iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** VI **Month of publication:** June 2019

DOI: http://doi.org/10.22214/ijraset.2019.6142

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

Road Crash Analysis: A Case Study between Polem Checkpost to Canacona, Goa and Remedial Measures

Vaibhav R. Shirodkar[1], Kamlesh L. Banavali[2], Manthan G. Harikantra[3], Prajot B. Pednekar[4], Sarvesh D. Todurkar[5]
[1]*Assistant Professor GSIT Karwar,* [2, 3, 4, 5]*UG Student GSIT Karwar, Department of Civil Engineering, Girijabai Sail Institute of Technology, Karwar, Karnataka*

Abstract: ***Rapid growth of population coupled with economics activities has resulted in continuous growth of motor vehicle and due to increasing population and vehicles, traffic accidents are increasing day- by-day. Each year more than 1.2 million people die in road accident around the world. The majority of this death (about 50%) is pedestrians, cyclist and bikers. For this research work stretch of NH-66 has been selected from Polem checkpost to Canacona 24km. The crash data was collected for last 6 years, from 2013-2018 from the police stations and found 344 crashes. The collected data were analyzed to evaluate the effect of influencing parameters on crash rate. Traffic volume count, land use pattern, road inventory survey carried out at NH-66 on selected stretch.***

Keywords: Highway, Road accident, injuries, traffic volume, safety.

I. INTRODUCTION

Road transport is the dominant mode of transport in India, both in terms of traffic share and in terms of contribution to the national economy. To meet the demand for road transport, the number of vehicles and the length of road network have increased over the years. A negative externality associated with expansion in road network, motorization and urbanization in the country is the increase in road accidents and road crash fatalities. Today, road traffic injuries are one of the leading causes of death, disabilities and hospitalization in the country imposing huge socio-economic costs.

During the year 2015 the state of Uttar Pradesh ranked the highest (15,218) in fatal accidents followed by Tamil Nadu (14,524) and Maharashtra (12,009). Kerala topped in the number of grievous injury accidents to (26,449) followed by Karnataka (14,095) and Maharashtra (14,041). Minor injury accidents were the highest in Tamil Nadu (44,855) followed by Madhya Pradesh (36,690) and Karnataka (15,317).

During the year 2015 the state of Kerala ranked the highest (29,096) in the total number of persons grievously injured in the country followed by Karnataka (26,501) and Maharashtra (23,363). Persons with minor injuries in road accidents were the highest in Tamil Nadu (70,321) followed by Madhya Pradesh (49,570) and Karnataka (30,470). The total number of grievously injured and minor injured persons in the country during the calendar year 2015 were 1,81,471 and 3,18,808 respectively.

Out of the 53 Million Plus cities, 50 Million Plus cities reported road accident data for 2015. For the first time in two consecutive years, i.e. 2014 and 2015, there was a decline in the number of road accidents, the number of persons killed and the number of persons injured in road accidents in Million plus Cities. These 50 Million plus Cities accounted for a share of 22.1 per cent in total road accidents in the country during 2015 as against 22.7 percent in 2014. During 2015, in Million plus Cities 11.3 per cent persons were killed in road accidents as against 11.9 percent in 2014.Whereas, 16.4 per cent persons were injured in road accidents in the country during 2015 as against 16.8 percent in 2014. An important accident related parameter is the extent of accident severity (road accident related deaths per 100 accidents). It varies from a low of 2.6 per cent in Mumbai to a high of 66.0 per cent in Amritsar . The other cities which reported a very high accident severity included Ludhiana (55.4 per cent), Varanasi (47.9 per cent), Asansol-Durgapur (47.1 per cent), Allahabad (47.0 per cent), and Jamshedpur (45.2 per cent). An illustrative table indicating the total number of accidents, persons killed and injured with details of grievous injuries, minor injuries and non-injuries in the 50 Million plus cities. Out of these fifty Million plus Cities Mumbai reported the highest number of road accidents (23,468) during 2015 as against (22,570) in 2014, while Delhi reported the highest number of deaths (1,622) due to road accidents during 2015 as against 1,671 during 2014. Accident severity in terms of percentage share of 50 Million Plus cities was 14.9 per cent in 2015 as against 15.0 per cent in 2014.The fatal accidents in terms of percentage remained the same at 12.8 during 2014 and 2015.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

II. OBJECTIVES OF STUDY

The objectives of the study are as follows:

1) To study the causes of crashes and remedial measures.
2) To identify the critical crash location on selected stretch of Polem check post to Canacona.
3) To study the Road Inventory Survey from Polem Check Post to Canacona NH-66.
4) To study traffic survey at the selected locations.

III. METHODOLOGY

The steps followed during study are depicted in figure 1.

