PalArch's Journal of Archaeology of Egypt / Egyptology

Impacts Of Traffic, Manmade Features And Roadway Condition On Road Safety

Nalini Ranjan Singh[1], Biswajit Mohanty[2], Pradyumna Sagar Sahoo[3] Sagarika Panda[4]

[1]Student of Civil Engineering Department, Centurion University of Technology and Management, Odisha

[2] MTech Transportation Engineering, Centurion University of Technology and Management, Odisha

[3]MTech Transportation Engineering, Confiance Infratech Management Pvt. Ltd, Bhubaneswar, Odisha

[4]Asst. Prof. of Civil Engineering Department, Centurion University of Technology and Management, Odisha

Email: [1]nrsingh999@yahoo.com, [2]mbiswajit7@gmail.com, [3]pradyumna.nitt@gmail.com, [4]sagarika.panda@cutm.ac.in

ABSTRACT

The fast-increasing population accompanied by economic growth and penchant for consumerism has resulted in generation of huge vehicle population. The accident severity has seen an upward trend due to the increase of the vehicular population causing an alarming situation in country. Road accidents wreak heavy remunerative loss for the nation. Accident has a major impact on the society by not only creating loss in form of death but also contributes to damage to property, disablement, public anguish and extensive abasement of the society. Scarcity of highways and other roads leads to neglecting of the demand of the traffic which leads to high rate of crash. A way to diminish crash is by incorporating a requisite road safety features among the users and monitoring the same over the period of time to make the road safer and full proof traffic. The insights of impact of roadway condition

and road safety condition of a major National Highway in the state of Odisha connecting Rourkela to Rajamunda (NH 143) is presented here.

1. Introduction

Road accidents are humane mishap, which involves a high level of agonize. They inflict a high loss to the society in form of loss of life, severe injuries and deprivation of the potential remuneration. The upshot of road crash is severe and has pessimistic impact not only the affected person's health but also to the financial condition of the individual. India has drawn the shady variance by creating a huge quantity of casualties in crashes in the globe. This has led road safety to emerge as serious agitation across the globe and chiefly across the India. Road safety is known for cutting down the accident in a structured way by the implementation of new skills in a discrete time. The scale of up gradation process is likely continued up to end of next decade as a minimum.

In the current situation across the world, road safety has a high concern among all. The aspects of road safety are a multi-directional. It has a all round impact the society by assimilating the evolution, operation and management of highway network, urban land planning, enforcement of law etc. Specifically, it confines spans of engineering aspect of highway and automobile for heath and trauma care treatment after the crash schema. Road crash scenario across India is given in the Table-1 below:

Table 1*: Number of Road Crash and Persons Associated: 2002 to 2011*

Number of Road Crash and Persons Associated: 2002 to 2011				
Years	Number Of Crashes		Number of Persons		Accident Extremity
	Total	Lethal	Killed	Wounded	
2002	4,07,496	73,649	84,674	408,711	20.8
2003	4,06,726	73,589	85,998	435,122	21.1
2004	4,29,910	79,357	92,618	464,521	21.5
2005	4,39,255	83,491	94,968	465,282	21.6
2006	4,60,920	93,917	105,749	496,481	22.9
2007	4,79,216	1,01,161	114,444	513,340	23.9
2008	4,84,704	1,06,591	119,860	523,193	24.7
2009	4,86,384	1,10,993	125,660	515,458	25.8
2010	4,99,628	1,19,558	134,513	527,512	26.9
2011	4,97,686	1,21,618	1,42,485	5,11,394	28.6

The road traffic safety helps to reduce the risk of a road user being getting injured or killed in an accident by providing a set of ways and measures to be followed. The main objective by which serious injuries or death in a crash can be avoided despite of the road user errant is by following the road safety strategies developed by the government. The safe design of road at conflict point is necessary so as to reduce the death and injury due to crash.
 The main causes of crash are given as below:
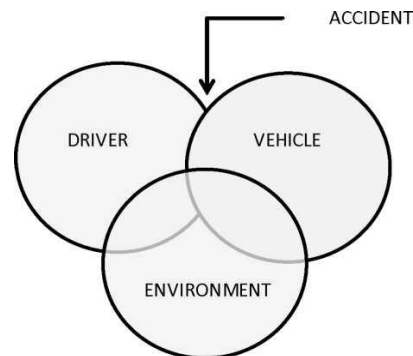
- Driver
- Vehicle
- Environment

ACCIDENT

Figure 1: *Cause of Accident*

Augmentation in road web, outpouring in automation due to enhancement of automobile industry and increase in population of our country has resulted towards a leap of the total numbers of road crash. With the fast moving economy there is an increase of vehicular population and ultimately has resulted the cause of accident to get compounded annually. The abstract here is documented in the following manner. The initial part deals with the present outline of accident in the national level. It also explains the need and contribution of the study. Thereafter the following part consists of review of various literatures. Selection for stretch of road to be studied, the specific data collection from the local authority for the same and the methodology adopted for the interpretation of the data. The next part studies about the traffic and surface properties of the stretch selected. And finally we will discuss about the investigation of the data interpreted and black spot analysis of the road. And finally we obtain a significant conclusion from the study.

