A Research Paper on Identification, Analysis and Suggestions Upgrade of Accident Related Black Spots on Nh-86, Division Sagar, Madhya Pradesh

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Abstract — The problem of road vehicle collisions owing to Black Spots is very severe in highway transport, occurs by a complicated vehicular traffic flow pattern with miscellaneous traffic and roadside pedestrians, and also caused by the presence of human fault or road factors. Roadway collisions are the main causes of property rupture, death and damages all over the world. The essential fundamentals in road collisions are becoming road operators, sleazy automobiles, pavement conditions, pavement layout geometrical and environmental aspect. Road collisions cannot avoid nevertheless via employing appropriate traffic engineering, traffic controlling measures and superior security plans, road collisions rates can be decreased. An accidental "black spot" is a segment of the roadway where accidents frequently happen.

Keywords: Black Spots, Weighted Severity Index (WSI)

I. INTRODUCTION

The analysis of Hazard an Accident's Location and Treatment, one of the best methods for preventing traffic accidents is commonly recognized as using black spots. Black spots are areas of the road that are deemed hazardous for the reason that many collisions have occurred there, Road accidents occurred there because of numerous causes such as a pointed horizontal curve, inadequate super elevation design at the curve, Improper road junction, Broken warning signs board and Poor pavement condition, etc these all reason called geometric design deficiencies. The most important reasons of highway traffic collisions become improper design parameters and poor road conditions and also drunken drivers, careless driving and over speeding, etc. By examining the accidental related records providing by the police station over the previous five years, the current study seeks to discover unintentional black spots on a stretch of NH-86 (from Sagar to Shahghar). This study consists of a black spots were identified using the weighted severity index (WSI), and it was determined that the frequency of road traffic accidents during this study indicated that the fundamental causes of accidents had been identified. Appropriate corrective strategies were also offered for a specific site.

A. Scope and Objectives

To build a procedure to recognize the most dangerous accidental extend along National Highway. The result from the case study can be used for enhanced valuation of roadway sections for upcoming attentions. The black spots studies on Sagar to Shahgarh stretch (72.7.km) have been taken up with the subsequent objectives-

- To pinpoint different pavement-related factors that contributes to accidents.
- Perform black spot analysis utilizing WSI techniques.
- To determine how frequently traffic accidents occur on the roads.
- Each spot's best-suited enhancement for each black spot is likewise identified.

II. STUDY AREA

The studied area is situated in district Sagar of Madhya Pradesh and this study stretch is between Sagar to Shahgarh on National Highway-86. Some feature of this road section is specified below-

1) No toll booth at a select stretch.
2) No Bus lay-bys and Truck lay-bys.
3) The shoulder of the road was not suitable for turning or waving.

III. METHODOLOGY

The following efficient technique was used to collect the different aspects of this investigation. The following phases are a part of this approach, and they can help us conduct our research more easily.

A. Collection of Data

Two sections of this study's brief describe the data collection. For the study, both primary and secondary data were gathered. It takes a lot of work and time to acquire data.

1) Collection of Primary Data
2) Collection of Secondary Data

1) Collection of primary data

This collection includes the following important data which are collected for field survey and field investigation of the study area.

Roadway inventory contains a variety of details about each road section, including the name of the road, its length, its type (flexible or rigid pavement), its carriageway width, its shoulder width, etc.

- Highway Name: Sagar To Shahghar –NH-86.
- Highway Length: 72.7 km.
- Highway width of carriageway: 7.0 to 7.5 meters (Double Line) with individually side shoulders.
- Pavement Type: The surface is a type of Flexible pavement i.e. bituminous road.
- Engineering Structures: At these road section five minor bridges and some culverts. All Structures are in good condition.

B. Examination of Secondary Data Collection

The analysis's primary goal is to identify the areas of the NH-86 road stretch that are likely to be accident hotspots. The study's secondary data was gathered. Pavement collisions records from the past five years (2016–2020) remained gathered since the relevant police department as secondary

data, and this collisions record was then evaluated by the weighted severity index method (WSI).

YEAR	Location Accident Details	Chhapri Path	Bratiraha	Dalpatpur Village	Rurawan	Ganesh Pura Area	Imlakheda	Chhanbeela	Pathanwali Dargah
2016	Total no of accidents	18	11	23	3	3	10	4	20
	Deaths	8	1	3	2	0	1	0	11
	Serious injury	22	5	23	7	2	6	9	31
	Minor injoury	15	13	20	5	5	19	7	19
2017	Total no of accidents	9	11	18	6	2	7	2	12
	Deaths	2	0	3	2	0	0	0	3
	Serious injury	11	7	13	7	2	9	2	18
	Minor injoury	8	10	23	5	4	13	3	9
2018	Total no of accidents	11	8	15	3	4	5	7	19
	Deaths	5	0	4	0	0	2	1	5
	Serious injury	14	13	10	2	5	7	3	27
	Minor injoury	13	9	11	6	7	11	4	15
2019	Total no of accidents	15	7	26	4	7	8	3	16
	Deaths	10	1	6	1	3	1	1	7
	Serious injury	18	9	17	5	12	9	4	21
	Minor injoury	18	11	12	9	10	15	5	14
2020	Total no of accidents	13	8	20	4	7	8	3	16
	Deaths	6	2	5	1	3	1	1	2
	Serious injury	10	6	15	4	12	9	5	18
	Minor injoury	6	7	8	7	7	13	3	11