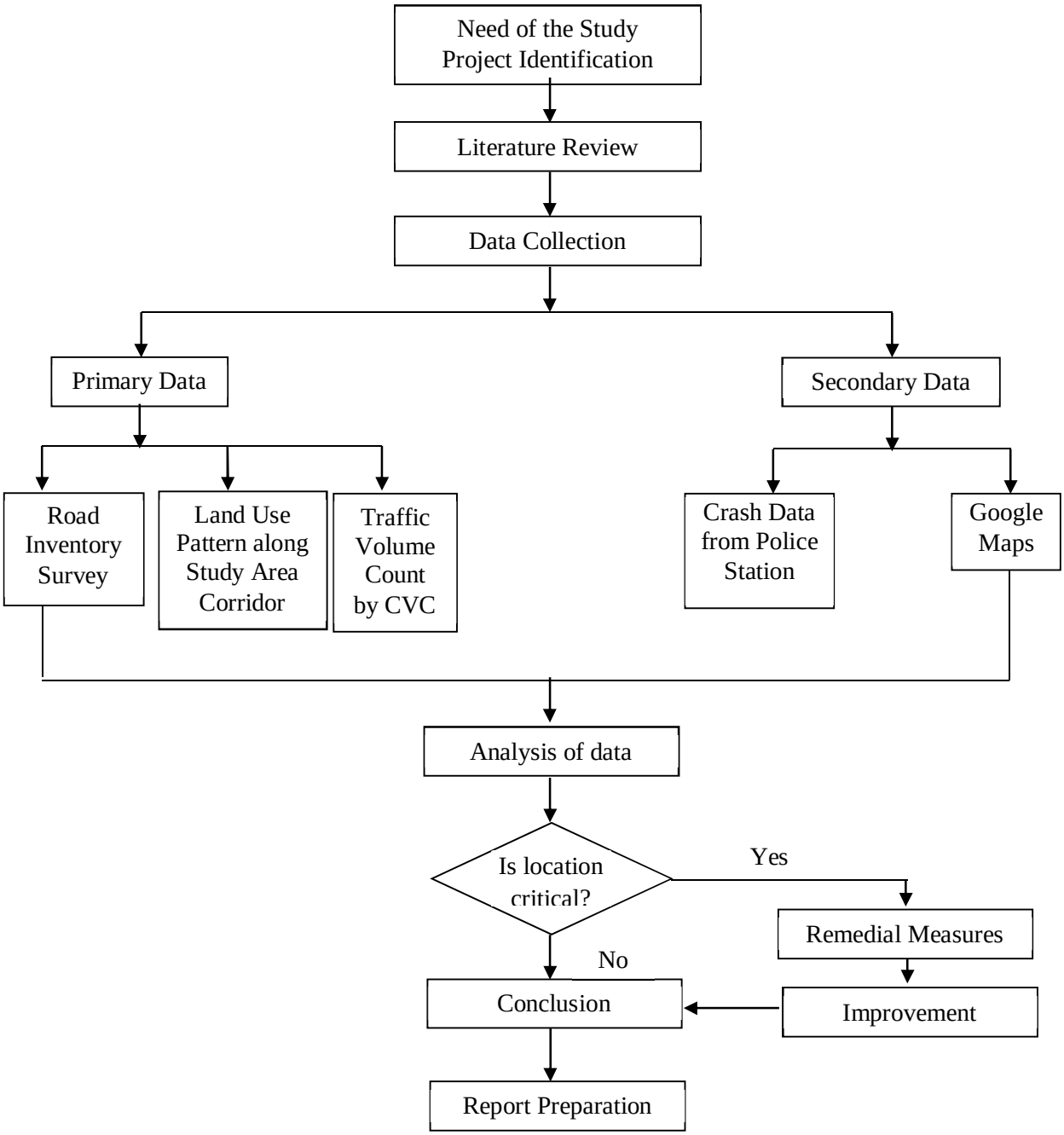


Figure1: Framework of Study

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

IV. STUDY AREA LOCATION

Present study is carried out between Polem Check Post to Canacona, Goa. NH-66 plays major role in passenger and goods transportation. Canacona is located at 15.02°N 74.02°E. It has an average elevation of 10meters (32 feet). Canacona is an ancient city in the South-Goa district, Goa. Canacona is considered as tourist hub. Canacona is popular for beaches so people are attracted towards the city. The population of the city is almost 1 lakh.

Fig 2: Goa Road Map

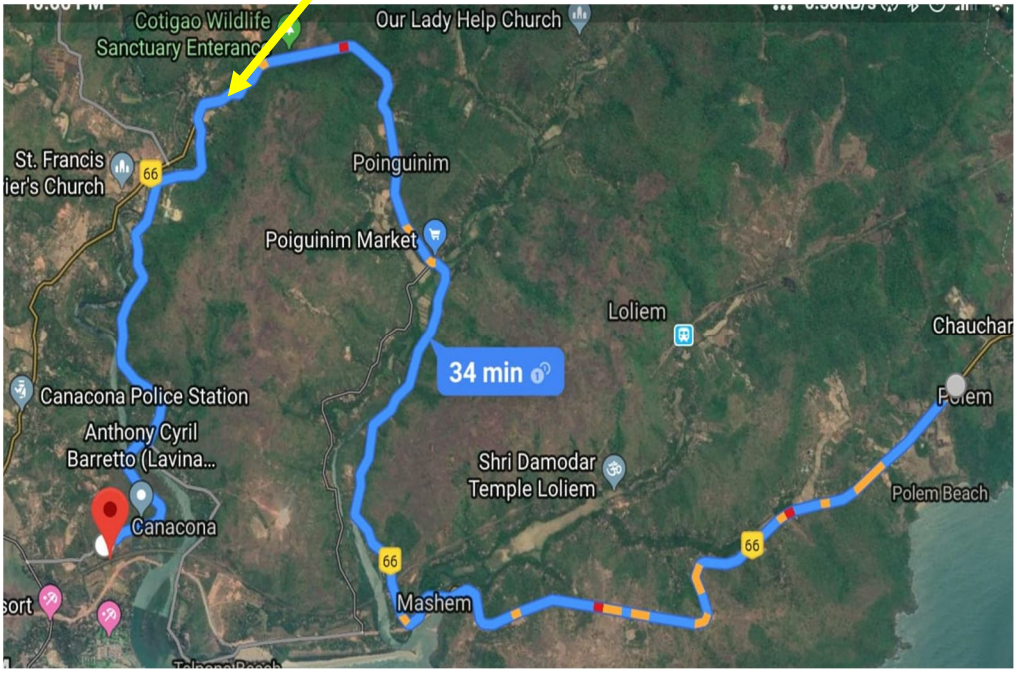


Fig 3: Study stretch Location on NH-66

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VI, June 2019- Available at www.ijraset.com

V. DATA COLLECTION

The data which were collected to analyze the crash on the study stretch are:

A. Road Inventory Survey

Road inventory surveys were perform by visual observer method. From the survey salient features of select stretch like exiting roadway width, marking, shoulders width, median, major bridges, minor bridges, and number of Junction can be find out, road inventory survey gives existing facilities of selected stretch and it is useful to identifies the black spot on NH-66. The inventory data for study stretch is given in Table 1.

