

Epidemiology of Road Traffic Accidents in Western Uttar Pradesh, India: A Hospital Based Study

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Authors' contributions

Author Urfi designed the study, performed the data acquisition, data analysis, statistical analysis, wrote the protocol, wrote the first draft of the manuscript and manuscript review. Authors MHK and SK managed the analyses of the study, manuscript editing and review. All authors read and approved the final manuscript.

Original Research Article

Received 10th May 2013
Accepted 9th September 2013
Published 19th October 2013

ABSTRACT

Objective: i. To study the socio-demographic profile of patients of Road traffic accidents (RTAs) with head injury, ii. To assess the variation in Road traffic accidents (RTAs) with head injury with month of year, day of week and time.

Study Design: A hospital based cross-sectional study.

Setting: Casualty and neurosurgery ward, JNMCH, AMU, Aligarh.

Study Unit: All patients of RTAs with head injury in age-group 15-45 years who have registered themselves in casualty.

Sampling Design: Purposive sampling.

Study Period: One year from August 2010 to July 2011.

Statistical Analysis: Data analysed with SPSS 17.0

Results: Maximum number of patients belonged to 15-24 years of age-group. Majority of patients were males (81.2%) and only few were females (18.8%). Higher number of patients belonged to rural areas (59.8%). Majority of the patients were literate. 30.2% of the

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patients were unemployed. Maximum risk of RTA was found in upper-lower class (55.1%) i.e. class IV. Maximum cases of RTAs occurred in July, August and September which corresponds to rainy season. Highest number of accidents occurred on Friday. Accidents were equally distributed over other days with no statistical difference with regard to day of week. No significant variability was observed between weekdays and weekends. Most accidents occurred either between 4.00 -7.59 p.m. or between 8.00-11.59 p.m. and a continuous rise in number of accidents with time of day was noticed starting from morning and progressing upto night with peaking at 4.00-7.59 p.m.

Conclusion: Young males are at increased risk of RTAs. Increase in level of education provides no immunity to accidents. There is considerable increase in RTAs leading to head injury during rainy season. No significant day to day variation noticed. A definite rise in RTAs with time is seen and needs further research.

Keywords: Road traffic accident; head injury; hospital based study.

1. INTRODUCTION

Transportation is increasingly associated with the rise in road accidents and premature deaths, as well as physical and psychological handicaps [1]. The International Red Cross has characterized the last 100 years as “the century of road death”. The first pedestrian death was noted in 1896 and the first driver died in crash in 1898 [2].

RTAs were the 10th leading cause of death worldwide and accounted for 2.1% of all deaths globally. Furthermore, these road traffic deaths accounted for 23% of all injury deaths worldwide. Worldwide, about 1.2 million persons are killed in road traffic crashes every year [3]. Global mortality is 97/100,000 population. About 850,000 are under 45 years of age, who are the main source of livelihood for their families in most of the developing countries. Every day, there are 3300 deaths and 6600 serious injuries on the road [4].

India accounts for about 10% of road accident fatalities worldwide. More people die in road accidents in India than anywhere else in the world, including the more populous China [5]. During the year 2010, there were around 5 lakh road accidents, which resulted in deaths of 134,513 people and injured more than 5 lakh persons in India. These numbers translate into 1 road accident every minute, and 1 road accident death every four minutes. During 2010, 499,628 road accidents were reported by all States/ Union Territories (UTs). Of these, about 23.9% (119,558) were fatal accidents. The number of persons killed in road accidents was 134,513, i.e. an average of one fatality per 3.7 accidents. The proportion of fatal accidents in total road accidents has consistently increased since 2001 from 17.6% to 23.9% in 2010 [6]. India has 1% of the world’s vehicles, but 6% of the total global RTA deaths [4]. Road deaths in India registered a sharp 6.1% rise between 2006 and 2007. However, road safety experts say the real numbers could be higher since many of these accident cases are not even reported. “There is no estimate of how many injured in road accidents die a few hours or days after the accident” [7].

