BLACKSPOTS IDENTIFICATION AND ACCIDENT ANALYSIS OF INDUS HIGHWAY (N-55)

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Abstract

Traffic accidents are unavoidable in human life therefore highway safety is one of the most important factors of transportation engineering. After the advent of National highways and freeways, developing nations including Pakistan is facing new dimensions of highway safety challenges, highway safety management demands more attention due to the involvement of high-speed dynamics. This study presents a method by which accident-prone locations commonly termed as Blackspots are been identified. A stretch of 188 KM of National Highway N-55 also known as Indus highway from Peshawar to Lakki Marwat has been selected for the study. Road traffic accident data was only available with local district police in a manual file record (First Investigation Report). Accident data were collected from nine police stations along the selected route for seven years i.e. from 2013 to 2019. After analysis, it was found that most of the accidents occurred due to over speeding and geometric problems. Moreover, it was also found that there are no proper pedestrian crossings. The data was analyzed month and year wise. Fourteen such locations on which five or more fatalities occurred were identified as blackspots. The blackspots are within the range of 1KM.

I.   Introduction

National highway N-55 also known as Indus Highway is a 1264 KM highway that runs along the Indus River in Pakistan and connects two major cities of Pakistan i.e. Karachi and Peshawar. Indus Highway has proposed in 1980 [XIII]. The geometrics of highway is different at different locations, at some sections the

Muhammad Majid Naeem et al

highway is four lanes separated by the median and at some sections the highway is two lane without a median. Accident is an unintended event that happens when a vehicle hits an individual, an object, or another vehicle that can result in fatality, injury or property damage**.** Reasons for an accident can be lack of education, lack of driving skills, geometric problems and inappropriate design of pedestrian crossing etc. Accidents are broadly classified as fatal accidents, non-fatal accidents and property damage only. Accident blackspots may be defined as the locations on a highway where the frequency of accidents is high concerning other sections of highway where accident frequency is comparatively low.
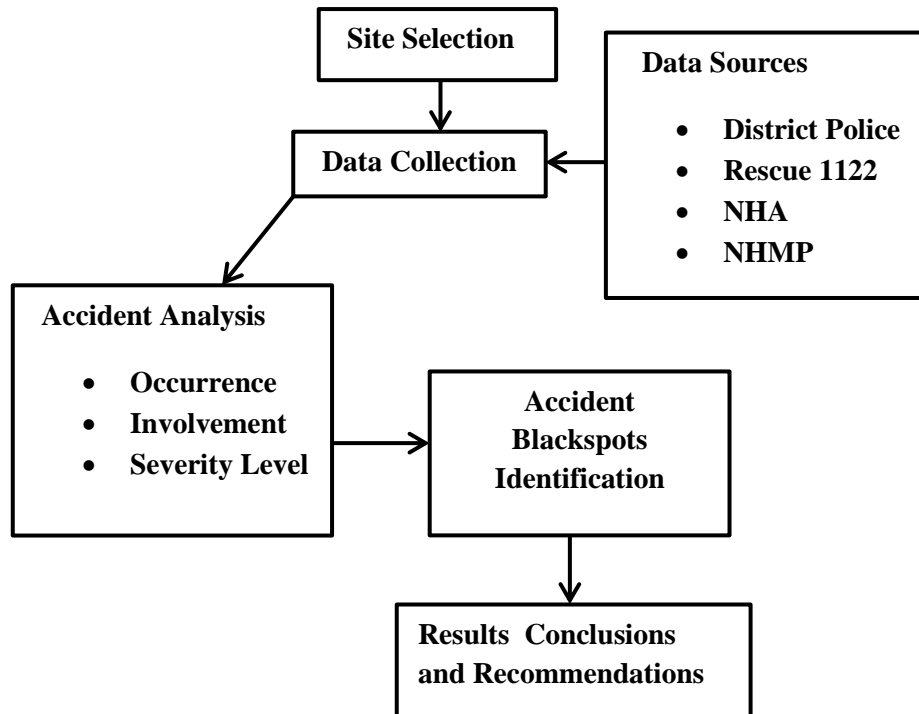
II. Literature