Table 1: Salient features of study area corridor

No. of section	Stretch length (km)		Land use Pattern
	From (km)	To (km)	
1.	1	8	Agricultural, Commercial and Residential.
2.	8	13	Residential and Non Agricultural.
3.	13	14	Commercial.
4.	14	15.3	Non Agricultural.
5.	15.3	18.5	Non Agricultural and Residential.
6.	18.5	19.2	Forest area.
7.	19.2	24	Commercial and Residential.

B. Land Use Pattern

The NH-66 stretch from Polem Checkpost (CH: 00.00Km) to Canacona,Goa (CH: 24.00Km) corridor is having residential, commercial and agricultural land uses along the road sides.

Table 2: Land use pattern along selected stretch

Sr. no	Salient features	Description
1	Carriage width	7.5m
2	Shoulder	1.5m
3	Pavement marking	Centre line marking
4	Major bridges	1
5	Minor bridges	4
6	Main river across the road	1
7	Median	2
8	T-intersections	19
9	Y-intersections	25

C. Classified Volume Count By Manual Count Method

To understand the traffic characteristic on NH-66 traffic volume survey was carried by Manual method on both directions at selected point near Polem Toll gate. The survey was performed by three numbers of trials on the location during day from 8.00 am to 8.00 pm.

Table 3: Traffic data (8:00am to 8:00pm)

Vehicle class	PCU Equivalent factor	No. of vehicles		PCU/Day		
		Up direction	Down direction	Up direction	Down direction	Total
2 wheeler	0.5	885	1015	442.5	507.5	950
3 wheeler	1	2	3	2	3	5
Car	1	862	790	862	790	1652
Truck	3	355	263	1065	789	1854
Bus	3	132	93	396	279	675
LCV	1.5	99	122	148.5	183	331.5

D. Crash Data from Police Station

Crash data for 6 years (2013-2018) was collected from Canacona police station Canacona, Goa and data was distributed in following manners:

1) Yearly variation of crashes (2013-2018)
2) Crashes classified by vehicle type
3) Crashes classified according to spot
4) Month wise crash classification
5) Crashes classified according to time wise
6) Crash prone location based on data

Table 4: Crash Data from Police station

Name of the Police station	No. of crash recorded	Percentage of crash (%)
Canacona police station	344	100
Total	344	100

VI. ANALYSIS OF CRASH DATA

A. Yearly variation of crashes (2013-2018)

The result shows that 344 crashes occurred in the year 2013-2018. The year wise distribution shows that in 2013 about 16.36%, 2014 about 12.35%, 2015 about 20.13%, 2016 about 20.82%, 2017 about 19.45% and 2018 about 10.86% from analysis observed that in 2016 Maximum nos. of crash take place.

Table 5: Yearly variations of crashes (2013-2018)

Year	Fatal	Serious Injury	Minor Injury	Damage Only	Total	Percentage
2013	4	4	48	87	143	16.36
2014	3	2	33	70	108	12.35
2015	3	23	47	103	176	20.13
2016	7	5	70	100	182	20.82
2017	3	24	34	109	170	19.45
2018	1	10	26	58	95	10.86
Total	21	68	258	527	874	100

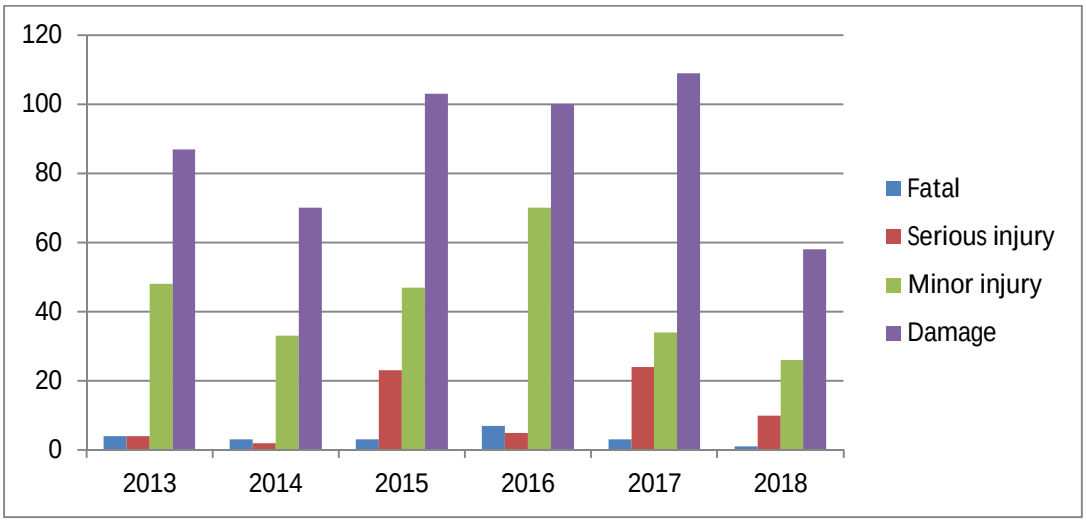


Fig 4: Yearly percentage variation of crashes (2013-2018)

B. Crashes Classified By Vehicles Type

From the year 2013 to 2018, which type vehicles involved in crashes that can be identified on National Highway. The more number of crashes taking place by motor cycle. The data shows that motor cycle vehicle (45.08%) are having more number of crashes and car/jeep/van (35.69 %) and heavy vehicles (Bus and Truck) (18.29%) are also high number of crashes.

