

Identification and Improvements of Black Spot in Urban Area: A Case Study of Junagadh City

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Abstract— Road traffic accidents also can be defined as “An accident include collision, overturning or slipping or skidding that 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.” India is a second largest populated country in the world. Transportation sector plays the important role in developing our country. Transportation sector of any country, acting as an indicator for the economic development of that nation. Accidents by some persons are called as “ACT OF GOD” or the result of luck (bad or good) or two sides of a coin. An accident is considered as an unpleasant, undesirable event or damage that happens unexpectedly or by chance. This study gives better idea for mitigating accident problems on city roads through systematic identification, analysis and measure of black-spots. Based on Accident Severity Index (ASI) method, the top most two accident prone stretches are identified.

Key words: Road Accident, Accident Prone Location, Black Spot, ASI

I. INTRODUCTION

Accidents cannot be totally prevented but through scientific analysis and proper engineering measures their frequency and severity can be reduced. Therefore, traffic engineer has to carry out systematic accident studies to investigate the causes of accidents and to take preventive measures in terms of design and control. It is essential to analyze every individual accident and to maintain zone wise accident records. The statistical analysis of accidents carried out periodically at critical locations or road stretches or zones will help to arrive at suitable measures to decrease the accident rate effectively.

In general, an unplanned, unexpected, and undersigned event which occurs suddenly and caused injury or loss, a decrease in value of the resources, or an increase in liabilities. As a technical term ‘accident’ does not have a clearly defined legal meaning. In insurance terminology, an accident is the events which is not deliberately caused, and which is not inevitable.

Over 1.2 million people die each year on the world’s roads accident, with millions more sustaining serious injuries and living with long-term adverse health consequences. Road traffic injuries are currently expected to be the ninth leading cause of death across all age groups globally and current trends suggest that by 2030 road traffic deaths will become the seventh leading cause of death unless urgent action is taken. The Figure 1 below shows the accident scenario in future years with and without taking action to prevent it.

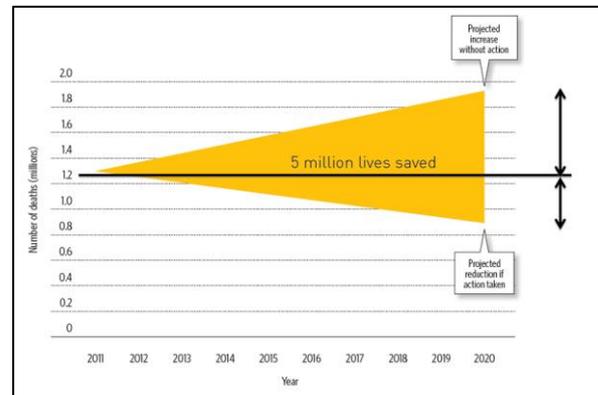


Fig. 1: Goal of the decade of action for road safety 2011-2020(WHO)

II. LITERATURE REVIEW

A. R.R.Sorate, R.P. Kulkarni, S.U. Bobade, M.S. Patil, A.M. Talathi, I.Y. Sayyad, S.V.Apte (2015) “Identification of Accident Black Spots on National Highway 4 (New Katraj Tunnel to Chandani Chowk)”

R.R.Sorate et. Al. analysed that the 34-km stretch of Mumbai-Bangalore highway in the Pune city limits has seen 110 fatal accidents in the last three years claiming 111 lives. Thus the primary aim of the project is to identify the accident black spots on National Highway-4 spanning 14.5 kms from New Katraj Tunnel to Chandani Chowk and to suggest remedial measures. Methodology adopted includes collecting the secondary data from respective authority, conducting physical survey (primary data) and analyzing them by method of ranking and severity index, accident density method, weighted severity index. Locations appearing in all the three methods were termed as black spots. Further corrective measures were suggested.

B. Gourav Goel & S.N. Sachdeva (2014) “Identification of Accident Prone Locations Using Accident Severity Value on a Selected Stretch of NH-1”

Gourav Goel & S.N. Sachdeva studied on road accident data of a selected stretch of NH-1 (Delhi-Ambala-Amritsar Road). A 50 km road stretch between RD 98 km to 148 km was selected and road accident data of four years 2007-2010 was collected. The 6-laning work of NH-1 is in progress during the selected period so the study considers the effect of widening project on road accidents also. The effect of 6-laning work on road accidents has been evaluated by dividing total number of accidents into two groups before construction and after construction work started. To identify the accident prone locations the total stretch was divided into smaller sections of 5 km each. Total accidents and accident severity value has been used to rank the accident prone locations. The stretch of the road 140-144 km is found

to be the most accident prone followed by the stretch 98-104 km and the stretch 145-148 km. A field study has been conducted to compare the analysis with field results.

