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Quantification of Accidents and Suggested Improvements A Case Study of Nandyal Town in Andhra Pradesh

B.Sudharshan Reddy[1,*], M.S.Anantha Venkatesh[1], Clifford Dean[1] and G.Srinivasa Reddy[2]
[1]Department of Civil Engineering AVR & SVR College of Engineering and Technology, Nandyal.
[2]Department of Civil Engineering KSRM College of Engineering, Kadapa.

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ABSTRACT
The problem of accident is very acute in highway transportation, leading to loss of life and property. The various causes of road accidents are road users, vehicular defects, road condition, road design, environmental factors and other causes such as improper location of advertisement boards, improper location of level crossings not closed when required etc. Road accidents cannot be totally prevented, but by adopting suitable traffic engineering and management systems the accident rate can be reduced to a certain extent. Proper investigation of the cause of accident will help to propose preventive measures in terms of design and control. With this back ground in the present the detailed investigation on the quantification of accidents in Nandyal town, Andhra Pradesh has been carried out and suitable remedial measures has been suggested by conducting through filed investigations.

Introduction

Road accidents have been a source of major concern to every one as it causes loss of life, injuries and sufferings to the human being, besides involving huge economic loss to the country. The accidents and the fatalities on the roads are the results of inter play of a number of factors, such as fault of drivers; in adequate and improper traffic control devices; inadequate care in design, construction and maintenance of roads; inadequate knowledge about road safety; non observance of traffic rules; etc. Over one million fatalities are caused by the accidents every year across the globe .The road accidents cause economic loss equal to 1 to 2 percent of the Gross Domestic Product (GDP) of the nations. Considering the enormity and seriousness of the cause, most of the countries have drawn up plans and policies to reduce the fatalities. "Road accidents do not just happen but are caused" is a common cliché in the area of traffic safety. Thus, if accidents are caused by some agents, surely they could be identified and appropriate remedial measures could be developed and implemented for their prevention to the extent feasible for the reduction of the ill effects and trauma of the accidents. Analysis of the data on accidents in the country showed that drivers of the motor vehicle are the single major factor responsible for the accidents as they fail to perceive the situation ahead because of poor reflexes, fatigue, inexperience or being under the influence of toxicants. There are however, other factors, which contribute directly or indirectly to the road accidents are, road, vehicle, road user and environmental factors. In our country, an accident occurs at every 1.2 minute and a person is killed in every six minutes, this is to say that 235 persons die every day and 1243 persons get injured in road accidents. Nearly 60 percent of total accidents take place during nights though the night traffic is hardly 15 percent of 24 hours volume which means that the accidents in India during night times greater than the day traffic.

Study Area Description

The present study involves the data collection and analysis of eight busy stretches in the zone of Nandyal, Kurnool district of Andhra Pradesh. The first collector street is from Bommalasathram to Nunenepally which is of 2.47 km length consisting of no speed breakers and no horizontal curves. The second stretch is from chamakalva to railway station road which is of 1.29 km length comprising of 3 horizontal curves and 6 speed breakers. The third collector street is from railway station to saibaba nagar which is of 1.59 km length and comprising of 3 horizontal curves and 5 speed breakers the fourth stretch is from Bommalasathram to bus stand which is of 2.79 km length involving two horizontal curves and four speed breakers. The fifth one is from sreenivas centre to government hospital which is of 1.95 km length and comprising of 14 horizontal curves and 11 speed breakers. The sixth stretch is from Byrmal Street to bus stand which is of 0.62 km length with 6 horizontal curves and no speed breakers. The seventh stretch is from sreenivas centre to sanjeev nagar which is of 1.53 km length and it consists of 2 horizontal curves and 3 speed breakers. The Last collector street is from sreenivas centre to Gandhi chowk which is of 0.48 km length involving zero horizontal curves and 4 speed breakers.

Study Methodology

The methodology involves the collection of accident data, calculation of speed data, collection of population data, and collection of traffic data as presented below.

Step1 Collection of Accidental Data

Accident data of the selected roads is collected from the secondary sources for the past 7 years i.e., from 2008 to 2014. These data are collected from different police stations all around the Nandyal zone. The data includes number of

Tele: +91-9676076033
E-mail addresses: sudharshan2055@gmail.com

accidents occurring during the year, time of accident, vehicles involved, accused gender, place of accident and accused vehicle driver age etc.

