ISSN - Print: 2277 – 1522; Online: 2277 – 3517

ORIGINAL RESEARCH ARTICLE

DOI: 10.26727/NJRCM.2018.7.1.52-55 Year: 2018 Vol: 7 Issue: 1. Jan.-Mar. Page: 52-55

# Influence of environmental factors on road traffic accidents: Hospital based cross sectional study at Tirupati

**Bayapa Reddy N[1], Shakeer Kahn P[2*], Surendra babu D[2], Khadervali N[1], Chandrasekhar C[2], Sravana Deepthi C[2]**

**1-Associate Professor, Department of Community Medicine, Apollo institute of Medical Sciences and research, Chittoor, Andhra Pradesh. 2-Assistant Professor, Department of Community Medicine, Apollo institute of Medical Sciences and research, Chittoor, Andhra Pradesh, India**

| | | | |
|---|---|---|---|
| **Date of Submission** | **: 28-12-2017** | **Date of online Publication** | **: 07-02-2018** |
| **Date of Acceptance** | **: 30-01-2018** | **Date of Print Publication** | **: 31-03-2018** |

***Author for correspondence**: Dr P.Shakeer Kahn, Assistant Professor, Department of Community Medicine, Apollo institute of Medical Sciences and research, Murakambattu, Chittoor-517127 .Andhra Pradesh, India. Email ID-khansvmc@gmail.com

## Abstract

**Introduction:** Globalization with simultaneous motorization and population surge has led to rise in the number of road related accidents, injuries and fatalities. Vulnerable environmental conditions play a significant role in the escalating toll of Road Traffic Accidents. The objectives of this study are to know the road related factors and climatic conditions during RTA, and determine the association of environmental factors with type of injury. **Methodology:** A hospital based, cross sectional study with victims of road traffic accidents admitted in S.V.R.R. Government General Hospital, Tirupati, as study subjects was done. Study was conducted between during June 2013 to May 2014 for one year. A total of 820 victims of road traffic accidents were interviewed after taking prior consent using a predesigned questionnaire. **Results:** Most of the road traffic accidents have occurred 'within village' and near turnings of the road. Majority of the victims was familiar with the road where RTA happened and adequate lighting was reported in approximately half of the cases. Weather was mostly hot & dry in majority of cases. Grievous type of injury was more in case of road traffic accidents taking place at national highways. **Conclusion and recommendations:** RTAs on national highways has recorded most of the grievous injuries, hence speed limit sign boards and speed detector sensors places is needed as required on these roads. Junction points are one of the vulnerable sites of RTAs, which makes proper signaling systems and traffic police supervision at specific areas mandatory. There is a need to improve the quality of roads and establishment of surveillance mechanism for proper feedback to prevent the occurrence of RTAs.

**Key-words:** Road Traffic Accident, National Highway, Environmental factors, Grievous injury

## INTRODUCTION

Nearly 1.24 million people die every year on the roads and another 20 to 50 million sustain nonfatal injuries as a result of road traffic accidents across the world.[1] Road crashes deserve to be a strategic issue for any country's public health and can lead to overall growth crisis, if not addressed properly.[2] Light in the scene of crash, weather condition, roadway geometrics and road surface were reported to be the important contributors to traffic crash injuries and deaths in Iran.[3] Residing of the family in the same area for many years and longer length of the school day were protective factors in preventing road traffic injuries.[4] Appropriate road engineering with prompt road signs and speed limits would be useful. There should be regular road maintenance to eliminate potholes.[5] Road traffic accidents drags the least attention from health administrators and subsequent allocation of funds.[6] In general roads that are planned and made are of substandard level, laid down without due attention, and with minimal supervision.[7]

**Objectives:**

To know the road related factors during road traffic accidents in and around Tirupati

To study the climatic conditions at the time of RTA

To determine the association of environmental factors with type of injury

## METHODOLOGY

A hospital based, cross sectional study with victims of road traffic accidents admitted in Tertiary care. Government General Hospital, Tirupati, as study subjects was done. All road traffic accident cases admitted for at least more than

24 hours were included into the study. Exclusion criteria include victims of road traffic accidents admitted for less than 24 hours, Cases treated on outpatient basis and not admitted into hospital, Victims who were immediately referred to higher centre, In case of unconscious patient & if the family members are not willing to participate, Cases not willing to participate in the study. Study was conducted at departments of Emergency, Surgery, Orthopaedic and Neurosurgery at S.V.R.R. Government General Hospital, Tirupati for a period of one year from June 2013 to May 2014 after obtaining approval from institutional ethical committee.

