed decreased with hands free phone. Reaction time to warning sign at road side decreased for hand held phone user. Oduro (2012) surveyed about different types of accidents and found that 83% break failure result in accident. Brake ineffectiveness is due to vehicle overloading, uneven tyre pressure, incorrect brake adjustment, air in breaking system, automatic brake adjuster not working, brake fluid on lining. Brake failure is due to broken pipe, low brake fluid level, cracked brake drum, brakes overheating. Somchainuek (2013**)** investigated road side safety on Thai National Highway. The result showed that speeding vehicles were involved in roadside crashes accounted for about 70% of the total crashes and 30% of road side crashes were due to road side trees.

IV. METHODOLOGY

The methodology adopted in this study is based on data from various govt. sources namely; Hyderabad Traffic Police, Hyderabad Metropolitan Development Authority (HMDA) reports are the main sources for Accident data. The collected accident data includes the time of occurrence of accident, type of accident, vehicles involved in the accident, location of accident, number of affected persons etc. The collected data will be tabulated and the general analysis has to be carried out. The General analysis includes like total number of fatal and non-fatal accidents and total number of accidents by yearly wise, monthly wise, daily wise etc.

Outer Ring Road (officially: Nehru Outer Ring Road) is a 158 kilometer, 8-lane ring road expressway encircling the City of Hyderabad, Telangana, India. Hyderabad Metropolitan Development Authority (HMDA) reports are the main sources for Accident data. The collected accident data includes the time of occurrence of accident, type of accident, vehicles involved in the accident, location of accident, number of affected persons etc. For this study the following stretches were selected for data collection.

Stretch chainage:

1) Gachibowli to shamshabad (158.16 km to 133.78 km).
2) Patancheru to Shamirpet (23.70 km to 61.70 km).
3) Ghatkesar to Peddaamberpet (61.70 km to 95 km).

V. ANALYSIS

Distribution of accidents by highest injury severity

The distribution of the total 459 road accidents by injury severity (based on the most severe injury sustained by any human involved in each accident) is shown in Figure 1. As it can be seen, more than 26% of the accidents examined during this study resulted in fatal or major injury.

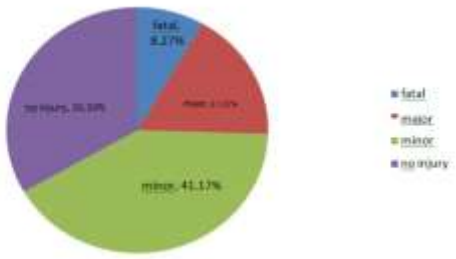

Fig: 1 Distribution of accidents by highest injury severity

Distribution of accidents by time of occurrence

The total numbers of accidents used for the contributing factors study were plotted against time durations of 3 hours to identify times of occurrence (Figure 2). The data shows highest percentage of accidents (30%) occurred between 12:00pm to 06:00pm hrs.

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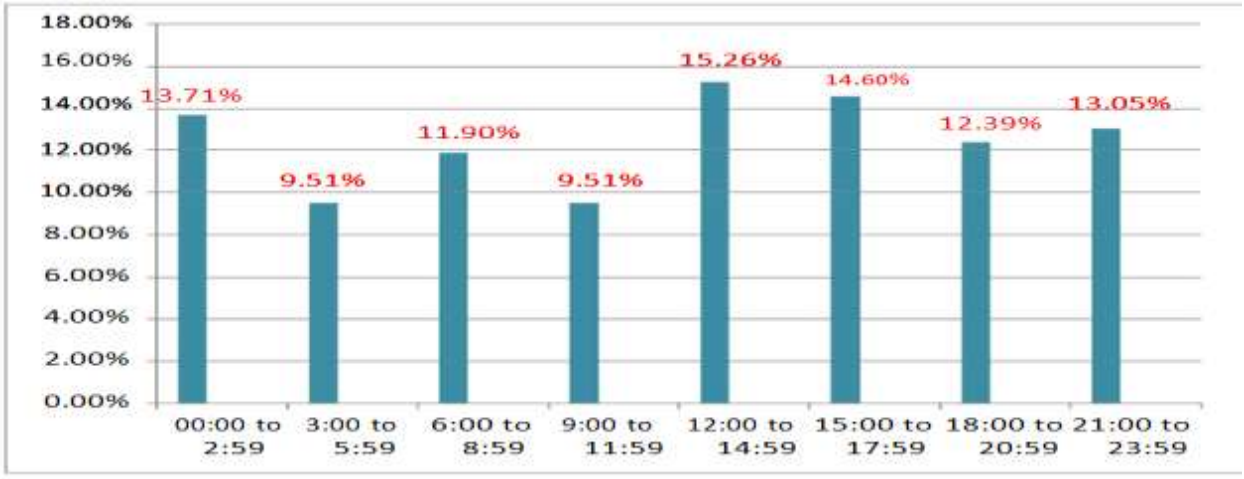