III. DATA COLLECTION

Development of road transport in Junagadh city is very fast. There is also increase in vehicle ownership and population in the Junagadh city in last decade. The accident data has been collected from police commissioner office and various police stations of Junagadh city from the year 2010 to 2017. Road Accident statistics of Junagadh city from year 2010-2017 is shown in Table-1. Accidents are classified in Fatal Accidents(FA), Grievously Injured Accidents(GI), Minor Injured Accidents(MI) and Non-Injury Accidents(NI). In the year 2010, the total number of accidents registered was 475 and in the year 2017 the total number of accidents was 133. During these Eight years, the Population and Vehicle ownership have get changed but the Number of Fatal Accidents has remained approximately constant in the Junagadh city but Number of Total Accidents were decreased in city.

This may be because of improved quality of roads, introduction of new roads, increased width of roads, installation of traffic control devices (signs, signals etc.) at junctions, channelizing island at intersection, introducing medians on roads and improvement in geometrics of roads of the Junagadh city. This may also be due to increased traffic sense in the people and strictly implementation of traffic rules by traffic police of city.

For the present study accident data, vehicle registration data and other data of study area are required, which is a laborious work. Global and national level data are obtained and from various journals and different technical published papers. State level data are collected and compiled from State Traffic Branch. Vehicle registration data is collected from Regional Transport Office of study area. Population, land use pattern, physical features of various roads, map of study area etc. are collected from municipal corporation office.

Sr.No.	YEAR	FATAL ACCIDENT	GRIEVOUSLY INJURED	MINOR-INJURED	NON-INJURY ACCIDENT	TOTAL ACCIDENT	NO. OF DEATHS	NO. OF SERIOUS INJURIES	NO. OF NORMAL INJURIES
1	2010	52	21	378	24	475	56	25	512
2	2011	47	19	324	18	408	50	20	418
3	2012	42	14	286	15	357	45	21	409
4	2013	34	10	181	12	237	41	14	281
5	2014	31	10	171	11	223	34	15	249
6	2015	33	5	141	8	187	33	7	229
7	2016	28	19	122	12	181	35	24	190
8	2017	23	10	94	6	133	26	15	110

Table 1: Year-wise Accident classification of Junagadh city from 2010-2017

IV. DATA ANALYSIS

A. Accident Severity Index Method

Accident Severity Index (ASI) method suggest average accident weightage points of a stretch per km per year. In this method is employed for ranking the most severe

stretches, as it involves all type of accidents with proper weightage. For computation of Accident Severity Index, the accidents are classified into four group's namely (1) fatal accidents, (2) grievous injury, (3) minor injury and (4) non-injury accidents. Weightage is assigned to categories based on relative cost of accidents. As Chakraborty et. al in 1995 has given weightage points as follows:

- Fatality = 6
- Grievous Injury = 3
- Minor Injury = 0.8
- Non-Injury = 0.2

Using the above weightage points Accident Severity Index is calculated by the following formula:

$$I = (n1w1+n2w2+n3w3+n4w4) \div 5L$$

Where;

I= Accident Severity Index

L= Length of road

n1, n2, n3, n4 = Number of fatal, grievous and minor injury and non-injury accidents.

w1, w2, w3, w4 = Corresponding weight age points for each kind of accidents.

Based on ASI ranking of the accident prone stretches are done. Higher the value more severe is the stretch. In police department, Fatal and Total Accidents details according to different stretch are available. Top ten Ranking of accident prone stretches is based on accident severity index method is shown in Table 2 and graphically presented in Figure 2.

Sr. No.	Name of stretch	Length (km)	Accident Severity Index (ASI)	Ranking of Stretches
1	M.G.Road	1.5	113.87	1
2	Cinema Road	3.8	78.28	2
3	Post-Office Road	0.5	77.84	3
4	Chittakhana Road	1.3	76.62	4
5	Sukhnath Road	0.8	72.05	5
6	Bhauddin Road	1.2	69.93	6
7	Datar Road	1.7	67.86	7
8	Bahumadi Bhavan Road	0.7	62.69	8
9	PTS Ground Road	1.6	60.55	9
10	Girnar Taleti Road	2.5	39.33	10