Most blackspots are caused by the user's speed and aggression. Geometric conditions have a relatively low contribution to accidents [V]. Blackspots programs were effective in Western Australia, lower the accident rate by 15% and savings from collisions were 50.8 Million Australian Dollars [VII]. Research work indicated that in a group of countries a statistical relationship can be established between fatality rate (per licensed vehicle) and levels of vehicle ownership (vehicles per head of population). The equation was; $\frac{F}{V} = 0.00078 \left(\frac{V}{P}\right)^{-0.44}$ where; F=Road Fatalities, V= Number of vehicles & P= Population [VIII]. The primary objective of this study was to investigate the conditions under which most of the accidents occurred in Pakistan. From September 1987 to December 1993 a total of 1585 accidents have been analyzed in this study using computer software to identify the blackspots. From the data, it seems that buses/minibusses are the common vehicles involved in most of the accidents. In this study, the blackspots could not be identified because of the incomplete information about the exact location of the accident [XI]. The objective of this study was to investigate and analyze the causes of the accident that have taken place in the past five years. A total of 13 blackspots were identified. It was observed that public service vehicles are mostly involved in the accidents particularly Commuter Vans. The analysis led to the conclusion that the geometric conditions of the road do not contribute significantly to the accident. Rather in this section, the road users are mainly responsible for accidents [XII]. In this research study, it was observed that hotspot (or blackspots) identification is an important element of modern transport technology, advantages of high investment security, and responds to community sites and media interest with a high accident frequency [XIII]. Accident blackspots is a road section with a maximum length of 200m, with 5 or more accidents with a severity indicator greater than 20 in the year of analysis. There was no distinction between intersection and non-intersection accidents. The total number of accidents is used [IV]. A relation was used to identify blackspots and analyze accidents concerning different parameters. The accident analysis includes the distribution of accident data based on type of vehicle involved, peak hour, type of

Muhammad Majid Naeem et al

fault and blackspots ranking of top ten locations [IX]. The approach allows us to assume that the estimated model parameters can vary randomly along the road segments to account for unobserved effects potentially related to; the road characteristics, Environmental factors & Driver behavior [VIII]. To have efficiently appropriate resources for the treatment of accidents, engineers in general, a ranking of accidents is based on the average number of accidents during the period. Identification, classification and sitting of the hazardous phenomenon in the group, the question is a key challenge for researchers of road safety [III]. To film the relationship between the choice of speed and accidents, the work studied the speed of the car (and variations) one loop detectors individual roads in Southern California and the collision data. Driver behavior, geometric design, weather conditions and other factors play a role in accidents [VI]. Large trucks are involved in a disproportionality small share of total accidents. But a disproportionate share of casualties, because of its large size and physical difficulties in the elimination of accident scene, large truck accidents often results in significant congestion. Thus prevention of accidents of heavy trucks is important for improving road safety and operation [XIV].

III. Methodology

The selected site for the research is a section of National Highway N-55 which is a 188 KM stretch that starts from Peshawar and ends at Lakki Marwat (Gandi Chok). The road traffic accident data is collected from the year 2013 to 2019. First investigation reports (FIR File) of accidents on Indus highway for the selected section were collected from nine local district police stations along the route. The collection was first converted to year wise excel spreadsheets. The information about the location of the accident, time, date, fatalities, injuries, vehicles involved, cause of the accident was clearly mentioned in FIR File. The data was then analyzed and graphs were developed. For our research, we define the blackspots as "the road section of 1 km span on which the accident frequency is high and at least five fatalities have occurred on these spots according to available data".

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                 │  Site Selection │                  ┌──────────────────────┐
                 └────────┬────────┘                  │   Data Sources       │
                          │                           │                      │
                          ▼                           │  • District Police   │
                 ┌─────────────────┐ ◄────────────────│  • Rescue 1122       │
                 │ Data Collection │                  │  • NHA               │
                 └────────┬────────┘                  │  • NHMP              │
                          │                           └──────────────────────┘
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   ┌────────────────────┐
   │ Accident Analysis  │
   │                    │            ┌──────────────────┐
   │  • Occurrence      │            │    Accident      │
   │  • Involvement     │───────────▶│    Blackspots    │
   │  • Severity Level  │            │   Identification │
   │                    │            └─────────┬────────┘
   └────────────────────┘                      │
                                               ▼
                                    ┌──────────────────────┐
                                    │ Results  Conclusions │
                                    │ and Recommendations  │
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Flow Chart

IV. Data Analysis

The summary tables of accident data from the excel sheets were analyzed year wise and month wise and graphs/bar charts were developed.

