

ROAD SAFETY AUDIT: AN IDENTIFICATION OF BLACK SPOTS ON BUSY CORRIDOR BETWEEN NAROL- NARODA OF AHMEDABAD CITY

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Abstract— demand for transportation, safety is an issue of major social concern and an area of extensive research work. The rate of accident in developing countries like India increases year by year. An accident is an unplanned and uncontrolled event, which occurred on a road open to a public traffic resulting in personal injury, damages to the property and loss of life in which at least one moving vehicle was involved. The location in a road where the traffic accidents often occur is called a Black Spot. To reduce this adverse effect of transportation the work towards road safety is become necessary now a day. The main objective of this paper is to find out black spots and to understand the importance of road safety audit in the developed as well as in developing country for reducing vulnerability of accident in the main corridor of urban area. For this research paper the study area selected is corridor of Narol to Naroda national highway-Ahmedabad city of Gujarat state.

Index Terms— Black Spots, Road Accident, Road safety, Road Safety audit, and Transportation.

I. INTRODUCTION

In today's world, road and transport has become an integral part of every human being. Everybody is a road user in one shape or the other. The present transport system has minimized the distances but it has on the other hand increased the life risk. Every year road crashes result in loss of lakhs of lives and serious injuries to crores of people. In India itself about eighty thousand people are killed in road crashes every year which is thirteen percent of the total fatality all over the world. The accident is of three types due to their effects or seriousness of accident, fatal accident, injury and property damage only. Man behind the wheel plays an important role in most of the crashes. In most of the cases crashes occurs either due to carelessness or due to lack of road safety awareness of the road user. Hence, road safety

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education is as essential as any other basic skills of survival.

A. ROAD ACCIDENTS

A road is a thoroughfare, route, or way on land between two places, which has been paved or otherwise improved to allow travel by some conveyance, including a horse, cart, or motor vehicle.

An accident is an unplanned and uncontrolled event, which occurred on a road open to a public traffic resulting in personal injury, damages to the property and loss of life in which at least one moving vehicle was involved.

Road traffic accidents which are generally unintended and preventable are a common risk every day to life that can happen to almost every one, anywhere. The problem of road traffic accident is increasingly becoming a threat to public health and national development in many developing countries. Road traffic accidents contribute to poverty by causing deaths, injuries, disabilities, grief, loss of productivity and material damages. It is surprising to know that India has only 1 % of the total world's vehicles which accounts for 16% of the total world's accidental deaths (Punetha, Kumar and Mehta, 2012).

Statistical projections show that during the period between 2000 and 2020, fatalities related to traffic accidents will decrease with about 30% in high income countries. The opposite pattern is expected in developing countries, where traffic accidents are expected to increase at a fast rate in the years to come. A study done in Calcutta India, reported that there are some host (human) factors (such as the behaviour of drivers, pedestrians and cyclist behaviours) and seasonal factors (weather and time) that contribute to fatal road traffic accidents (Zhang et al 1998). Overall, most traffic accidents occurred on main roads (highways) and in the majority of cases pedestrians were found to be at fault during crossing the roads (Majumder et al 1996).

a) Accident causes and the effects

Some of the risk factors due to which accidental and the unsafe situation on road occur are, improper geometric condition of roads, high speed of vehicle, unsafe

behaviour of driver, lack of indications provision at road sides, physical condition of driver, vehicle characteristics, roadside parking etc. . . For preventing or controlling that unsafe situation and provide safe roads, the study of road geometry, control devices, pavement markings and signs and the different accidental scenario are necessary.

Apart from humanitarian road safety, injuries and fatality occurs from road accidents have serious implications for a country in both social and economic terms. Medical expenses and lost incomes of the victims have been taken into account. Administration cost incurred by legal entities that oversee accident investigation and the Property damages such as vehicle repair costs were added up to the total resources lost. An amount for the pain grief and suffering of the victim and their dependents was also taken as effect of accident. The vehicle damages insurance and health insurance also taken into account as economic effect. For the fatal type of accident the death compensation is given which is also one of the economic effects to the country. The losses of national economy caused by all accidents may amount to figures as high as 8 to 10% out of the GNP. Because accidents are caused by external factors, their prevention by regulating the causative agents is possible. The great human health and economic values of the consequences of accidents make accident prevention one of the most promising priority areas of preventive health policy, both for public health and for occupational health and safety.

B. BLACK SPOT

The location in a road where the traffic accidents often occur is called a Black Spot. An accident black spot is a term used in road safety management to denote a place where road traffic accidents have historically been concentrated. It may have occurred for a variety of reasons, such as a sharp drop or corner in a straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at cross-roads etc.

C. ROAD SAFETY

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network. 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. Furthermore, the highest possible degree of safety shall be ensured when transporting goods by road. It is of vital importance to monitor and validate the road transportation safety, including comprehensive checks on drivers, vehicles and safety processes. Road safety is a complex issue and there are a high number of factors and indicators involved in the accidents. The problem itself is underestimated in many countries, especially in developing countries where the issue is challenging.