Step 2

Calculation of Speed: For calculating the speed, a stretch of 50mts is selected such that there are no curves either horizontal curve or vertical curve and no speed breakers beyond 10mts from the selected stretch. Time is calculated by using stop watch, for every vehicle that crossed the selected 50mts stretch. The study is done in 12hrs of time. The speed is calculated for every 15 min of interval of time.

Step 3

Collection of the population growth: The population growth of Nandyal town is collected from the Mandal Revenue Office for the past two decades and it is observed that the population growth is increasing at a rate of 3 % every year.

Step 4

Collection of Vehicle growth: The vehicle growth is increasing rapidly these days and this data is collected from the road transportation authority, Nandyal.

Step 5 Calculation and computations: The collected data from the different sources is analyzed. General analysis include total number of fatal and non-fatal accidents year wise, time wise, etc

Detailed Analysis and Measures

Fatal and Nonfatal Accidents (I-Town Police Station)

Accidental data was collected from the three different police stations of Nandyal zone i.e., I-Town police station, II-Town Police station and III-Town police station. The data consists of accidents for total 8 collector streets from 2008 to 2014.The accident details include date of Occurrence, place of occurrence, time of accident, accused vehicle driver age, gender, number of fatal accidents and number of non fatal accidents. It was observed that the main stretches under I-Town police station are RTC bus stand, Atmakur bus stand, Sreenivas center and Byrmal streets. From the gathered data, it is noticed that there are more number of non fatal accidents at RTC bus stand, Atmakur bus stand and Sreenivas center as presented in the Table 1 and Figure 1

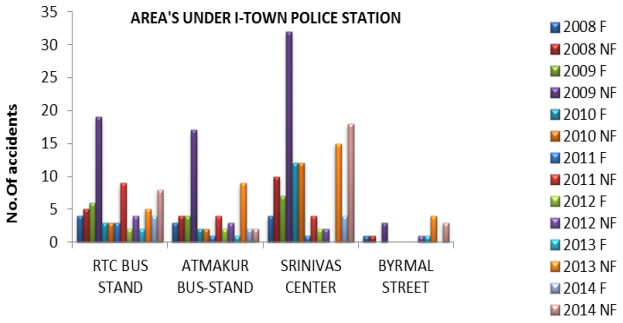

Figure1 Shows fatal and nonfatal accident (I-Town Police Station)

Remedial Measures

More number of non-fatal accidents are occurring at Srinivas center, RTC bus stand and Atmakur Bus stand. As these three are with high traffic it is recommended form the analysis and field investigation that there is a need to provide the traffic signal lights and sign boards. Further, keeping in view of the day by day growing of traffic the road widening is to be done to cater the needs of future traffic estimations.

Fatal and Nonfatal Accidents (II and III -Town Police Station)

The main areas under II-Town police stations are NGO's colony, Tekke, Municipal office and Government hospital. The detailed investigations were also done on these areas and accident data were collected and analyzed carefully. The results are presented in Table 2 and Figure 2 shows the graphical representation of the accident situations. The main areas under III-Town police stations are Bommalasathram, Noonepally, railway station Road and Devanagar. The results of the areas are presented in Table 3 and Figure 3 along with the remedial measures.

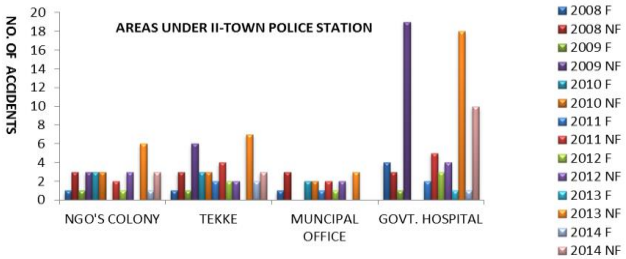

Figure 2. Shows fatal and nonfatal accident (II-Town Police Station)

Table 1. Fatal and Nonfatal Accident (I-Town Police Station)