Figure:2 Distribution of accidents by time of occurrence

Type of vehicles involved in the accident

A total of 447 vehicles were involved in the ORR expressway accidents examined. Figure 3 shows the percentage distribution of the types of vehicles involved in these accidents for the study to date. Findings show that the type of vehicles most often involved in accidents on the expressway is trucks (21.47%) and cars (51.67%) these are also the principal road users seen on the expressway.

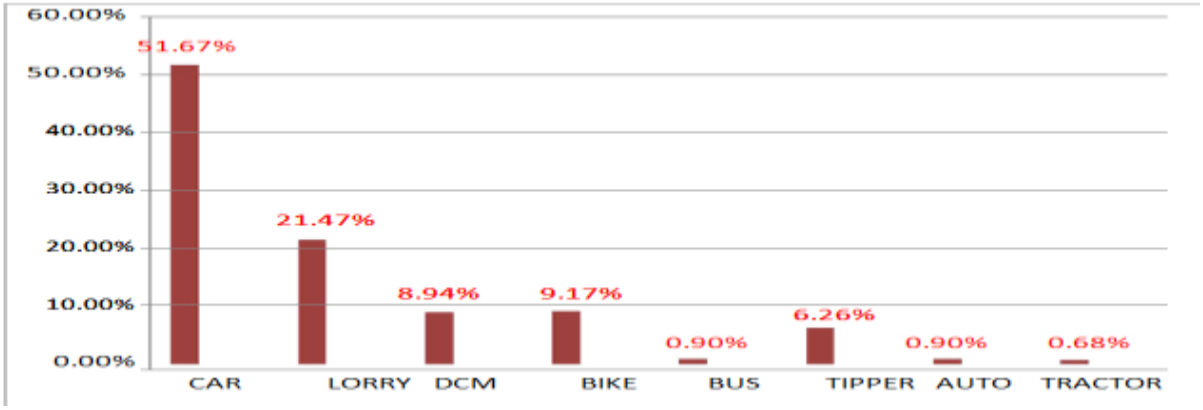

Figure:3 Type of vehicles involved in the accident

Percentage distribution of accidents by road condition

The more number of accidents are occurring along straight road that is 82.82% of accidents are occurring on straight road whereas 12.40% of accidents are occurring on Slight curves of the road section and 4.80% of accidents on sharp curves of the road stretch. The expressway has many sections of road with sharp curvatures which require the driver to reduce speed and steer carefully. Unfortunately, due to insufficient advance warning, drivers are not well prepared to steer through the curve carefully and can end up under steering and departing the roadway.So to avoid these types of accidents the driver has to be informed well in advance about the road condition by means of providing advance warning, informatory signs etc.

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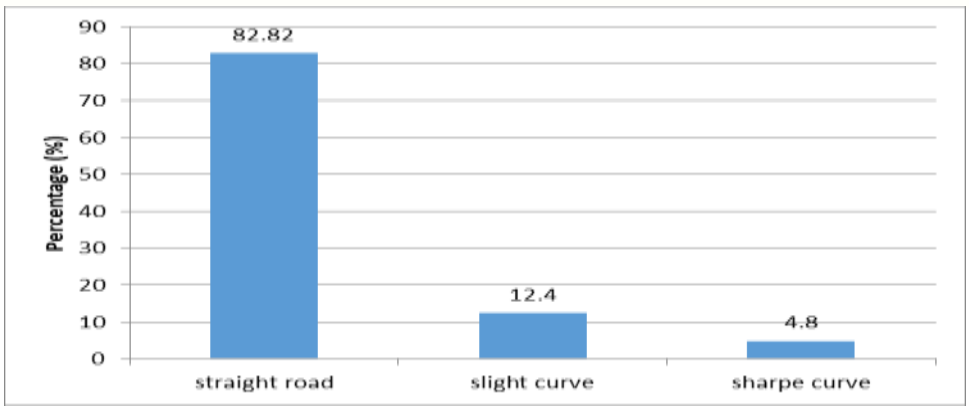

Figure:4 Percentage distribution of accidents by road condition

Percentage distribution of accidents by accident type

The accident types used in coding for this study are listed below.