2. Review of Literature

Bhuyan studies showcased that a wide variety of element has a major effect on the behavior of driver and road safety on national highway.
According to Hassan and Aty studies on road safety involving youth driver states that the aggressive and distractive nature has a major impact in crash
Constantinou et al. studies resulted that juvenile drivers have a high risk related to traffic offence.
Chandraratna et al. Studies resulted that youth are generally tempted for over speeding whereas the older age group are more observed for non speeding through a regression analysis.
Bjornskau and Sagberg studied that the reaction time to avoid a crash in case of male driver is far more reaction time and hence increasing the risk.
Shivkumar and Krishnaraj, studied found out that the after effect of

alcohol on driving has lead to maximum crash and the blood alcohol level has a direct relation with the severity of the crash.

Vaez and Lafllame, studied that driving the influence of alcohol and any other sub-stance has a high impact on road crash. The use of any substance while driving shall be zero as the narcotics department.

Anne at al. has created a model with the help of the crash potential and the total time travel with the help of a real time crash. Outcome of the same has also produced another outcome indicating that the variable speed could reduce the crash potential by a major aspect.

Prabhakharan et al. has studied that by providing a systematic knowledge about road safety to the driver there can be a substantial decrease of crash.

3. Collection of Data

The history of accidents of an area can be gathered from the FIR (First Information Report) lodged at the local police station for analysis. The data from the FIR records of the local police station were gathered for the analysis. The type of vehicles that are associated in accidents are considered for the analysis along with the cause of accident was noted. The group of vehicles involved in the accident is auto rickshaw, LCV, coach, LMV, two axle trucks, three axle trucks, motor cycle, tanker, trailer (articulated vehicle) and bus.
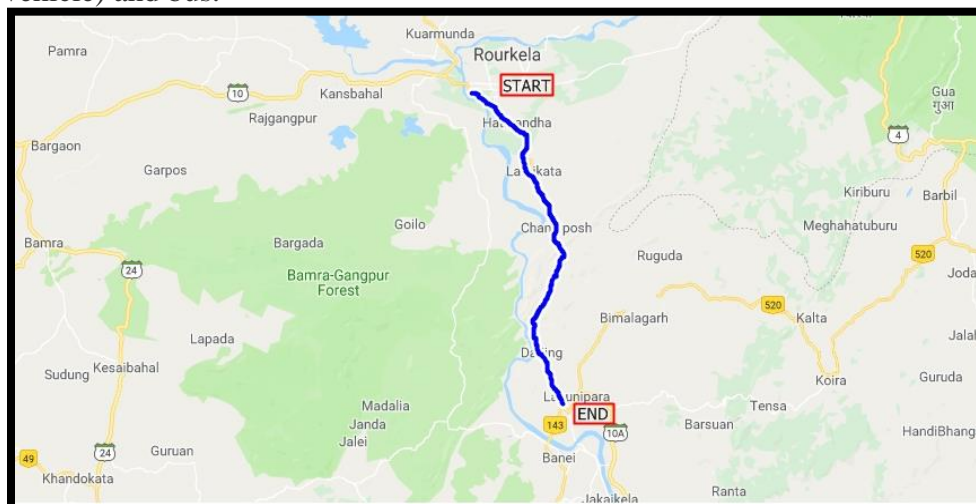

Figure 2: Key plan of selected section to be analyzed

Accident details on the selected stretch of road are given in Table-2 below. The data of accident were gathered for the selected years from the local police station and were sorted accordingly. Standard yearly discrepancy of accidents of the selected stretch of road is presented in table-2 below.

Table 2: *Accident details on the selected stretch of road*

Years	Lethal	Severe Injury	Trivial Injury
2002	14	15	36
2003	12	36	51
2004	15	24	46

2005	21	33	38
2006	20	35	41
2007	19	40	83
2008	3	25	62
2009	14	31	80
2010	19	35	85
2011	12	29	59
Total	149	303	581

4.   Data Analysis and Deliberation

The rate of accident and the accident frequency of the sample collected is analyzed and presented below.

Rate of Accident $= \dfrac{M}{L}$

M denotes the s Total no of Accidents of a stretch

L is the Length of Road

Table 3: Rate of Accident

Stretch Number	Length	Number of crash across a year	
		Total in 10 Years	Accident rate
Stretch I	5 km	227	45.4
Stretch II	5 km	209	41.8
Stretch III	5 km	27	5.4
Stretch IV	5 km	240	48

Table 4: Accident Frequency

Origin Distance	Number of Crash (2002-2011)	Frequency	Total frequency
0-5	227	32.3	32.3
5-10	209	29.7	62
10-15	27	3.8	65.8
15-20	240	34.2	100
Total	703	100	

The graph (figure-3) attached below shows the yearly trend of crash per million vehicle-kilometer-years (MVKY) along the stretch of road. The upward trend in accident rate is perhaps due to the increase in population at cities, growth of factories and industries, improper maintenance of the shoulder, electric pillar and transformer station along the carriageway, trees present closer to the shoulder, lack of sight distance due to plants, unauthorized crossings, illegal parking of vehicles along the carriageway

and shortfall of minimum awareness regarding road safety with users.