Area's under I-town police station	2008		2009		2010		2011		2012		2013		2014	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
RTC Bus Stand	04	05	06	19	03	03	03	09	02	04	02	05	04	08
Atmakur Bus-Stand	03	04	04	17	02	02	01	04	02	03	01	09	02	02
Srinivas Center	04	10	07	32	12	12	01	04	02	02	00	15	04	18
Byrmal Street	01	01	00	03	00	00	00	00	00	01	01	04	00	03

Table 2. Fatal and Nonfatal Accident (II-Town Police Station)

Area's under II-town police station	2008		2009		2010		2011		2012		2013		2014	
	F	**NF**	**F**	**NF**	**F**	**NF**	**F**	**NF**	**F**	**NF**	**F**	**NF**	**F**	**NF**
NGO'S Colony	**01**	**03**	**01**	**3**	**03**	**03**	**00**	**02**	**01**	**03**	**00**	**06**	**01**	**3**
Tekke	**01**	**03**	**01**	**6**	**03**	**03**	**02**	**04**	**02**	**02**	**00**	**07**	**02**	**3**
Municipal Office	**01**	**03**	**00**	**0**	**02**	**02**	**01**	**02**	**01**	**02**	**00**	**03**	**00**	**0**
Govt. Hospital	**04**	**03**	**01**	**19**	**00**	**00**	**02**	**05**	**03**	**04**	**01**	**18**	**01**	**10**

Remedial Measures

More number of non-fatal accidents are occurring at the Government hospital. As this is a T- junction and as well as there are more schools near that area, we need to provide some of the traffic signal lights, sign boards in this area to reduce fatal and non-fatal accident rates.

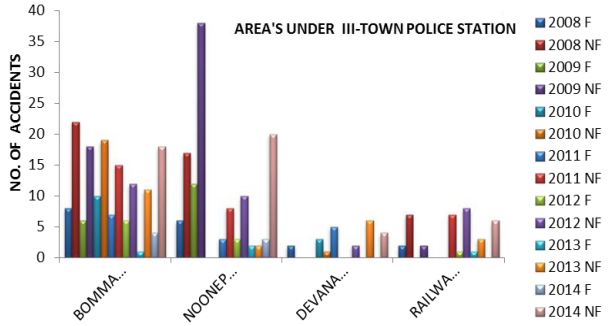

Figure 3. shows fatal and nonfatal accident (III-Town Police Station)

Remedial Measures

More number of fatal and non-fatal accidents are occurring at Bommalasatram and Noonepalli. As these two areas come under the National highway, the traffic is vast in these areas. The remedy to reduce the accidents in these two areas is to arrange some speed breakers at every 100mts of road and as well as to provide some sign boards and Traffic signal lights in these areas.

Analysis of factors affecting Accident in the study area

Traffic volume

Further, by analyzing the traffic volume data of the Nandyal zone it is revealed that there is 5 percent of two wheelers and 8 percent of three wheelers, 6 percent of four wheelers, 1 percent of busses and 8 percent of other vehicles is observed as presented in the Table 4.

Remedial Measures

As the vehicle distribution is increasing day by day, in the present trend we have to widen the roads according to the vehicle distribution, so that we can reduce some of the accidents that are occurring mainly due to the congestion of the roads.

Time of the Day

The time of occurrence of accidents is categorized in the hourly block indicating that the accidents are distributed throughout the day. It is noticed that 67percent of accidents occurred in the day time i.e. from 06:00 AM to 06:00 PM and 33percent of accidents occurred at night time i.e. from 06:00 PM to 06:00 AM. The accidents occurred in the area are presented in Table 5 below.

Table 3. Fatal and Nonfatal Accident (II-Town Police Station)

Area's under III-town police station	2008		2009		2010		2011		2012		2013		2014	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
Bommalasatram	08	22	06	18	10	19	07	15	06	12	01	11	04	18
Noonepalli	06	17	12	38	00	00	03	08	03	10	02	02	03	20
Devanagar	02	00	00	00	03	01	05	00	00	02	00	06	00	04
R.S Road	02	07	0	02	00	00	00	07	01	08	01	03	00	06

Table 4. Traffic Volume Data (Classified distribution data)