Table 3.1: Accident data 2016 - 2020

IV. RESULT AND DISCUSSION

Calculations of collected location-wise samples containing accidental records by using the WSI formula (from above Equation 1)

$$(WSI)= (41 \times K)+ (4xGI)+(1x MI)$$

Accidental data put in the above formula from Table 4.1 then we determine the value of WSI for each location as calculated below-

Location–Dalpatpur Village

Value of WSI in 2016= (41 x3) + (4 x23)+ (1 x 20) =235
Value of WSI in 2017= (41 x3) + (4 x13)+ (1 x 23) =198
Value of WSI in 2018= (41 x4) + (4 x10)+ (1 x 11) =215
Value of WSI in 2019= (41 x6) + (4 x17)+ (1 x 12) =326
Value of WSI in 2020= (41 x3) + (4 x15)+ (1 x 18) =201

Similarly all values are calculated by WSI method and mentioned in Tabular form.

S.No.	Location	2016	2017	2018	2019	2020
1	Chhapri Path	431	134	274	500	374
2	Bratiraha	33	38	61	88	281
3	Dalpatpur Village	235	198	215	326	201
4	Rurawan	115	115	14	70	64
5	Ganeshpura	13	12	27	181	178
6	Imlakheda	84	49	121	92	90
7	Chhanbeela	43	11	57	62	64
8	Pathanwali Dargah	594	204	328	384	165

Table 4.1: Weighted severity index of the specific locations

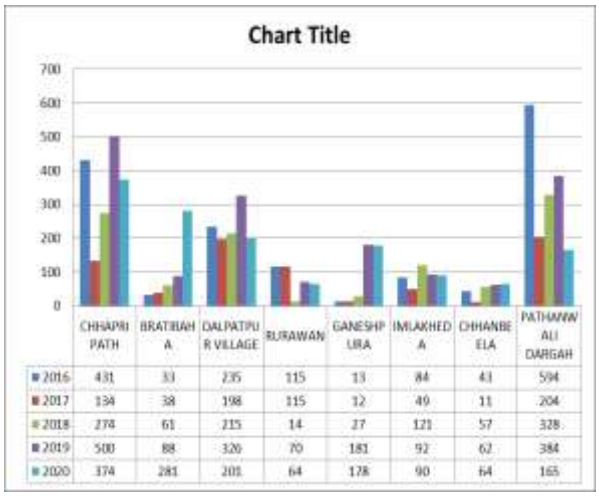

Fig. 4.1: Weighted severity index(WSI) of the specific locations

The entire analysis of the National Highway 86 area in the Sagar district has two lines. As specified by the road inventory survey, all segments of the carriageway range in width from 7 to 8 meters. Heavy traffic is insufficient, and the current width does not meet National Highway regulations. Most National Highways in our country have been divided into four and six lanes based on the traffic volume, but there haven't been any alterations in a while even though traffic volume is rising year after year.

Dalpatpur and Bratiraha locations are town portions of the National Highway there are stretches and having no divider to distinguish the path of movement. It can be induced skull collisions due to blindness and glare problems. Also no parking area for passenger vehicles, these become stands on the main carriageway.

In Beela, Ruravan sections of Highway we experimental that the bad situation of the asphalt surface for the reason that rainwater overtops to be converted into at this region.

In Imlakheda and Chhapri turn is a sharp curve in the road, also no proper sight distance and no sign boards at the curve which cause accidents to occur at this location.

Pathanwali Dargah is a hazardous location for the whole study area because of these steep curves of road which leads to many sharp turns, improper gradient, poor drainage system for rainy water and insufficient sight distance designed for vehicles at this portion of the Highway.