A pilot study was conducted for a period of one month during May 2013 by using a pre-designed Proforma and necessary corrections were made. A total of 820 cases of road traffic accidents reported to the Emergency, Surgery, Orthopaedic and Neurosurgery units of S.V.R.R. Government General Hospital at Tirupati were interviewed after taking prior consent using a predesigned questionnaire. Data was collected by the interviewer in convenient time during day time(9:00AM to 4:00PM) and regularly between 4:00PM to 8:00PM. In case if patient is not in a situation to respond, information was collected from family members, relatives, or friends. Data was entered into MS excel and analyzed using Epi-infoTM 7.1.3.10 version software and appropriate statistical tests of significance were employed like Chi-Square test for significance of difference in proportions.

## RESULTS

The place of road traffic accident was found to be 'within village' in majority of cases (43.8%) followed by State high way (34.0%). The site of road traffic accident was found to be near 'turnings of the road' in majority of cases (57.7%) [Table 1].

**Table 1: Distribution of cases based on place of road traffic accident (N=820)**

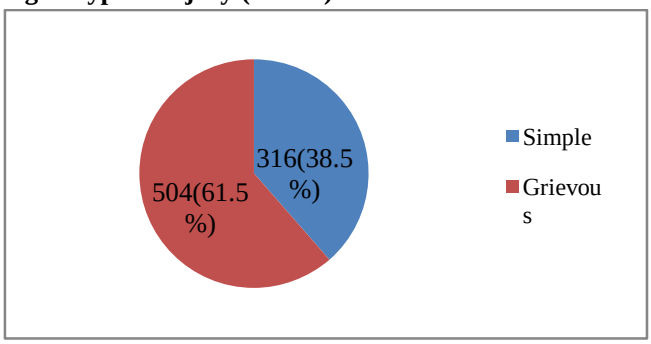
| S.No | Variable | Yes | Percent. |
|---|---|---|---|
| **1** | **Place of accident** | | |
| (a) | Within village | 359 | 43.8 |
| (b) | State highway | 279 | 34 |
| (c) | Within city | 151 | 18.4 |
| (d) | National Highway | 31 | 3.8 |
| **2** | **Site of accident** | | |
| (a) | Turning | 473 | 57.7 |
| (b) | Straight road | 174 | 21.2 |
| (c) | Junction | 173 | 21.2 |
| **3** | **Road condition** | | |
| (a) | Normal road | 372 | 45.4 |
| (b) | Damaged road | 155 | 18.9 |
| (c) | Dividers | 115 | 14 |
| (d) | Wet slippery road | 95 | 11.6 |
| (e) | Speed breakers | 83 | 10.1 |
| **4** | **Make of the road** | | |
| (a) | Paved | 761 | 92.8 |
| (b) | Unpaved | 59 | 7.2 |

Majority (83.5%) of the victims were familiar with the roads where RTA occurred and adequate lighting was reported in 47.7% cases. Overcrowding of the road at the time of accident was reported by 17.2% victims. Weather was mostly hot & dry in majority of cases (80.8%) [Table 2].

**Table 2: Distribution of various conditions at the time of accidents (N=820)**

| S.No | Variable | Number of subjects | Percent. |
|---|---|---|---|
| 1 | **Road overcrowded** | | |
| (a) | Yes | 141 | 17.2 |
| (b) | No | 679 | 82.5 |
| 2 | **Road familiar** | | |
| (a) | Yes | 685 | 83.5 |
| (b) | No | 135 | 16.5 |
| 3 | **Adequate lighting** | | |
| (a) | Yes | 391 | 47.7 |
| (b) | No | 429 | 52.3 |
| 4 | **Weather at time of accident** | | |
| (a) | Hot & dry | 663 | 80.8 |
| (b) | Rainy | 100 | 12.2 |
| (c) | Cold | 57 | 7 |

**Fig-1:Type of injury (N=820)**




Grievous type of injury was more in case of road traffic accidents taking place at national highways (77.4%)[Figure 1]. Further there is a statistical significant difference in proportions between the place of accident and type of injury. Majority (65.9%) of the injuries happened at junctions were of grievous in nature [Table 3]. In roads without overcrowding, it was found that majority (63.0%) of the road accidents involve grievous injury [Table 4].

Among RTAs occurred in adequate lighting, 63.4% had sustained grievous type of injury while it was 59.7% in 429 RTAs occurred in inadequate lighting.

