Black Spot Identification and Remedial Measure for Accident in Urban Area- A Case Study of Ahmedabad City

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Abstract—There has been tremendous growth of both road network and road traffic in India. It has brought in its wake the problem of road accidents resulting in injuries and fatalities to road users and its own social negative externalities apart from human suffering. The increase in road accident is one of the burning issues in the present society. Accident do not occurs uniformly on the complete road network. The improvement of accident prone location is of prime importance. The Black spots are identified based on the accidents recorded and remedial measures are given for reducing accident at each black spot. The Study is carried out on Ashram Road from approach at Paladi cross road to Vadaj cross road. The study could open the door for planners and traffic engineers to overcome the problems associated with traffic accident occurrence at different Black spots and enhance their safety.

Key words: black spot, causes of accident, remedial measure

I. INTRODUCTION

Transportation network is a heart of a nation and transport services are considered as growth engine of economy. Roads are the backbone of any country, acting as an indicator for the economic development of that country. The problem of deaths and injury because of road accident is now acknowledged a global phenomenon. Road traffic accidents can be defined as “An accident that occurred on a way or street open to public traffic; resulted in one or more persons being killed or injured, and at least one moving vehicle was involved. Thus, RTA is collisions between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles”. Over the last two decades consequent to a rapid increase in the number of motor vehicles and a phenomenal expansion of the road network, there has been a steep rise in the occurrence of road accidents in India. Highway safety at a roadside feature is mainly affected by human factors (including drivers’ ability, driver performance, driver knowledge and awareness), environmental factors and vehicle characteristics. The human misery and the serious economic loss caused by road accident demand the attention of the traffic engineering and call for evolving appropriate solutions to tackle this problem. Therefore, improving safety on roadways can be achieved through further improvements in vehicle safety, improvements in driver, pedestrian and bicyclist behaviors as well as a Variety of geometric design improvements in roadway safety features.

II. REVIEW OF LITERATURE

Vatanavangs Ratanavaha and Chisanu Amprya (2003) developed and applied a methodology for investigating the causative highway accident factor. The five method of identifying hazardous locations are, namely, (1) The accident frequency method, (2) Accident rate method, (3) quality control method, (4) accident severity method and (5) combined method. M M Desai (2010) analyzed the accident data for Ahmedabad city considering different factors resembling driver characteristics, road characteristics, time characteristics, vehicle characteristics and environmental characteristics. Ranking of accident prone stretches was done based on Severity index. Problem is identified and improvements are suggested for high accident prone location. Lad Rajankumar (2013) worked on identification of black spot and developed accident model for S. G. Highway, Ahmedabad between Thaltej cross road and Gota cross road. They identify black spot and find out various causes of accident in study area. They gave remedial measure for each black spot. Nikhil T.R. and Harish S. Kulkarni (2013) studied accident scenario in Bangalore city. They analyzed yeshwanthpur junction because of number of accident on this junction due to variety of reasons such as sharp drop or corner in a straight road, oncoming traffic is hidden, a hidden junction on a fast road, poor or hidden warning signs at cross roads. They analyzed the signal time at intersection also. They suggested remedial measures for improvement of pedestrian green time required, street light at night time required; road bump in the stretch before intersection required, installation of proper sign posts, and installation of road reflectors in the junctions and also near the road humps.

III. OBJECTIVE OF STUDY

The main objective of research paper
(1) To identify the black spots on the stretches of the study area.
(2) To find out causes of various accidents of the study area.
(3) To suggest the remedial measures for reducing an accidents.

IV. STUDY AREA

Growth of road transport in Ahmedabad city is very fast, Ashram Roadis one of the highest traffic volume in Ahmedabad. The heavy vehicles and passengers are moving on the Ashram Road in the Morning and evening peak hours. The accidents rate of the study area is about 58 per year including all types of accidents as per the record of police station. The Study is carried out on Ashram Road from approach at Paladi cross road to Vadaj cross road. The length of the study area is 4.9 km.
V. METHODOLOGY
The accident analysis involves the identification of accident black spot location, find out causes of accident and remedial measures for reducing accident.

VI. ACCIDENT DATA
Accident data carried out from the Ellisbridge Police Station, Naranpura Police Station and Navarangpura Police Station last five year from 2010 to 2014. Asharam road is urban road so maximum numbers of accident are minor and major injuries. Maximum Accident occurs between Pedestrians, two wheelers, car and buses.

<table>
<thead>
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<th>Fatal</th>
<th>Major &amp; Minor</th>
<th>Total</th>
</tr>
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<td>8</td>
<td>53</td>
<td>61</td>
</tr>
<tr>
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<td>9</td>
<td>54</td>
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<td>2012</td>
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<td>59</td>
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<td>2013</td>
<td>13</td>
<td>47</td>
<td>60</td>
</tr>
<tr>
<td>2014</td>
<td>7</td>
<td>49</td>
<td>56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>41</strong></td>
<td><strong>262</strong></td>
<td><strong>303</strong></td>
</tr>
</tbody>
</table>

Table 1: Summary of Accident in the study area (Source: Police Stations of the Study Area)

VII. IDENTIFICATION OF BLACK SPOT
The Black spots are identified based on the accidents recorded on Police Stations. The black spots are identified on the Google image for the study area shown in figure. Following are the black spots in the study area.