Table 6: Crashes classified by vehicle type

Vehicle Type	Fatal	Serious	Minor	Damage	Total	Percentage (%)
Motor cycle	10	29	165	190	394	45.08
Three wheeler	-	-	-	-	-	-
Car/jeep/van	8	36	61	207	312	35.69
Bus	1	2	10	43	56	6.40
Truck	1	-	19	84	104	11.89
Others	1	1	3	3	8	0.91
Total	21	68	258	527	874	100S

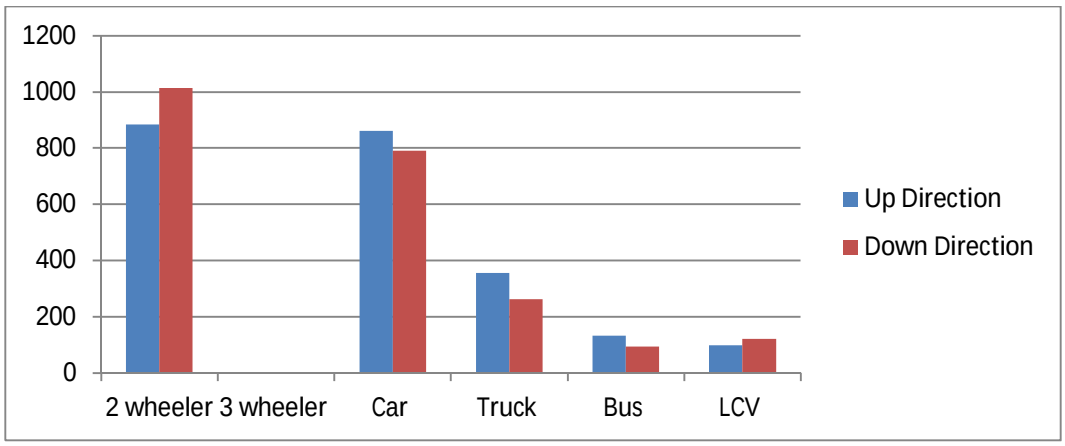


Fig 7: Percentage crashes classified by vehicle type

C. Crashes Classified According To Spot

From the data of crashes spot it is observed that on NH-66 (From Polem Checkpost to Canacona, Goa) maximum numbers of crashes occurred at Straight (61.67%), Curve (37.64%) and T-Junction (0.68%).

Table 7: Crashes classified by according to the crash spot

Accident spot	Fatal	Serious injury	Minor injury	Damage	Total	Percentage
Straight road	10	33	165	331	539	61.67
T – junction	-	-	2	4	6	0.68
Y- junction	-	-	-	-	-	-
4 way intersection	-	-	-	-	-	-
Bridge / culvert	-	-	-	-	-	-
Other	-	-	-	-	-	-
Curve	11	35	91	192	329	37.64
Total	21	68	258	527	874	100