Head on collision; Rear end collision; Over turning; Collision with an obstacle in the carriageway; Collision with another vehicle moving laterally in the same direction and Others

The most commonly occurring type of accidents is Vehicle colliding with other vehicle (34.36%) and Vehicle hitting objects on the carriageway (30.10%).

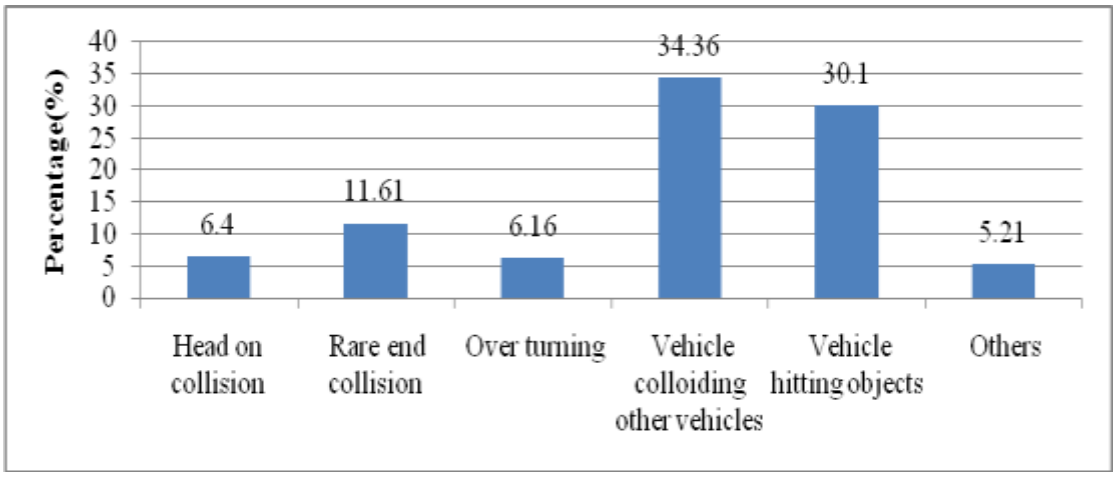

Figure:4 Percentage distribution of accidents by accident type

Percentage distribution of various factors influencing the accidents

The major influencing factor of accident is Speed (53.70%) and followed by Vehicle out of control (39.90%).Even though the expressway has posted speed limits, drivers often ignore these or consider them inappropriate for the vehicle they are driving. Hence, there is an urgent need for scientific research to understand what drivers feel is a safe-speed based on the road features and the vehicle being driven. Many countries have improved on speed limits using speed management techniques

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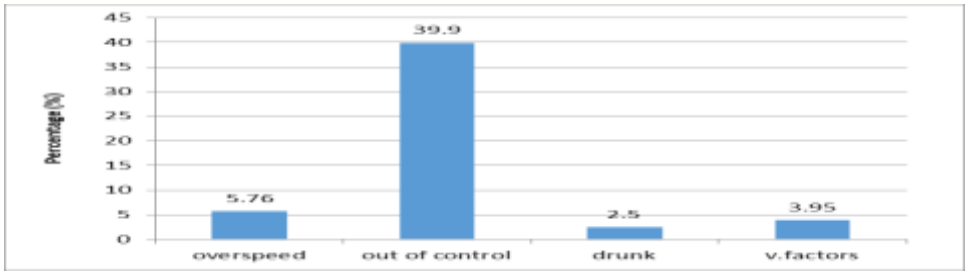

Figure:5 Percentage distribution of various factors influencing the accidents

Total number of accidents by age

From the data it is found that the age group between 20-39 are have more causalities than any other age group

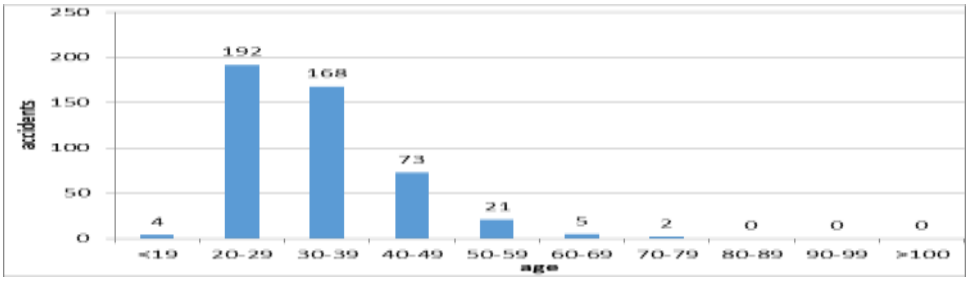

Figure:6 Total number of accidents by age

Black spot analysis

Black spot analysis is done for following three stretches they are

Stretch I: Patancheru to Shamirpet (29.0 km to 43.0 km).