YEAR	DEATHS/FATALITIES	INJURIES
2013	25	115
2014	36	147
2015	45	159
2016	51	165
2017	57	189
2018	43	195
2019	50	131

Fatalities and injuries 2013-19

Muhammad Majid Naeem et al
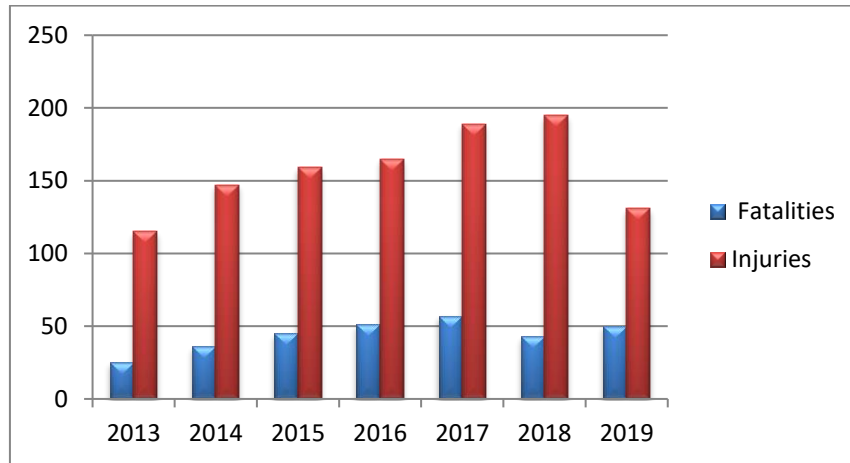
Bar Chart of Accident Data Analysis 2013-19

IV.i. Spatial Analysis

It was analyzed that the section of N-55 near Kohat Central Jail (33°30'26"N 71°26'04"E) is most dangerous with 28 accidents which resulted in 14 fatalities and 66 injuries in the past seven years (2013-2019)
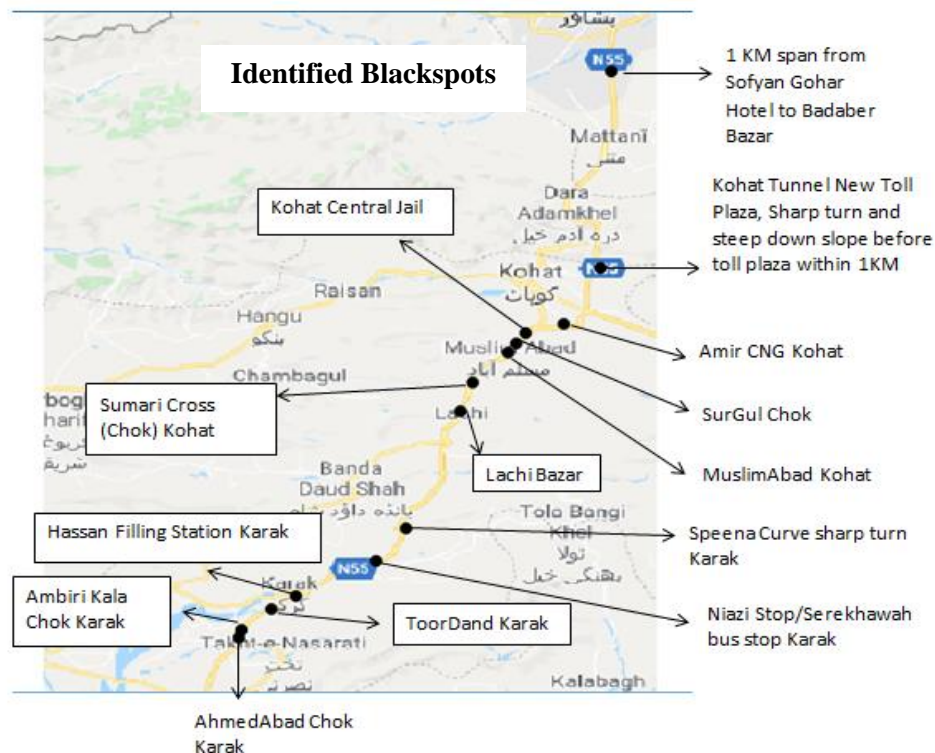
IV.ii. Temporal Analysis

It was also analyzed that on the selected section of N-55 in February 2019 seventeen fatalities and ten injuries occurred.