SL.NO	Class of Vehicles	No. of Vehicles						
		2008	2009	2010	2011	2012	2013	2014
1	Two Wheelers	7711	9391	11991	12751	13311	13815	18316
2	Three Wheelers	1171	1077	1145	967	872	1155	1573
3	Four Wheelers	810	678	1064	1085	1141	1230	913
4	Buses	81	72	86	116	138	104	79
5	Lorries	63	53	15	40	3	35	50
6	Tractor	875	651	930	1172	786	955	1443
7	Other Vehicles	1152	747	647	528	313	434	559
	Total	11863	12669	15878	16659	16564	17728	22933

Table 5.Accident data (Time of the day data)

Time of the day	No of accidents	Hour of the day	No of accidents
0:00- 1:00	4	12:00-13:00	29
01:00 - 2:00	6	13:00-14:00	20
2:00- 3:00	6	14:00-15:00	21
3:00-4:00	9	15:00-16:00	34
04:00 - 5:00	11	16:00-17:00	44
5:00-6:00	12	17:00-18:00	25
6:00-7:00	24	18:00-19:00	23
7:00-8:00	16	19:00-20:00	32
8:00-9:00	37	20:00-21:00	29
9:00-10:00	33	21:00-22:00	27
10:00-11:00	44	22:00:00- 23:00	7
11:00-12:00	21	23:00-24:00	5

Driver's age

More number of accidents has been reported by the drivers of the age group in between 30 to 40 and presented in below Table 6.

Table 6.Traffic Volume Data (Classified distribution data)

S.No	Driver's age	No.of accidents
1	0-10	0
2	10-20	14
3	20-30	142
4	30-40	145
5	40-50	91
6	50-60	56
7	60-70	23
8	>70	0

Remedial Measures: As more accidents have been reported by the drivers of a very young age group, as a remedial measure, the License issuing authority should get awareness in the people and also they must have a very keen observation while issuing the license to the drivers.

Population Growth

Nandyal zone population growth is increasing day by day. It is noticed that the population growth of 2008 is 13percent and it is increased to 16 percent by 2014 as presented in Table 7.

Table 7 Population data

Name of the town	Population Growth						
	2008	2009	2010	2011	2012	2013	2014
Nandyal	184,316	189,316	193,898	200,516	206,531	212,546	218,561

Remedial measures

As reduction of population growth rate is a complicated issue and can't be done in a single instance, we can reduce the accidents by widening the roads according to the growth of population for every year.

Type of vehicle involved in the accidents

The type of the accused vehicles involved in the accidents are mostly three wheelers and two wheelers as presented in Table8.

Table 8. Vehicle data

S.No	Vehicle type	Accused vehicle
1	2W	460
2	3W	494
3	LORRY	100
4	CAR	159
5	BUS	50
6	Pedestrians	280

Genders involved in the accidents

Studies have been carried out regarding the involvement of gender in the accidents in Nandyal zone are presented in Table 9.

Table 9. Genders involved in the accidents

Year	No.of accidents	Male	Female
2008	**115**	**105**	**0**
2009	**195**	**96**	**0**
2010	**86**	**74**	**0**
2011	**86**	**74**	**0**
2012	**89**	**79**	**0**
2013	**109**	**83**	**0**
2014	**116**	**89**	**0**

Speed of selected stretches

From the collected data it is noticed that, 30% of vehicles are moving with a speed of 10 to 20 KM per hour and 25% of vehicles are moving with a speed of 20 to 30 km per hour as presented in Table 10.

Table 10. Speed data

S.No	Speed	Vehicles
1	0-10KM/HR	20
2	10-20 KM/HR	121
3	20-30KM/HR	111
4	30-40KM/HR	67
5	40-50KMHR	64
6	50-60KM/HR	18
7	80-90KM/HR	01

Remedial measures

Speed is the most important criteria in causing road accidents. As a remedial measure speed limit boards are to be placed on the sides of the roads. If anyone crosses the speed limit the traffic authority should impose huge fines and the concerned authority should also create awareness among the people.

Conclusion

It is concluded that the Speed and weather are the most important factor in causing accidents in study area. In order to reduce the accidents due to the weather in winter we have to use most advanced systems in weather forecasting and monitoring along with staff education and improved procedures in expected to improve the winter traffic safety. Further, it is revealed from the data that 74.16 percent of the non-fatal accidents have occurred for the past seven years. These accidents are just occurred due the less width of road and worst geometric features so, in order to reduce these non-fatal accidents the road should be widen and the road should be laid with well conditions.

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