- Paladi intersection
- V. S. Hospital
- Ellisbridge intersection
- Nehrubridge intersection
- Gujarat Sahitya intersection
- City Gold cinema
- Incometax intersection
- Gujarat Vidyapith
- Usmanpura intersection
- Vadaj circle

VIII. CAUSES OF ACCIDENT IN THE STUDY AREA
Following are the causes of accident in study area

- The vendors stand near foot path. It is the prime reason for unorganized parking which reduces the capacity of road. It is also one reason for an accident.

- There are AMTS and GSRTC bus stands on the road without specific road-markings which reduces the capacity of road. Due to this, movement of pedestrian is unsafe for the location.

- AMTS and GSRTC drivers’ stop bus without lane discipline, so that the capacity of the road reduces. It is also one reason for accident.

- Many of AMTS and GSRTC bus stands are near the intersection and high volume of pedestrian is observed. It is also one reason for an accident.
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Fig. 4: Bus Reduce the Road Capacity
- Non availability of signal and speed breakers at any entry of Minor Street into Main Road.
- Non availability of signal at entry and exit of bus stand at Paladi intersection and Vadaj circle. Due to this, buses enter the road when the traffic stream is continuous.
- The traffic signals are present but not in working condition.
- There is no speed breaker ahead of intersection.
- The construction work is in progress at Vallabhsadan intersection. The heaps of soil have been found which reduces the capacity of road.

Fig. 5: Signal at entry of Minor Street into Main Road

Fig. 6: Non availability of Signal at AMTS bus stand

Fig. 7: Signal not working
- There are no proper covering of manholes in between the roads and bad surface condition.
- It is observed that many vehicles were parked on the footpath. Due to this, pedestrians prefer to walk on carriageway.
- Auto rickshaws and cars were also involved in unauthorized parking which also reduces the capacity of road.
- Road side activities have covered the road space. Vehicles users are forced to drive on the center of the main road.
- There is no speed breaker ahead the intersection.
- In the study area, many places have a considerable difference in level of road surface.
- In the study area, each intersection has a high pedestrian volume; there are no facilities available for pedestrian crossing and no pedestrian signal available.
- Especially at V. S. hospital, maximum volume of pedestrians is observed. There are no proper facilities for crossing the road, so that maximum pedestrian accident occurred near V. S. hospital.

Fig. 8: Manhole in between the road and Bad Surface condition
IX. REMEDIAL MEASURES FOR PREVENTING ACCIDENTS

- Presence of vendors on road side reduces the capacity of road so those vendors should be removed as soon as possible.
- Because of no proper working of traffic signals on this route, the drivers are not well aware of the vehicle movements on cross roads. So these signals should be made working as early as possible.
- There are no proper pedestrian crossing facilities all over the route, which forces the pedestrians to cross the road in an uneven pattern. This increases the conflict points and in turn giving rise to accident. So proper foot over bridges or foot under bridge should be constructed according to the need of the region.
- Proper diversion facilities should be made at the places where constructional work is going on.
- Proper management should be done to bring evenness to the roads wherever there is a difference in the level of road.
- Manholes of gutters should be properly covered.
- The auto rickshaws and cars are involved in an unauthorized parking which reduces the capacity of road due to which accidents occur. So proper facilities for their parking should be provide alongside the road.
- Side street signal required throughout the road.
- Proper signal required at Paladi and Vadaj AMTS bus stand.
- Parking on foot path should be strictly prohibited.
- Alternative routes are suggested for peak hour

X. CONCLUSION

- Identification of Black Spots is based on Police Record. Other tentative spots are also identified to reduce an accident.
- It is also observed from the inventory survey that no speed breaker is provided on the stretch of selected area.
- Many signals are not in working condition. There is no availability of traffic police on the minor and ‘T’ intersection. Many unauthorized parking is observed on the selected area.
- Foot path should be provided throughout the road but the vehicles are parked on the footpath. Due to non-availability of space on the footpath, the pedestrians prefer to walk on carriageway width.
- It has been found that a number of vendors are present at different location in study area. People park their vehicles in unauthorized way which reduces the capacity of the road.
- The volume of pedestrian is maximum at Ashram road. Maximum accidents occur due to improper crossing pattern of pedestrian.
- The accidents caused by faulty road geometry are very less in city.
- Proper lane marking should be provided at each AMTS bus stand throughout the study area.
- Bus priority signal should be designed at Paladi AMTS bus stand.

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