Location	Road Traffic Accidents per Year					Total	Share (%)
	2016	2017	2018	2019	2020		
Chhapri Path	14	10	12	17	20	73	16.19
Bratiraha	12	12	9	9	13	55	12.20
Dalpatpur Village	29	19	16	28	25	117	25.94
Rurawan	4	7	3	6	5	25	5.54
Ganeshpura	2	3	5	9	6	25	5.54
Imlakheda	5	8	6	10	16	45	9.98
Chhanbeela	2	3	7	5	8	25	5.54
Pathanwali Dargah	12	14	19	18	20	86	19.07
				TOTAL		451	100.0

Table 4.2: Variation in the frequency of road traffic accidents

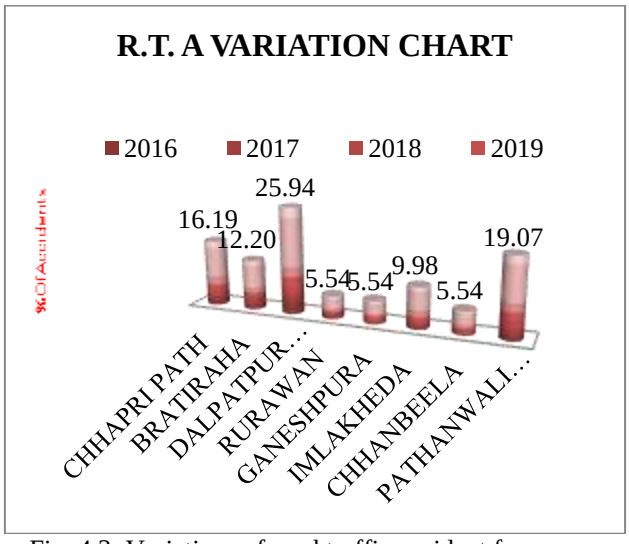

Fig. 4.3: Variations of road traffic accident frequency location wise

General factors involved in the road traffic accident (RTA) on the National Highway-86 section from Sagar to Shahgarh. During the research area, the number of road traffic accidents (RTA) has considerably increased at concerning rates from year 2016 to 2020.

Based on the number of road traffic accidents (RTA) that occurred along the study section of NH-86 from Sagar to Shahgarh, a comparison was done. According to this research report, Dalpatpur Village and its extension experienced 111 (or 27.75%) of the 400 incidents that occurred between 2016 and 2020. 82 (20.50%) and 67 (16.75%) incidents occurred near Pathanwali Dargah and Chhapri Turn, respectively. Mountainous and escarpment areas were the most susceptible to traffic accidents due to difficulties.

A. Existing road problems & roadside hazard checklist when visiting the site

1) Existing road problem

1) In some places, Shoulders are misplaced
2) Shoulder irregular and too thin
3) The horizontal curve's too-small radius (sharp curve)
4) Improper Drain in a mountainous area
5) A section of the road does not contain road markings.
6) Improper Super elevation

2) Roadside hazard

1) Guard rails missing
2) Inappropriate bus stop position
3) Destructive sign boards are seen
4) Not at all parking Places in municipal area

V. CONCLUSION

Accident black spots, which are areas of road where accidents occur frequently and which lower overall road safety, can be recognized and analyzed. Black spots are defined as areas of a highway where accidents commonly happen. The goal of the current study was to identify the National Highway-86 stretch's Sagar to Shahgarh stretch's most dangerous accident black spots. The weighted severity index (WSI) approach and the frequency of road traffic accidents (RTAs) were used to categorize the accident-prone areas along a particular section of NH 86. Based on the value of WSI from the data gathered on traffic accidents, the top five locations were identified as black spots and proposed some potential improvements to the transport system. If there is enough data available, it has been discovered that the overall methodology is useful for the detection, assessment, and behavior of accidental black spots.

This study included two significant information points. One is data on traffic accidents, while the other is road geometry data. Data on road accidents was gathered from the police department and is used to briefly summarize some of their general characteristics, such as clashing position, amount of collisions annually, the quantity of fatalities, and amount of injuries. These field-collected statistics on road geometry cover a broad range of design components and their detrimental effects on traffic.

According to the examination of accidental data, there are significant differences in the frequency and amount of road accidents along some stretches due to many variables, including road alignment effect (such as Tangent, mountainous, and escarpment areas), Temporal variation (such as monthly, yearly), Traffic rules awareness, and road user characteristics, among others. On the additional hand, the essential data from pedestrians, locals, vehicle drivers, and government officers of the closest police station is used to determine the reasons for road traffic accidents through questionnaire surveys and interviews. Road design issues include excessive speeding, inability to yield to other traffic or pedestrians, overtaking in sweeping horizontal curves, and a disregard for traffic regulations.

During the ground investigation defects were found, including deteriorated pavement surfaces, sharp curves, uneven shoulders, inadequate median opening, lack of drainage, blind corners, and carriageway width in mountainous areas, etc., as well as deficiencies in road furniture, including the absence of parking lanes, the absence of guard rails and obtrusive barriers at turns, missing sign boards, improper pavement marking and bad lighting in the urban area. When the suggested changes are put into place and contribute to improving overall traffic safety, these shortcomings might be eliminated.

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