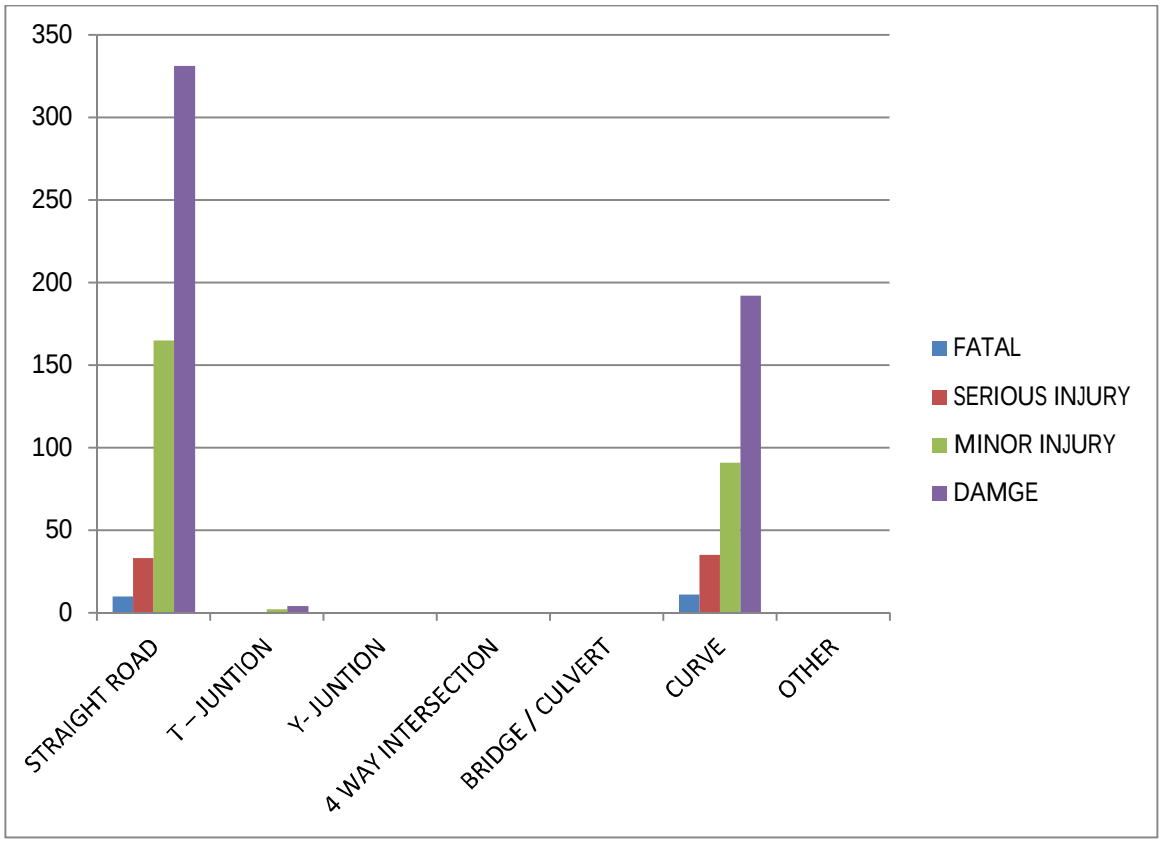


Fig 8: Percentage crashes classified according to crash spot

D. Month wise Crashes classification

Month wise crashes classification shows that in the month of March (11.67%), September (10.06%), January (9.61%) and April (9.15%) there are high crashes rate. It may be due to migrated people of this area come for celebration of Holi, Christmas and New-year festival. It's Main festival for their person and people come who went for migrated from all region of Canacona, Goa for working so this reason traffic volume has increased in these months.

Table 8: Month wise crash classification

Month	Severity				Total	Percentage (%)
	Fatal	Serious Injury	Minor Injury	Damage Only		
January	4	3	25	52	84	9.61
February	-	13	13	47	73	8.35
March	-	20	36	46	102	11.67
April	1	3	24	52	80	9.15
May	2	5	13	48	68	7.78
June	4	2	21	42	69	7.89
July	3	1	16	28	48	5.49
August	1	2	21	40	64	7.32
September	3	5	25	55	88	10.06
October	1	6	20	36	63	7.20
November	1	2	24	40	67	7.66
December	1	6	20	41	68	7.78
Total	21	68	258	527	874	100

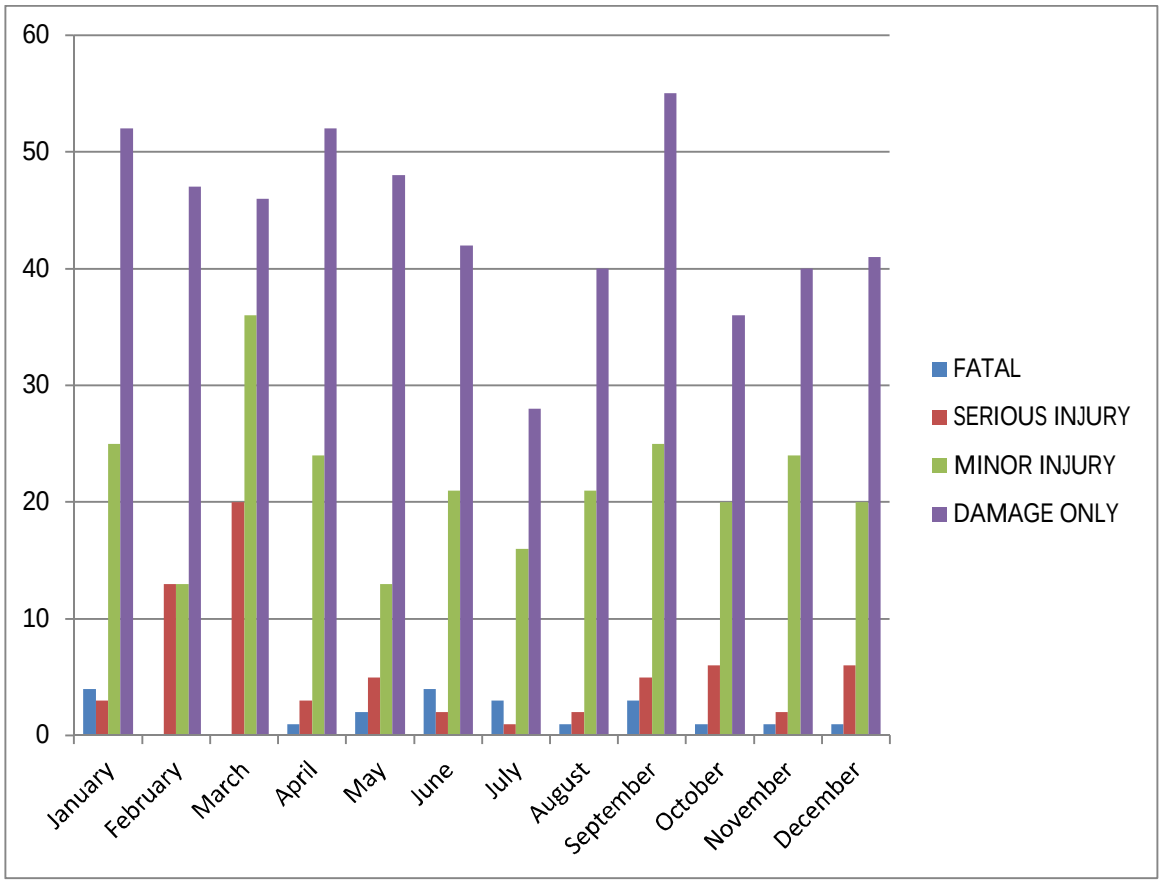


Fig 9: Percentage month wise crash classification

E. Crashes Classified According To Time Wise

It is observed that maximum number of crashes is occurred during evening period. The maximum number of minor crashes takes place at noon and evening time and also fatal crashes on stretch. The maximum crashes have been occurred between 15.00 pm to 18.00 pm.