Table 2: Accident Prone Stretches in Junagadh city

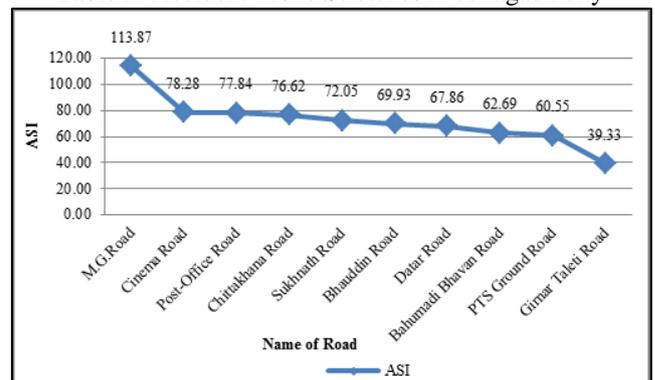


Fig. 2: Accident Severity Index of Top Ten Stretches from 2010-2017

In this study, the top two most severe stretches are identified as below:

- 1) M.G. Road – ASI 113.87
- 2) Cinema Road – ASI 78.28

B. M.G.Road:

M.G.Road is starting from to Kadva chowk to Chittakhana police choki. The length of this road is 1.5 km. Effective width is 8 meters.

1) Problem Identification

Based on field survey of this road following problems are identified:

- 1) There is Market Place in this road, So many 2w and 4w are travelling through it and city buses are also coinciding. More than that there are no any traffic control devices are situated.
- 2) At Shopping centres, there are many people in weekends so it results in increasing delay time.
- 3) There is a Dargah and also one temple on this road. So, on religious day, it is necessary for traffic police to hold on because it is not police controlled area.
- 4) There are many shops and commercial complex available. So, it would be difficult for shop owner and pedestrian to pass within small street.
- 5) Encroachment on Both the side also make conflicts.
- 6) No pedestrian facilities provided on M.G.Road.
- 7) In monsoon season, rain water spills over the road of near press caters due to poor drainage facilities.
- 8) There is a main problem of parking within this area. No parking space or side is provided so people are parking their vehicles anywhere even through the whole day.

2) Proposed Improvement

- 1) There should be a provision of channelized Intersection to stream line traffic movement.
- 2) Proper action should be taken against large hoardings.
- 3) Proper drainage facilities at road should be introduced.
- 4) Pedestrian facilities, foot path with guard rails in the intersection area should be provided on throughout the stretch.
- 5) Road signage and markings should be introduced at appropriate places.
- 6) Encroachment should be restricted or shifted elsewhere from the road.
- 7) On-street parking should be controlled and it is required to make a compulsion to park the vehicle on the specified parking slots or multi-level parking should be provided.

C. Jay-Shree Cinema Road:

Cinema road is road joining Kadva chowk and Majejadi gate. The length of this road is 3.8 km. Effective width is 8.5 meters. It is a fully divided two lane road.

1) Problem Identification

Based on field survey of this road problems defined are listed below:-

- 1) There is a railway crossing in this road, So it creates more traffic in this area.

- 2) Main junction Gandhi chowk is in middle of this road and there is maximum no of vehicles passing from this chowk and it creates more traffic congestion.
- 3) No any on street parking facilities are provided in this stretch. So parked vehicles are also disturbing this way.
- 4) ST bus station is on this road which mostly affect adversely to the effectiveness of road.
- 5) At ST bus station not provide any traffic control devise and pedestrian crossing. So, more number of pedestrians are being killed and injured at this place.
- 6) Several hotels and hospitals have very poor parking facilities in their own premises.
- 7) At Gandhi chowk, Traffic signal is absent.



Fig. 3: Traffic Problem at Gandhi Chowk

2) Proposed Improvements

- 1) Road signage and markings should be introduced at appropriate places.
- 2) Traffic police should be provided at ST bus station.
- 3) Foot path is required to be widened to at least 1.5 meters on both the side of the roads.
- 4) At Gandhi chowk, signalized intersection is required to be working for the whole day as this is the main road of the city leading bus station, crossing, cinema and hospitals and restaurants carries heavy traffic throughout the day.
- 5) Parking is required to be shifted from the intersection area to off street.
- 6) Pavement markings and traffic signs should be introduced at proper locations to control the traffic.
- 7) Foot path should be provided both side of road, so that pedestrian can use it and roadway conflicts can be reduced.

V. CONCLUSION

The study presented in the paper has been conducted to identify the accident black spots on the selected stretch and improvements are suggested.

- There should be a provision of channelized Intersection to stream line traffic movement.
- Proper action should be taken against large hoardings.
- Proper drainage facilities at road should be introduced.

- Pedestrian facilities, foot path with guard rails in the intersection area should be provided.
- Road signage and markings should be introduced.
- On-street parking should be controlled.
- Road signage and markings should be introduced at appropriate places.
- Traffic police should be provided at ST bus station.
- Foot path is required to be widened to at least 1.5 meters on both the side of the roads.
- Parking is required to be shifted from the intersection area to off street.

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