D. ROAD SAFETY AUDIT

A **Road Safety Audit** (RSA) is defined as "the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users."

Road safety audits differ from conventional traffic safety studies in two key ways: road safety audits are often pro-active investigations, rather than reactive investigations of sites with histories of complaints or poor safety performance, and the investigation team is independent from the staff that is designing the project or maintains the road.

A key feature of a road safety audit is the use of a team of professionals with varied expertise. The team should include highway safety engineers, highway design engineers, maintenance personnel, and law enforcement. Additional specialties should be added to the team as needed. The team members must not be involved in the design or maintenance of the facility being examined, so that they can have an objective point of view.

In this paper the road safety audit which is becoming one of the necessities for the ongoing different road projects in the different parts of the urban as well as the rural segment of the country is discussed. In order to understand RSA of urban corridor of Ahmedabad city of Gujarat, the following objectives are considered.

II. OBJECTIVES

The specific objectives of this paper are:

1. To carry out study of existing condition of study area
2. To identify the black spots based on accidents occurred in study area

III. STUDY AREA

Growth of road transport in Ahmedabad city is very fast, Narol-Naroda road is one of them. There is heavy volume and many traffic problems occur on this road. Many heavy vehicles and passenger are moving on the Narol-Naroda National Highway in the Morning and evening peak hours. The Study is carried out on section of Narol-Naroda corridor. The corridor selected is from Narol circle to Soni ni Chawl (Rakhial) as a study area. The length of the study area is 8.9km. The corridor is surrounded by industry, markets and residencies and commercial areas. BRTS facility is also provided on this road corridor at the centre.

The accidents occurrence rate on the stretch selected is 91 per year, inclusive of all types of accidents, which is considered to be very high. This accidental rate represents only accidents registered in zonal police stations.

IV. ANALYSIS OF ACCIDENT DATA

The section of national highway no.8 with provision of BRTS corridor is selected as study area for accidental study. The data of accidents occurred in this corridor from

past 5 years are collected from zonal police stations. Accident data collected are from the zonal police stations of last five year from the 2009 to 2013, There are 58 number of fatal accident, 310 number of major accident and 90 number of minor accident as shown in Table 1.

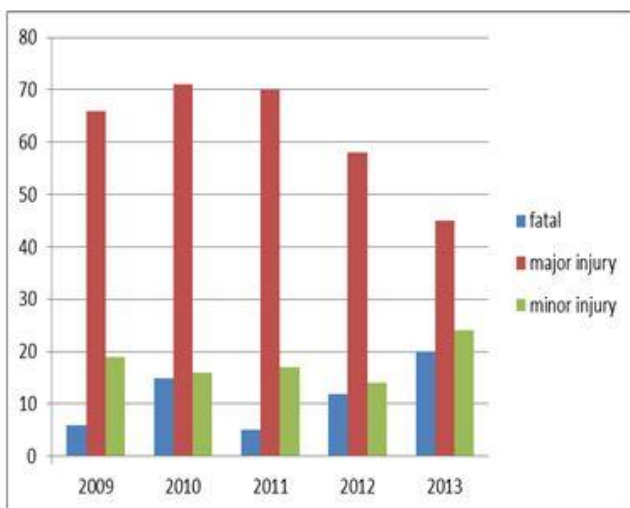
Table-1: Accident statistics of Study area from the year 2009 to 2013

Year	Fatal	Major injury	Minor injury	Total
2009	6	66	19	91
2010	15	71	16	102
2011	5	70	17	92
2012	12	58	14	84
2013	20	45	24	89
Total	58	310	90	458

(Source: zonal police stations of Ahmedabad)

The chart below shows the graphical representation of statistics of the accident from year 2009 to 2013 for the study area selected from Narol circle to Soni ni chawl.

Chart-1: Graphical representation of accident statistics from the year 2009 to 2013



V. IDENTIFICATION OF BLACK SPOT

The Black spots are identified based on the accidents recorded in the police stations. The accidents recorded from

past 5 years are shown in table1 for the whole stretch selected. The accidents details at every spots covered in whole study area are show in table2:

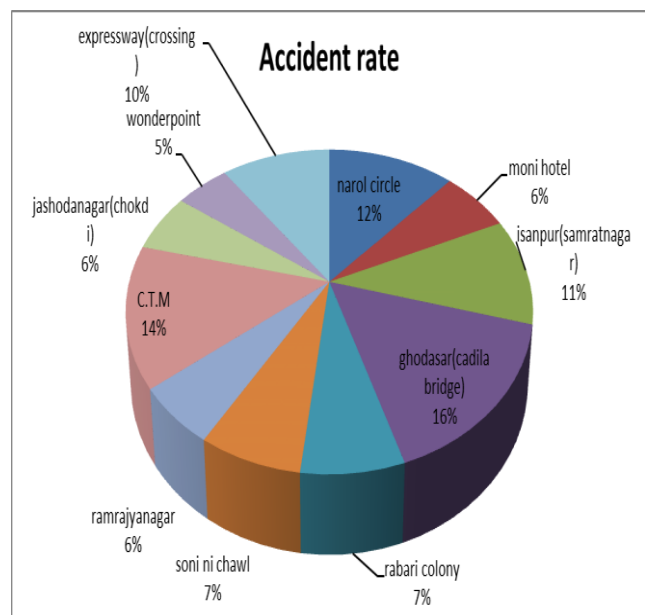
Table-2: Accident statistics at every locations of Study area from the year 2009 to 2013