Table 9: Crashes classification according to time

Time	Number of crashes
0:00 – 1:00	16
1:00 – 2:00	4
2:00 – 3:00	5
3:00 – 4:00	2
4:00 – 5:00	6
5:00 – 6:00	1
6:00 –7:00	6
7:00 – 8:00	12
8:00 – 9:00	21
9:00 – 10:00	17
10:00 – 11:00	21
11:00 – 12:00	20
12:00 – 13:00	14
13:00 – 14:00	19
14:00 – 15:00	18
15:00 – 16:00	29
16:00 – 17:00	28
17:00 – 18:00	23
18:00 – 19:00	17
19:00 – 20:00	20
20:00 – 21:00	9
21:00 – 22:00	15
22:00 – 23:00	8
23:00 – 24:00	13
TOTAL	344

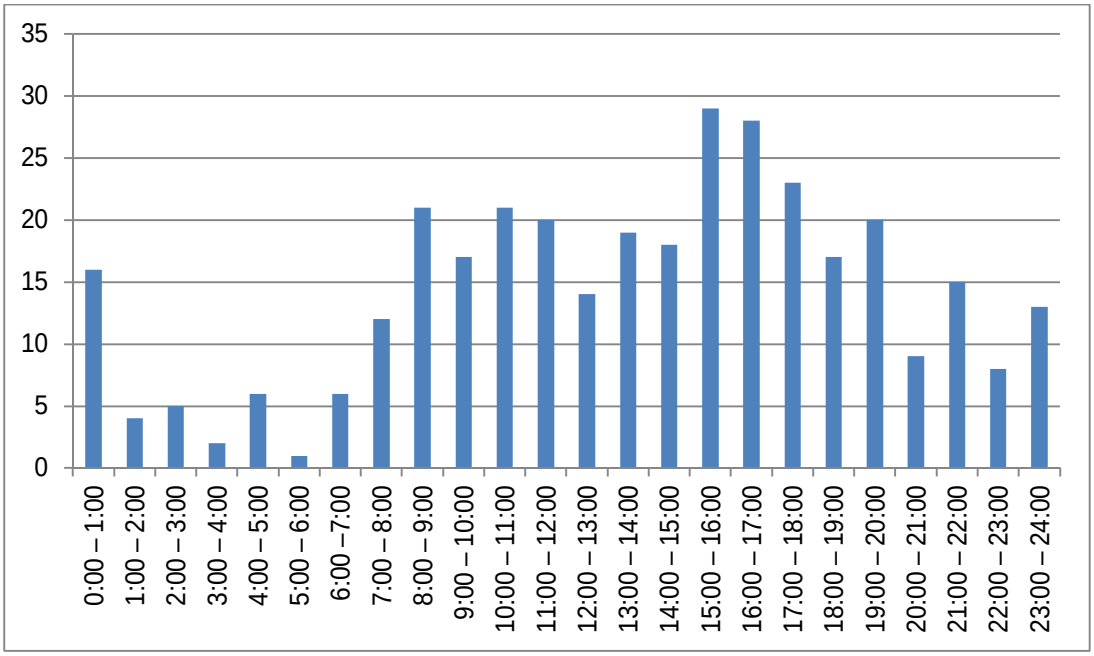


Fig 10: Crashes classified according to time

F. Crash Prone Location Based On Data

The study stretch was divided into six equal stretches of each 4 km length. Stretch VI has highest number of crashes which accounts for 31.12% of total crashes. Stretch V has the second highest number of crashes accounts for 21.51% of total crash. Number of crashes in stretch III accounts 19.18% of total crashes .Stretch II has minimum number of crashes accounts for 9.30% of total crashes. Critical sections are those which has high % of crashes plus high crash per/km. So based on this analysis stretch VI, V and III are critical crash location.

Table 10: Crash prone location based on data

No. of Section	Stretch Length (Km)		No. of Crashes	Crash/Km	Percentage (%)	Remark
	From (Km)	To (Km)				
1	0	4	35	8.75	10.17	Non-Critical
2	4	8	32	8.00	9.30	Non-Critical
3	8	12	66	16.5	19.18	Critical
4	12	16	30	7.5	8.72	Non-Critical
5	16	20	74	18.5	21.51	Critical
6	20	24	107	26.75	31.12	Critical
Total	-		344	14.33	100	-

G. Percentage Of Accident During Day And Night Time

The report shows the percentage of accidents during day as well as night time, separately. The report shows that majority of accidents have occurred during the daytime. On an average, around 70% accidents occurred during daytime in comparison to just 30% during night. One should note that this does not imply that daytime driving for a specified length is more risky than night. If we estimate accident risk per unit of pass-km during day as well as night time, we may find that driving night is more risky than daytime. Unavailability of data restricts us to estimate the probability of accident risk for a specified length of journey during daytime and nighttime.