Skid Number, $SN = \sqrt{\dfrac{v^2}{2gl}} \times 100$

Where,
SN denotes as the Skid Number
v is the velocity of the vehicle
g is the acceleration due to gravity
l is the skid length
The Skid Number values was found out for the given stretches with the help of a LMV with a total weight 1050 Kg with including two people and are tabulated below. Generally in case of a bituminous surface, the skid number lies within 70 to 100. The table below cites that the values for Skid Number almost lie between the ranges.
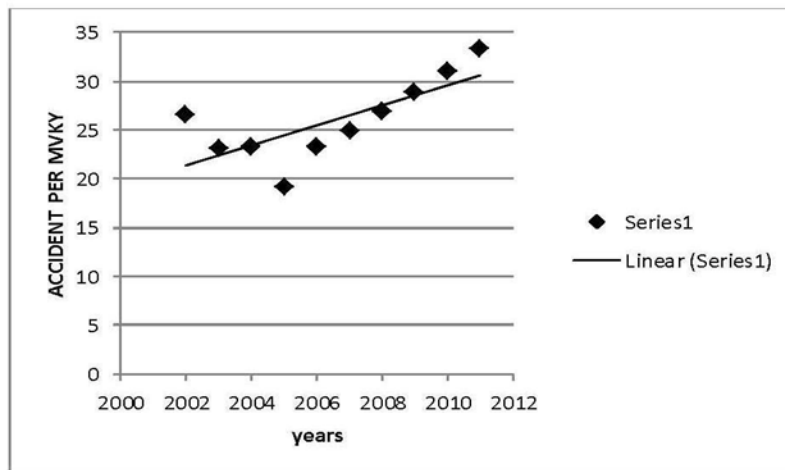

Figure 3: Yearly Trend of Crash Per Million Vehicle-Kilometer-Years (MVKY) Along The Stretch of Road

Table 3: Skid Number Results of Given Stretches

STRETCH NUMBER	LENGTH of SKID (in m)	VELOCITY of VEHICLE (in KMPH)	BRAKING	SKID NUMBER (SN)
I	9	45	N	94
II	10	55	N	109
III	14	65	N	109
IV	11	55	N	104

The standard surface depth was set on by Modified Sand Patch Method (Pestle Method).The sample collected for testing should pass through 300µ sieve and should retain on 150µ sieve. A sample of volume 50 ml (85gm) shall be spread uniformly upon road surface so as to fill it with the depression entirely in form of a circle. The circle's diameter has to measure.

The Standard Surface Texture Depth $=\dfrac{35416.6}{0.785*d^2}$

The standard surface texture depth through the stretch is given in the Table - 4below.

Table 4: Standard Surface Texture Depth Values of Road Surface

Specimen	Volume(in	Diameter (in	Standard	Remarks
1	50	33.5	0.40	Standard
2	50	31	0.46	Standard
3	50	32.5	0.43	Standard
4	50	30.5	0.48	Standard
5	50	38.5	0.31	Slippery

5. Conclusion

In this present study an effort has been made to showcase the accident scenario of the selected locations. The literatures referred above cite the analysis of crash indicated that driver's error created 77.5% of road accidents in India. Crashes in two lane road mainly occur due to the presence of heavy vehicle such as trucks. The casualty found from the above observation cited that heavy vehicle caused 59% of fatalities followed by others having a share of 26%, followed by bike with a share of 7%, jeep with a share of 5% and bus with a share of 3%. Awareness related to road safety should be upraised among road user. And an effort has been made to meet the necessary road safety of the user to have a well being for the society and mankind.

References

Bhuyan(2003), Accident analysis on two lane road, IIT-Roorkee.

Hassan and Aty(2012), Exploring the safety implications of young drivers attitude and perceptions, Accident Analysis and Preventions Vol-43.

Constantinou et al(2011) Risky and aggressive driving in young adults:PersonalityMatters,Accident Analysis and Prevention Vol-43.

Chandraratna et al(2006) Crash involvement of drivers with multiple crashes, Accident Analysis and Prevention Vol-38.

Sagberg and Bjørnskau(2006) Hazard perception and driving experience among novice drivers, Accident Analysis and Prevention Vol-38.

Sivakumar, Krishnaraj(2012),Road Traffic Accidents (RTAs) Due To Drunken Driving In India, Challenges In Prevention international journal of research in management and Technology, ISSN:2249-9563 Vol-2.

Vaez,Lafllame(2005).,Impaired driving and motor vehicle crashes among Swedish youth: An investigation into drivers' socio demographic characteristics Accident Analysis and Prevention Vol-37.

Anne et al.,(2010), The effects of minimum legal drinking age 21 laws on alcohol-relate driving in the United States Journal of Safety Research Vol-41.

Prabhakharanet al.,(2012)Impairment of a speed management strategy in young drivers under high cognitive work load Accident Analysis and Prevention Vol-47.

Golob and Recker(2003) Journal of Transport Engineering Vol-4