## DISCUSSION

The proportion of grievous injury was more in case of road traffic accidents occurring at national highways (77.4%) followed by within city roads (65.6%) and the differences were found to be statistically significant (P=0.01, S). National highways accounts for only 15% of the total length of roads in India but account for 33% of the

**Table 3:Type of injury according to various road related factors (N=820)**

| S No | Variable | Simple injury (%) | Grievous injury (%) | Total (%) | P value |
|---|---|---|---|---|---|
| 1 | **Type of road** | | | | $\chi^2$ =10.75; df=3; **P=0.01 S** |
| | Within village | 72 (47.7) | 79 (52.3) | 151 (100.0) | |
| | State highway | 141 (39.3) | 218 (60.7) | 359 (100.0) | |
| | Within city | 96 (34.4) | 183 (65.6) | 279 (100.0) | |
| | National Highway | 7 (22.6) | 24 (77.4) | 31 (100.0) | |
| 2 | **Site of accident** | | | | $\chi^2$ =1.81; df=2; P=0.40 NS |
| | Turning | 188 (39.7) | 285 (60.3) | 473 (100.0) | |
| | Straight road | 69 (39.7) | 105 (60.3) | 174 (100.0) | |
| | Junction | 59 (34.1) | 114 (65.9) | 173 (100.0) | |
| 3 | **Place of accident** | | | | $\chi^2$ =16.51; df=4; **P=0.002 S** |
| | Normal road | 132 (35.5) | 240 (64.5) | 372 (100.0) | |
| | Damaged road | 80 (51.6) | 75 (48.4) | 155 (100.0) | |
| | Dividers | 36 (31.3) | 79 (68.7) | 115 (100.0) | |
| | Wet slippery road | 40 (42.1) | 55 (57.9)) | 95 (100.0) | |
| | Speed breakers | 28 (33.7) | 55 (66.3) | 83 (100.0) | |
| 4 | **Make of the road** | | | | $\chi^2$ =9.78; df=1; **P=0.002 S** |
| | Paved | 282 (37.1) | 479 (62.9) | 761 (100.0) | |
| | Unpaved | 34 (57.6) | 25 (42.4) | 59 (100.0) | |

***If P<0.05,it is Significant(S) and if P>0.05,it is Non significant(NS)***

**Table 4: Type of injury according to environmental conditions (N=820)**

| S No | Variable | Simple injury (%) | Grievous injury (%) | Total (%) | P value |
|---|---|---|---|---|---|
| 1 | **Road overcrowded** | | | | |
| | Yes | 65 (46.1) | 76 (53.9) | 141 (100.0) | $\chi$2 =4.11; df=1; **P=0.04 S** |
| | No | 251 (37.0) | 428 (63.0) | 679 (100.0) | |
| 2 | **Adequate lighting** | | | | |
| | Yes | 143(36.6) | 248(63.4) | 391(100.0) | $\chi$2 =1.21; df=1; P=0.27 NS |
| | No | 173(40.3) | 256(59.7) | 429(100.0) | |
| 3 | **Weather** | | | | |
| | Hot & dry | 261(39.4) | 402(60.6) | 663(100.0) | $\chi$2 =10.36; df=2; **P=0.006 S** |
| | Rainy | 44(44.0) | 56(56.0) | 100(100.0) | |
| | Cold | 11(19.3) | 46(80.7) | 57(100.0) | |

fatalities. This could be due to increased proportion of passenger and freight traffic in national highways.[8]

Regarding site of road accidents 21.2 of the RTAs occurred at junctions, where as about 49 of total accidents took place on the junctions itself during the calendar year 2015 as against 57 during 2014.[8] Majority (65.9) of the injuries happened at junctions were of grievous in nature. Different types of vehicles approach at varying speeds near junctions. In addition pedestrians crossing at junctions are more vulnerable to RTAs. Speed breakers accounted for 10.1 of the total road accidents in this study while it was 2.2 as per Ministry of road transport and highways, India during 2015.[8] Nearly 12 of the RTAs happened during rainy season in this study while it was 60.7 in a study at Karimnagar.[9] Further in same study,[9] bright light favoured for 78.1 of accidents and this could be due to damage of roads by rains and density of traffic in day light respectively. Out of 820 victims, 68.7 and 66.3 of injuries are of grievous type, when road accidents occurred at dividers and speed breakers respectively. Further the differences in the proportions between type of injury and place of RTA was found to be statistically significant (P=0.002; S).

Make of the road was mostly paved (92.8) in this study, while in a study conducted at Rwanda, 95.6 of road conditions at crashes were paved.[10] Severity of injury sustained is more when the victims hit and/or fall over the hard surface of divider. Sometimes fast moving vehicles cannot be able to slow down at speed breakers as required and land into tragic RTAs. Among 92.8 of RTAs happened on paved roads, 62.9 had experienced grievous injury. Further the differences in proportions between make of road and type of injury was found to be statistically significant (P=0.002; S). As most of the roads are paved, they have a major share in road accidents. In addition harder surface of paved roads increases the severity of injury. Toll of RTAs can be reduced significantly with the active participation of civil engineers in road designing and involvement in accident investigation.[7]

In the present study, it was found that when the road was not overcrowded, majority (63.0) of the injuries were grievous type. Further the differences in proportions between type of injury and overcrowding was statistically significant (P=0.04 S). Most (80.7) of the victims driving in cold had suffered grievous type of injury followed by hot & dry and rainy season. There is a statistical significant difference between weather and type of injury sustained. Whereas in a study done at Karimnagar, majority of the victims had suffered major injury in rainy season[9] and in another study more than half of the RTAs occurred during winter season.[11] Bad weather conditions and defective roads were found to be some of the environmental risk factors for RTAs in North eastern India.[12]

**Conclusion and recommendations:**

Villages share major troll of road traffic accidents, probably due to poor maintenance and poor conditions of the roads. Further lack of road safety awareness among the residents may have a concern. Installation of speed limit sign boards at required places along with speed detector sensors for speed regulation is recommended to prevent over speeding. Most of the injuries among the RTAs occurred on the roads without overcrowding were grievous in nature,

substantiating the fact that vehicles travel fast on the roads with less traffic and may turn up into major road traffic accidents. Junction points are vulnerable sites for RTAs, hence proper signaling systems and traffic police supervision should be made mandatory at such sites. Construction of roads with acceptable standards and regular monitoring and maintenance of the roads by qualified civil engineering team will cut down the burden of RTAs. Establishment of integrated surveillance mechanisms for generating information regarding road traffic injury burden and their risk factors will help in developing guidelines to modify existing policies or for framing a new road safety policy involving various authorities.

## REFERENCES


1. Global status report on road safety 2013: supporting a decade of action. World Health Organization 2013.Available at http://www.who.int/violence_injury_prevention/road_safety_status/2013/en/. Last assessed on 25th July 2015
2. Mondal P, Kumar K, Bhangale UD, Tyagi UD. A Silent Tsunami on Indian Road: A Comprehensive Analysis of Epidemiological Aspects of Road Traffic Accidents. British Journal of Medicine & Medical Research. 2011;1(1):14-23.
3. Lankarani KB, Heydari ST, Aghabeigi MR, Moafian G, Hoseinzadeh A, Vossoughi M. The impact of environmental factors on traffic accidents in Iran. J Inj Violence Res 2014 Jul;6(2):64-71
4. Donroe J, Tincopa M, Gilman RH, Brugge D, Moore DA. Pedestrian road traffic injuries in urban Peruvian children and adolescents: case control analyses of personal and environmental risk factors. PloS One. 2008 Sep 10;3(9):e3166
5. Oladapo Adeoye P et al. Host, vehicular and environmental factors responsible for road traffic crashes in a nigerian city: identifiable issues for road traffic injury control. Pan African Medical Journal. 2014; 19:159. Available online at: http://www.panafrican-med-journal.com/content/article/19/159/full/
6. Rastogi D, Meena S, Sharma V, Kumar Singh G. Epidemiology of patients admitted to a major trauma centre in northern India. Chinese Journal of Traumatology 2014;17(2):103-7
7. Sharma SM. Road Traffic Accidents in India. Int J Adv Integ Med Sci 2016;1(2):57-64.
8. Road accidents in India-2015, Government of India, Ministry of Road transport and highways transport research wing, New Delhi. Available at: http://pibphoto.nic.in/documents/rlink/2016/jun/p20166905.pdf. Last assessed on 25th October 2016
9. Srinivasa Kumar PV , Srinivasan K. A study on environmental factors influencing road traffic accident victims in district hospital, karimnagar. International Journal of Research in Health Sciences. (Supplement) July –Sept 2013; 1(2):80-3
10. Patel et al. The epidemiology of road traffic injury hotspots in Kigali, Rwanda from police data.BMC Public Health (2016) 16:697
11. Shruthi P, Venkatesh VT, Viswakanth B, Ramesh C, Sujatha PL, Dominic IR. Analysis of Fatal Road Traffic Accidents in a Metropolitan City of South India. J Indian Acad Forensic Med. 2013; 35(4):317-20.
12. Joshi AK, Joshi C, Singh M, Singh V. Road traffic accidents in hilly regions of northern India: What has to be done? World Journal of Emergency Medicine. 2014;5(2):112-5


**Conflict of Interest:** **None**

**Source of funding support:** Nil

**How to cite this article:** Bayapa Reddy N, Shakeer Kahn P, Surendra babu D, Khadervali N, Chandrasekhar C, Sravana Deepthi C. Influence of environmental factors on road traffic accidents: Hospital based cross sectional studyat Tirupati. Nat J Res Community Med 2018;7(1):52-55.



**NJRCM:** www.commedjournal.in