Table 11: Percentage of accidents during day and night time

Year	Day	Night
2013	72	28
214	72	28
2015	70	30
2016	58	42
2017	52	48
2018	68	32

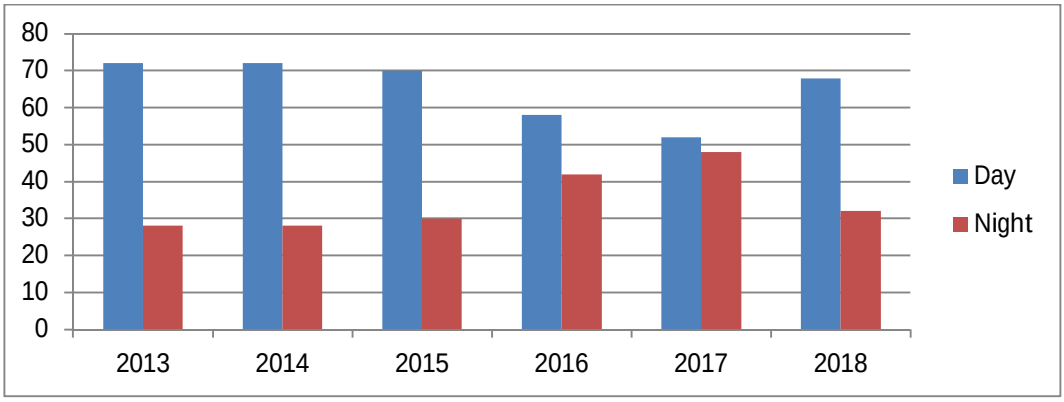


Fig 11: Percentage of accident during day and night time

VII. CONCLUSION AND RECOMMEDATIONS

The following conclusion and recommendations are drawn from the above study

A. The year wise distribution shows that in 2016 (20.82%) maximum number of crash take place.
B. The peak period for crashes comes out to be between 4.00pm to 6.00 pm (evening peak period)
C. From analysis it is evident that maximum number of crashes occur in the month of March (11.67%) and September (10.06%)
D. The data shows that motor cycle vehicle (45.08%) are having more number of crashes and car/jeep/van (35.69%) are also high number of crashes.
E. Higher numbers of crashes occurs at Straight (61.67%) and Curve (37.64%)
F. The number of village surrounding this sections and not proper facilities for pedestrian crossing and in these sections design of junction is poorly connected to main road. So provision of safe walking places for pedestrian walking and provided separation of pedestrian movement from heavy moving in these places as like zebra crossing, walkway.
G. The crash occurs in T- junction so every T-junction which connected to main highway, Bump should be installed in minor roads which connected to main road.
H. Many places in the stretch not provide proper access to main highway so provide efficient access to main highway should be properly designed.
I. Where number of crashes occur because that design of Y- junction is not properly designed. So design as per requirement of highway lane and provision of elevated and visible designed area for crossing of roads in these places.
J. Right and left turns are taken carefully and sections of highway close to facilities are black spots for heaving truck crash, as trucks tend to slow down or moving carefully.
K. Some of bus stop stand is not proper way it's very close to shoulder width so this reason bus to stop on a road. So it's give extra space to stop to bus.
L. Many hotels have not sufficient space for parking of vehicle and this reason vehicle parked on running road. So strictly prohibition of parking of vehicle on running highway near hotel.
M. According to public review, drink and drive is the major cause for accidents and therefore drink and drive must be prohibited and alcohol test must be done for every driver by the police.