Stretch II: Ghatkesar to Peddaamberpet (136.0 km to150.0 km).

Stretch III: Gachibowli to shamshabad(89.0 km to 96.0 km).

District: Rangareddy district. State: Telangana.

Table:1 Number of accidents on a selected stretch I

Accident stretch (km)	Number of accidents	Remarks
29-30	6	**Reasons for accidents**: pot holes, no sign boards, no marking on the divider, human errors
31-32	6	**Safety measures suggested:** provide sign boards, street parking. Rehabilitation of pavement, no on street parking.
32-33	6	
33-34	5	
34-35	7	
39-40	8	
42-43	7	

Table:2 Number of accidents on a selected stretch II

Accident stretch(Km)	Number of accidents	Remarks
136-137	18	**Reasons for accidents:** one significant reason is due to sharp curve, where people trying to take over the slow moving vehicles ending up hitting the crash barriers, and some reasons are drunk and drive, bad road condition, human errors. **Safety measures suggested**: By Controlling other vehicles entering, Lighting, Providing Red lights on the shoulder, Providing Red mark board at a place where two roads merge, Enhancing the road condition
140-141	13	
143-144	22	
144-145	12	
147-148	23	
151-152	14	
152-153	28	
153-154	15	
154-155	10	
155-156	11	

Table:3 Number of accidents on a selected stretch III

Accident point (KM)	Number of accidents	Remarks
89-90	8	**Reasons for accidents:** of many reasons cited in source, the major is due to bad lighting and two roads meeting at a point, sharp curve without any sign board, and no speed breakers, plants covering divider. **Safety measures suggested**: providing lighting, Clearing plants on medians, Providing Speed breakers and Installation of sign boards.
92-93	5	
93-94	10	
94-95	6	
95-96	5	

VI. DISCUSSIONS AND CONCLUSIONS.

Based on Accident data analysis of Outer ring road expressway Hyderabad the following conclusions are drawn:

- The accidents occurred involves fatal accidents (8.27%), Major accidents (17.21%), Minor accidents (41.17%), No injury accidents (33.33%).
- Cars and trucks are the most affected road user types in accidents on the expressway. It is estimated that the vehicles involved in the accidents consists of cars (51.67%), Trucks (39.67%), Bike (9.17%), Bus (0.9%), and Auto (0.9%).

- More number of accidents is occurring on straight road (82.82%) and the majority of accidents are occurring during the time period 12:00PM to 6:00PM.
- The age group of drivers who involved in more number of accidents is between 20-29 years (43.24%), and 31- 40 years (37.83%).
- The major influencing factors for occurrence accidents are Speed (53.70%), Vehicle out of control (39.90%), Drunk (2.5%) and others.
- The major type of accident occurred on ORR are Vehicle colliding with other vehicle (34.36%), Vehicle hitting the objects on carriageway (30.10%) and over turning (11.61%) and others.
- On Stretch II more number of accidents is occurring which accounts for 61.28% of total accidents Whereas Stretch I accounts for 26.36% and stretch III accounts for 12.35% of total accidents.

REFERENCES

[1] Sivakumar, .Krishnaraj (2012), *Road Traffic Accidents (RTAs) due to Drunken Driving in India*, Challenges in Prevention international journal of research inmanagement and Technology, ISSN:2249 9563 VOL. 2, pp.401-406.

[2] Global Road Safety Partnership Annual Report (2011).

[3] Bhuyan (2003), *Accident Analysis on Two-Lane Road*, M-Tech Thesis Indian Institute of Technology, Roorkee.

[4] Anne et al. (2010), *The effects of minimum legal drinking age 21 laws on alcohol-relate driving in the United States* Journal of Safety Research Vol.41,pp.173–181.

[5] Lee and Mannering (2006*), Impact of roadside features on the frequency and severityof run-off-roadway accidents an empirical*, analysis Accident Analysis and Preventionvol.34 pp.149 – 161.

[6] Tornros and Boiling (2005), *Mobile phone use—Effects of handheld and hands freephones on driving performance Accident Analysis and Prevention* Vol.37 pp.902–909.

[7]Oduro (2012), Brake failure of vehicle and accidents.

[8] Somchainuek et al. (2013), Investigation Roadside Safety on Thai National Highways Indian Journal of Science and Technology vol.6 issue 1.