Location	Fatal	Major	Minor	Total
Narol Circle	4	30	16	50
Moni Hotel	2	17	8	27
Isanpur(Samratnagar)	2	33	10	45
Ghodasar(Cadila Bridge)	2	55	9	66
Rabari Colony	5	20	4	29
Soni Ni Chawl	5	20	4	29
Ramrajyanagar	2	17	5	24
C.T.M	6	41	12	59
Jashodanagar(Chokdi)	3	17	5	25
Wonderpoint	2	16	3	21
Expressway(Crossing)	7	26	10	43
TOTAL	33	266	76	418

(Source: zonal police stations of Ahmedabad)

The chart below shows the rate of accident occurrence at every spot. This chart clearly indicates the spots having occurrence of maximum accident. With reference to the details appeared in chart, the five spots with maximum accidents are determined as black spots.

Chart-2: Pie chart representation of locational accident statistics



The black spots identified from chart above are the Narol circle, Isanpur, Ghodasar, C.T.M and Expressway cross

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road. The accidents occurred at these spots are more than 50% of total accidents occurred on the whole stretch during last 5 years. Because of the higher rate of accidents at these spots they are identified as black spots of the study area.

Table-3: Accident statistics at black spots of Study area from the year 2009 to 2013

Spots	Fatal	Major	Minor	Total
Narol circle	4	30	16	50
Isanpur	2	33	10	45
Ghodasar	2	55	9	66
C.T.M	6	41	12	59
Expressway	5	20	4	29
Total	19	179	51	249

(Source: zonal police stations of Ahmedabad)

VI. ROAD INVENTORY SURVEY

Road inventory survey was carried out from Narol circle to CTM cross road. There are five different locations selected as black spots as mentioned before. The inventory survey was carried out at those black spots. The locations are Narol circle, Isanpur cross road, Ghodasar, Expressway Tran Rasta and CTM cross road. The inventory details of the spots are as follows:

Table-4: Road Inventory Details (all dimensions are in meter)

Sr. no.	Location	Direction	Carriageway width in m	Footpath in m	Service lane width in m	BRTS Corridor width in m	Parking lane width in m
1.	Narol circle	Narol circle to Isanpur	14.75	3.05	4.60	6.10	3.57
		Isanpur to Narol circle	13.29	3.05	3.20	6.10	3.57
2.	Isanpur cross road	Isanpur to Ghodasar	13.60	2.57	5.70	5.50	3.57
		Ghodasar to Isanpur	12.75	2.57	4.97	5.50	3.57
3.	Ghodasar	Ghodasar to Jasodanagar	7.28	2.15	N.A.	5.01	N.A.
		Jasodanagar to Ghodasar	7.17	2.10	N.A.	5.01	N.A.
4.	Expressway Tran Rasta	Expressway to Jasodanagar	14.38	2.03	5.66	4.67	4.38
		Jasodanagar to Expressway	12.57	2.03	6.40	4.67	3.54
5.	CTM cross road	CTM to Expressway	12.59	2.00	6.68	5.01	4.61
		Expressway to CTM	14.36	2.00	6.59	5.01	4.49

From the road inventory study of the above corridor of urban

area, there are some annotations are observed. There is no parking lane as well as service lane designed at Ghodasar to Jasodanagar stretch. Another observation visible at the stretch is the use of service road by heavy vehicles which is against the designed geometry applicable in that stretch. The use of parking lane meant for the parking purpose is not fully utilised, instead of that the parking is carried out parallel to the shops. These whole mismatches of the utilisation of geometry lead to various ill-effects, which have been concluded in the following section.

VII. CONCLUSION

From the study of the above corridor it is seen that the following deficiencies are visible as seen below:

1. The black spots are identified based on police record, deficiencies of geometric like Non availability of footpath, service lane, parking lane etc. Non Availability of speed breaker, Advertisement board at intersection, improper zebra crossing, other parameter like absence of traffic police, not working traffic signal, unauthorized parking at intersection etc.
2. Based on the accident data majority of accidents occurred at the Narol circle, Isanpur, Ghodasar, C.T.M and Expressway cross road.
3. There are no of traffic signals provided at any of those five intersections.
4. There is no provision of service lane and parking lane from Ghodasar to Jasodanagar road.
5. The heavy volume of auto is parked at Narol circle, Isanpur intersection and Expressway Tran Rasta, this reduction in the available road space for the through traffic leads to traffic congestion and ultimately leads to accidents at various critical locations.

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