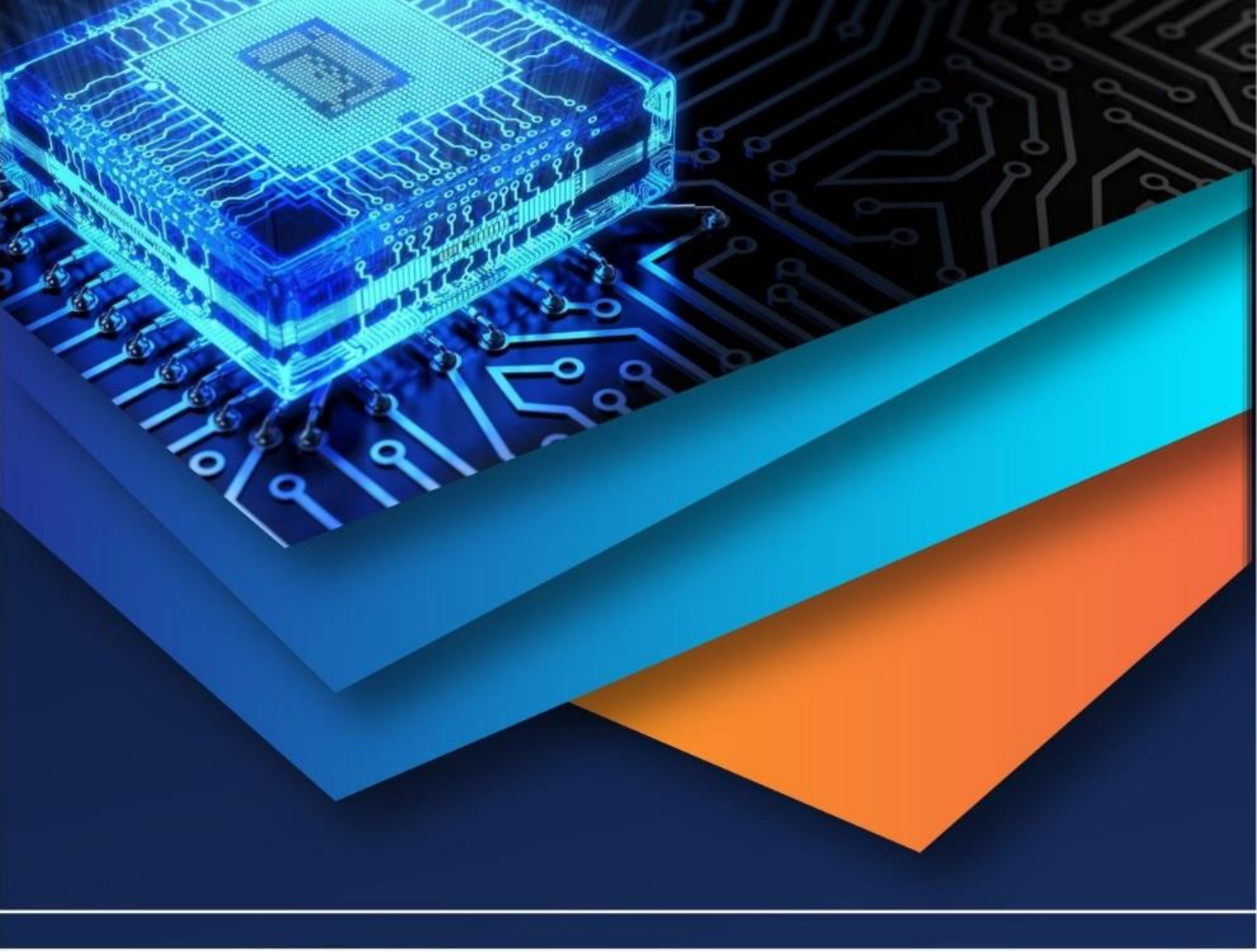
VIII. ACKNOWLEDGEMENTS

We would like to express our gratitude and sincere acknowledgment to Dr. Suresh D. Mane, Principal, Girijabai sail institute of technology, Karwar. He continuously helped with his valuable suggestions and encouragement during the entire project. We are grateful to Dr. Veeresh Menasinakai, Associate Professor, Head of civil engineering department for providing us the necessary help and encouragement whenever needed which has resulted in the success of our project. I would also like to thank all the staff member of our department, without whose constructive suggestion and valuable advice would not been able to blossom forth to give such a beautiful bloom the simple idea which has been borne by us. Last but not the least, We are grateful to all our family member and friends for their direct and indirect constant moral support through the project.

REFERENCES

[1] Amit Ghosh and Suman Paul. "Road Accident Scenario in Kolkata: A Spatio-temporal Study". European Journal of Applied Engineering and Scientific Research (India). Part CV: Department of Geography. 2013 (PP 47-57).
[2] Alkeshkumar B Labana, Asst prof. Vaidehi Parikh, Dr. Vilin P. Parekh. "Road Accidents Analysis and Identification Black spots on Dahod to Jhalod section of NH-13".International Journal of Advance Engineering and Research Development. Part CV: Civil Engineering Department. Volume2. No.5. May 2015.
[3] Dr.S.Krishnan,K.Geetha, Rabiya Bansri , "Road Accidents and Road safety measures in Tamil Nadu" An Analysis. 2017
[4] Dinesh Mohan."Road Accidents in India". Part CV: Volvo Chair professor, 30 March 2009.
[5] Er. Shakir Ahmed Bhat, Dr Rakesh Gupta. Review paper of accident Analysis of state of A state Highway (Gohana to Sonepat SH-11 Ataryana). International Journal of Latest Research in Engineering Department. Volume5. No: 4. July-August 2017. (PP 13-16)
[6] Fagoyinbo, Akinbingo, Ajibode, "Forecast Road Accident using least square method: A Case study of Lagos state. Nigeria" part CV: Department of Mathematics and Statistics, Vol4. No:23. 2014.
[7] Fshatsyon Brhane Gebretensay, Jayesh Juremalani. "Road Traffic Accident Analysis and Prediction model: A case study of Vadodara city" International Research Journal of Engineering and technology. Part CV: Dept. Civil Engineering. Volume5. Jan 2018
[8] P.Shruthi,V.T.Venkatesh, B. Vishwakath, C.Ramesh, P.L. Sujatha, I.R Dominic."Analysis of Fatal road traffic accidents in a Metropolitan City of South India" J Indian Acad Forensic Mad. Part CV: Department of Forensic medicine. Vol.35, No.4, December 2013.
[9] Peerzada Mosir Shah, Niharika Gupta. Study of Traffic flow Characteristics on the National Highway (NH-1) connecting Jalandhar-phagwara. International Journal of latest trends in Engineering and Technology. Part CV: Department of Civil Engineering. Vol.6, 4 March 2016.

[10] Pradnya Mawale, Raju Narwade. Traffic study and analysis of project road (SH-93) using pavement management system International Journal of current Engineering and Technology. Part CV: Department 0f Civil Engineering, Vol.7, No.1, Feb 2017.
[11] Rajat Sharma, O.P.Mittal."Riview paper on a detailed analysis on accident case study for NH-1, India" International Journal of Advance Research in Education and Technology. Part CV: Civil Department, Vol .3, April-June 2016
[12] Road Accident statistics, July August 2018.
[13] S. K.Khanna, C.E.G.Justo, A. Veeraragavan. Highway Engineering. Part CV: Professor of Civil, Highway Engineering. 1971.
[14] Surajo, Sandeep Kumar S."A survey on Analysis of factors related to Road Accidents using Data Mining Techniques" International Journal of engineering Development and Research. Part CV: Department of Computer Science and Engineering Vol.6, 2013.
[15] Sanjay Mitra, Kirti Saxena, "Road Accidents in India". 2015
[16] Sanjay Kumar Singh, Ashish Misra."Road Accidents Analysis: A case study of Patna City" Published in Urban Transport Journal. Part CV: Department of Humanities and Social Science. 2000,(PP:60-75)
[17] Y.S.Malik, "Road Accident in India". 2016
[18] Yong-gang Wang, Shen-Sen-Huang, Wen-Sen Xiang, Yu-long pei."Multipattern Road Traffic Crashes and Injuries: A case study of xi, an City". Vol 8, No 4. 2011.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY