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## Original Article

# Analysis of risk factors contributing to road traffic accidents in a tertiary care hospital. A hospital based cross-sectional study

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## ABSTRACT

**Purpose:** Road traffic accidents (RTAs) are a public health issue and cost a lot to individuals, families, communities and nations. Trauma care systems in India are at a nascent stage of development. There is gross disparity between trauma services available in various parts of the country. Rural area in India has inefficient services for trauma care, due to the varied topography, financial constraints, and lack of appropriate health infrastructure. The present study is to study the trends of occurrence of RTA cases by month, week and time of accident occurrence as well as to research the types of vehicle involved in accidents and other various risk factors related to them.

**Methods:** During 1st January 2017 to 31st December 2017, a hospital-based and cross-sectional study of RTA victims was conducted. The patients were admitted in emergency department of Uttar Pradesh University of Medical Sciences, Saifai, Etawah, when stabilized, they were shifted to the orthopaedics and surgery ward.

**Results:** In the study, 654 road accident victims were included, of which the majority were males (77.5%) and the most of them belonged to rural (67%). RTA victims according to the month of occurrence majority were found in January (12.5%) and evening was time of a day with maximum accidents (32.1%). Mortality cases of RTA victims based on type of road user and it shows decreasing trend of mortality of motorcyclists (54.2%) followed by pedestrian (25.1%).

**Conclusion:** There should be control over people driving vehicles under the influence of alcohol and drivers over-speeding and rash driving on urban roads as well as rural village roads.

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## Introduction

In 1956 World Health Organization (WHO) advisory group defined an accident as an “un-premediated event resulting in recognizable damage”.<sup>1</sup> According to another definition an accident is that “occurrence in a sequence of events which usually produces unintended injury, death or property damage”.<sup>2</sup> Half of these dying on the world's road are “vulnerable road users” like pedestrians, cyclists and motorcyclists. Therefore, without action road traffic crashes are predicted to rise and become the 7th leading cause of death by 2030.<sup>3</sup> The newly adopted sustainable developmental goal 11.2 targets to provide access to safe, affordable, accessible and sustainable transport systems for all by 2030.<sup>4</sup>

According to the WHO, road traffic injuries are the sixth leading cause of death in India with a greater share of hospitalization deaths, disabilities and socio-economic losses in the young and middle-aged population.<sup>5</sup> Rural areas are more prone to road traffic accidents, accounting for 53.8% of total road accidents during 2015. The percentage of road accident fatalities (61.0%) and injuries (59.1%) were also more in rural areas as compared to the urban areas in the country.<sup>5</sup> We studied the trends of occurrence of road traffic accident (RTA) cases by month, days of week and time of accident occurrence and also to study the types of vehicle involved in accidents and other various risk factors related to them.

## Methods

It is a hospital-based and cross-sectional study between 1st January 2017 and 31st December 2017, of victims of RTAs who were admitted in emergency department of a tertiary care hospital at first, and then transferred to orthopaedics and surgery

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ward after stabilized. The present study excludes patients of the outpatient department. The victims were interviewed bedside. In cases where the condition of victims doesn't warrant giving an interview, their relatives or attendants were interviewed. Records of the cases that died on admission or a few hours later before being shifted to the ward were taken from their respective case sheet on the same day. Also, the records of patients absconded were taken from the medical records. For the treatment outcome patient was followed up during his stay in the hospital. A pre-designed pretested semi-structured questionnaire was filled by the interviewer. Prior to the interview, informed consent was taken from each participant and confidentiality of the information collected was ensured. Data was entered in Microsoft Excel sheet and exported and analyzed using statistical package of social sciences version 24.0 (IBM Inc. Chicago, USA) software. The study area was emergency department, orthopaedic ward, surgery ward, neurosurgery ward of Uttar Pradesh University of Medical Sciences, Saifai, Etawah. Z-test was applied to look for the sex-wise difference in proportion in various age groups. The inclusion criteria were the injury involving people driving a vehicle or a pedestrian hit by a moving vehicle. And the exclusion criteria were the injury involving a stationary vehicle (e.g. people injured by loading or washing a vehicle) and the road injury with no involvement of a vehicle in the accident, such as people fall and slip on the road from the vehicle and sustain injury.

## Results

There were 654 victims, of which 77.5% were male in the study (Table 1). About two third of the study subjects belong to rural area. In the male group, victims aged 16–30 years constituted about 39.4%. The major proportion in the RTA victims was formed by victims aged 16–45 years (65.1%). The sex-wise difference in proportion in various age groups was significant in 16–30 years, 31–45 years and >60 years groups (Table 2). The majority of the RTA victims were motorcyclist (55.4%) followed by pedestrian (21.9%) among male group. Similar findings were seen among female

**Table 1**  
Demographic profile of RTA victims. (n = 654).

Demographic variable	n (%)
Gender	
Male	507 (77.5)
Female	147 (22.5)
Locale	
Rural	438 (67)
Urban	216 (33)
Religion	
Hindu	595 (91)
Muslims	46 (7)
Sikh	13 (2)
Education	
Illiterate	144 (22.2)
Literate	47 (7.0)
Primary school	90 (13.8)
Junior high school	112 (17.1)
High school	118 (18.0)
Intermediate	72 (11.0)
Graduate	60 (9.2)
Post-graduate and above	11 (1.7)
Socio-economic status	
Upper class	31 (4.7)
Upper-middle class	111 (17)
Middle class	161 (24.6)
Lower-middle class	230 (35.2)
Lower class	121 (18.5)

group, where the majority of RTA victims were motorcyclist (53.7%) followed by pedestrian (22.4%) (Table 3).

The frequency of occurrence of accidents was nearly evenly distributed throughout the year. Maximum number of accidents occur during the month of January (12.5%) and minimum in the month of October (6.0%) (Fig. 1). On analyzing time distribution of trend of accidents, it was observed that the maximum number of accidents occurred during 04:00–08:00 pm (Fig. 2). Distribution of occurrence of RTAs in accordance with days in a week was shown in Fig. 3, the highest value of which was in Monday. Fig. 4 showed that maximum number of accidents occurred during the monsoon season (33.0%). Highest number of accidents occurred on national highways (35.0%). The proportions of accidents on the village and district road were 28.7% and 23.1% respectively (Fig. 5).

## Discussion

Critical analysis of different crash parameter merits itself as a necessary study from public health point of view. Analysis of the season and pattern of months, Taravarmansh et al.<sup>6</sup> have described that in summer the traffic accidents were of the highest frequencies (1346 cases, 27.5%) due to different geographical distribution in Iran and more unsettled climates in summer. However, it is different from our study where majority of accidents occur in monsoon season due to slippery roads and water logging in road pits. In research of Mehta et al.,<sup>7</sup> the highest number of accidents occurred on Fridays (28%) and Sundays (18%) respectively. Also, Urfi et al.<sup>8</sup> showed that the highest number of accidents were reported on Friday. It is different from our study which might be that on Friday the majority of user was students. At 4:00–7:59 pm each day, the accidents occurred more frequently, which was the same with our study. Chaurasia et al.<sup>9</sup> studied about the types of vehicles, of which motorized two-wheeler accounted for 46.78% of the accidents. Out of total accident victims, 45% were drivers and riders which are in accordance to our study. Similar results were reported by Mehta et al.,<sup>7</sup> Jaiswal et al.,<sup>11</sup> Kahn et al.<sup>12</sup> and the high proportion were of motorized vehicle driver (66.00%), (44.44%) and (28.78%) respectively. While in the research of Pathak et al.,<sup>10</sup> 67% of patients were driving vehicles when accidents happened. The data is slightly more than our study in rural area because majority of people were pedestrian as maximum accidents occurred on village roads in our study.

**Table 2**  
Distribution of RTA victims according to their age and gender, n (%).

Age group (year)	Male	Female	Total	Z value	p value
<15	38 (7.5)	19 (12.9)	57 (8.7)	0.00	>0.9999
16–30	200 (39.4)	32 (21.8)	232 (35.5)	9.617	<0.001
31–45	147 (29.0)	47 (32.0)	194 (29.7)	4.371	0.002
46–60	85 (16.8)	36 (24.5)	121 (18.5)	1.41	0.1585
>60	37 (7.3)	13 (8.8)	50 (7.6)	1.808	0.05
Total	507 (100.0)	147 (100.0)	654 (100.0)	9.389	<0.001

**Table 3**  
Sex-wise distribution of road traffic victims based on type of road user, n (%).

Type of road user	Male	Female	Total	Z value	p value
Pedestrian	111 (21.9)	33 (22.4)	144 (22.0)	4.271	0.002
Pedal cyclist	42 (8.3)	13 (8.8)	55 (8.4)	2.469	0.01
Motor cyclist	281 (55.4)	79 (53.8)	360 (55.0)	7.338	<0.001
Three-wheeler driver	36 (7.1)	12 (8.2)	48 (7.3)	2	0.04
Car driver	17 (3.4)	6 (4.1)	23 (3.5)	1.213	0.22
Pick-up van driver	6 (1.2)	1 (0.7)	7 (1.1)	1.633	0.10
Heavy transport vehicle	13 (2.6)	1 (0.7)	14 (2.1)	3.051	0.002
Bus driver/occupant	1 (0.2)	2 (1.4)	3 (0.5)	1.8378	0.06
Total	507 (100.0)	147 (100.0)	654 (100.0)	9.389	<0.001

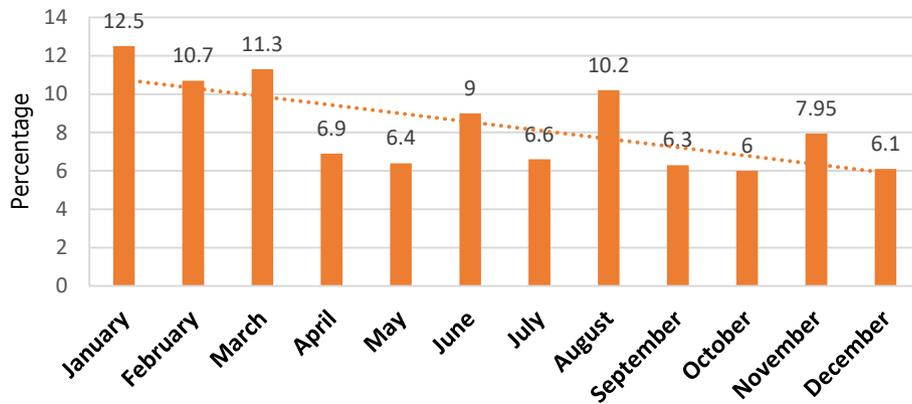


Fig. 1. Distribution of road traffic accident cases according to month of occurrence.

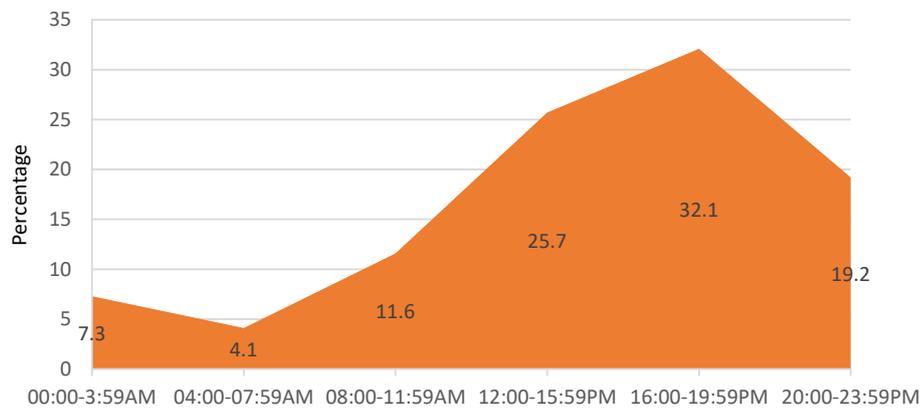


Fig. 2. Time-wise distribution of road traffic accident victims.

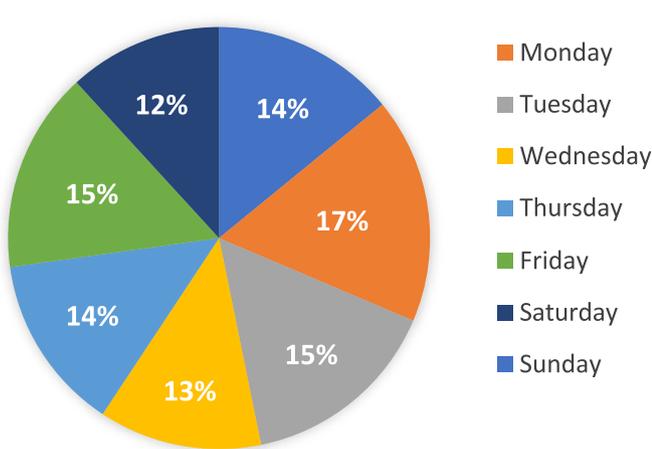


Fig. 3. Distribution of occurrence of road traffic accidents in accordance with days of a week.

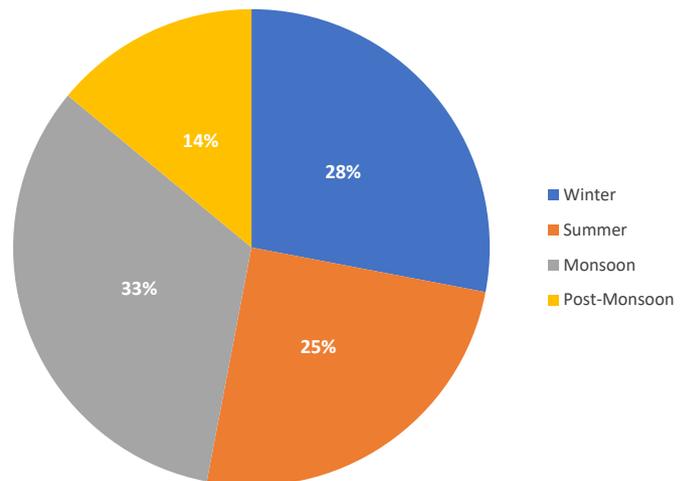
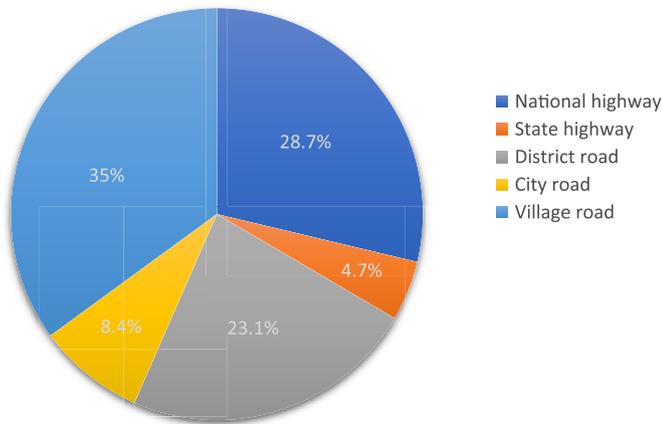


Fig. 4. Distribution of occurrence of road traffic injury according to the seasons.

In our study only 66 (10.1%) of victims were under the effect of alcohol in the accident and only 144 (22%) victims wore any protective gear either helmet on motor-cycle or seat belt in car or any other four wheelers. There were 374 (57.2%) victims who know about traffic rules and 304 (46.5%) victims who followed the traffic rules. In our study 14% of drivers have consumed alcohol prior to

the accident, which is similar to the study of Mehta et al.<sup>7</sup> According to the research of Roy et al.<sup>13</sup> only 33% people wore helmet or seat belts, which is slightly more than in our study. It might be due to the strict law enforcement in Greater Noida and the policeman executing 45.1% of cases. The relationship between the age and wearing helmet or seat belt was found to be statistically significant.



**Fig. 5.** Distribution of road traffic injury cases based on places of occurrence of road traffic accident.

Patel et al.<sup>14</sup> reported the highest numbers of fatal accidents (40%) recorded is in national highway. Mehta et al.<sup>7</sup> reported that in a rural tertiary hospital, most of road accident victims were on village roads, which is similar to our study.

According to season-wise distribution, majority of road accidents happened in monsoon season (33.1%) because of damaged roads, water logging, deep pits and slippery roads, which increase the occurrence of accident in high-speed. It is followed by in winter due to the fog, especially in the evening, like 4:00–8:00 pm. In our study, most accidents occurred on village roads, and 42.2% of them were brought to our tertiary care hospital by government ambulance. Here most victims were motorcyclists (55.04%) and young people (16–30 years, 35.5%). Only 22% of the victims wore protective gadget, but did not follow traffic rules.

The study showed the importance to accelerate the construction of infrastructure, such as the proper installation of street lights, repair of roads, placement of traffic signs, division of motor vehicle lanes and sidewalks. Traffic police and law enforcement personal should be during evening hours of the day. Some activities related to road safety awareness, helmet use, speed limits, traffic violations and alcohol abstinence should be implemented. In every district, driving school should be established and the driver only can get the licence after strict inspection. In rural area of central Uttar Pradesh, it might be an important contributor of the low death rates to supply adequate medical emergency facilities and prompt care at the site of accidents during the golden period.

## Funding

Nil.

## Ethical Statement

Ethical clearance was obtained from the institutional ethics committee of the hospital before the start of the study. Written informed consent was obtained from each patient before the conduct of the study.

## Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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