V. Results/Identified Blackspots

On the selected section of Indus Highway N-55, Fourteen (14) such locations at which at least five fatalities occurred on a span of 1 KM during the past seven years were declared as blackspots for the highway. The identified spots location with several accidents on the spot and fatalities and injuries are shown in the table

Sr. No.	Location Name	Coordinates	Number of Accidents	Fatalities	Injuries
1.	1 KM span from Sofyan Gohar Hotel To Badaber Bazar	33°54'29"N 71°33'29"E	10	7	14
2.	Kohat Tunnel New Toll Plaza, Sharp turn and steep downslope before toll plaza within 1KM	33°36'28"N 71°32'35"E	22	13	73
3.	Amir CNG Kohat	33°31'15"N 71°29'22"E	9	6	21
4.	Kohat Central Jail	33°30'26"N 71°26'04"E	28	14	66
5.	SurGul Chok Kohat	33°29'31"N 71° 25'13"E	14	7	41
6.	MuslimAbad Kohat	33°28'39"N 71°24'26"E	15	6	21
7.	Sumari Cross (Chok) Kohat	33°25'52"N 71°21'22"E	10	7	23
8.	Lachi Bazar	33°23'10"N 71°20'18"E	13	8	20
9.	Speena Curve sharp turn Karak	33°12'28"N 71°15'29"E	7	5	15
10.	Niazi Stop/Serekhawah bus stop Karak	33°09'27"N 71°12'52"E	7	5	17
11.	Hassan Filling Station Karak	33°06'14"N 71°05'51"E	6	7	11
12.	ToorDand Karak	33°05'05"N 71°03'42"E	7	9	33
13.	Ambiri Kala Chok Karak	33°03'09"N 71°00'59"E	9	5	18
14.	AhmedAbad Chok Karak	33°02'23"N 71°00'47"E	8	5	21

Muhammad Majid Naeem et al

Location Map of Study Area

VI. Conclusions

After the analysis and results following conclusions were made;

Among the fourteen identified blackspots the most dangerous blackspot is near Kohat Central Jail. The highway is two-lane and without a median and most of the vehicles use opposing side traffic lanes for overtakes which results in most of the accidents.

On the selected section of N-55 in February 2019 seventeen fatalities and ten injuries occurred.

Most of the accidents occurred on the selected section of N-55 Highway because of over speeding and geometric problems.

The maintenance and operation system of N-55 Highway needs improvement.

VII.   Recommendations

There should be proper bus stops for loading and unloading of passengers and goods at an appropriate distance from the carriageway of the highway.

To reduce the number of accidents in the future either provide a ramp at the side of the highway at end of the downslope to stop the vehicle during brake failure as shown

Muhammad Majid Naeem et al

in the figure OR shift the toll plaza away from the downslope which is already done during present days.

To reduce accidents in the future, there should be proper turning ramps for entry and exit from the highway.

To reduce accidents in the future there should be proper signboards of speed limits or speed checking cameras must be installed as done on motorways of Pakistan. Also, there must be proper pedestrian crossings at regular intervals. To reduce the number of accidents the highway should be provided with separation (median). Also, the heavy vehicles must not be overloaded so that there is a minimum effect on the geometric design of the highway and the road surface is safe from damages.

To reduce the accidents in future the highway should not be passed through commercial areas especially in between the markets. In the ongoing new project of N-55, the highway route is diverted from Lachi Bazar which will result in a reduction in the number of accidents.

To reduce the number of road traffic accidents on intersection points we must provide turning ramps and measures should be taken to reduce the speed of the vehicle at such locations. Also, proper pedestrian crossings must be provided at intersections.

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Muhammad Majid Naeem et al