RTAs is the most common cause of severe head injury. It may cause multiple injuries in the same person. Head Injury is the single most common cause of mortality in vehicle accidents. Majority of RTA injuries are predominantly of the brain. One person sustains traumatic brain injury (TBI) every 21 seconds in the United States [8]. At present, 5.3 million Americans are living with disabilities due to TBI and 50% of these are due to motor vehicle accidents. India

also has the highest incidence of head injuries in the world. In our country, 60% of TBIs are caused by RTA. Fatality rate is 70/1000 vehicles, which is 25 times higher than in developed countries [4].

Although the number of RTAs has continued to rise in the world as a whole, the road traffic mortality rates show clear differences in the pattern of growth between high-income countries on one hand, and low-income and middle-income countries on the other. There has been a decrease in the numbers and rates of fatalities in high-income countries. At the same time, there has been a pronounced rise in numbers and rates in many low-income and middle-income countries [1]. Thus to supplement the previous studies and to help the policy-makers in implementing evidence-based strategies to prevent such accidents in future, the present study is planned in 15-45 years age-group patients reporting to Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh following RTA with head injury.

2. MATERIALS & METHODS:

The present hospital based cross-sectional study was conducted in casualty and neurosurgery ward of Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh from August 2010 to July 2011 for a period of one year after a pilot study. Study unit was individual and study subjects included all the patients of RTAs with head injury in age-group 15-45 years admitted to this hospital over one year. Subjects were recruited using purposive sampling.

The criteria of inclusion were to include all patients of RTAs with head injury in age-group 15-45 years who have registered themselves in casualty and admitted to Jawaharlal Nehru Medical College Hospital. Head injury was first confirmed by residents of neurosurgery who first came in contact with patient. The patients excluded were those not giving consent to be a part of study, patients who were immediately referred to higher centre, patients who were brought dead and those below 15 years and above 45 years of age. If even after detailed interviewing it was noted that the information was not relevant or incomplete then that patient was also excluded from the study. Ethical clearance was obtained to conduct the study. Interview was scheduled on Monday, Wednesday and Friday of each week starting from August 2010 and was carried out till July 2011. Every eligible patient present in ward or casualty on the scheduled day was interviewed. Tools used were a pre-tested and semi-structured proforma modified from WHO Injury surveillance guidelines [9]. After screening of eligible patients they were contacted either in ward or casualty. They were told the purpose of the study and were invited to participate in the same. Informed consent (verbal) was taken from patients or concerned attendants or relatives after they were assured that confidentiality would be maintained. When the condition of the patient did not permit the interview, the parents, relatives or attendants present were interviewed. Modified Kuppaswamy's socio-economic status scale was used in the present study to define socio-economic classes (Table-1). It takes into account the education, occupation and family income per month. Based on the scores given to different education, occupation and income group a total score is calculated and based on this five different socio-economic classes are defined as Upper (I), Upper middle (II), Lower middle (III), Upper lower (IV) and Lower (V) [10].

Table 1. Modified Kuppuswamy Socio-Economic Status Scale

(A) Education		Score		
1.	Profession or Honours	7		
2.	Graduate or post graduate	6		
3.	Intermediate or post high school diploma	5		
4.	High school certificate	4		
5.	Middle school certificate	3		
6.	Primary school certificate	2		
7.	Illiterate	1		
(B) Occupation		Score		
1.	Profession	10		
2.	Semi-Profession	6		
3.	Clerical, Shop-owner, Farmer	5		
4.	Skilled worker	4		
5.	Semi-skilled worker	3		
6.	Unskilled worker	2		
7.	Unemployed	1		
(C)	Family income per month(in Rs)- original	Score original	Modified for 1998²	Modified for 2007
1.	=2000	12	=13500	=19575
2.	1000-1999	10	6750-13499	9788-19574
3.	750-999	6	5050-6749	7323- 9787
4.	500-749	4	3375-5049	4894- 7322
5.	300-499	3	2025-3374	2936-4893
6.	101-299	2	676-2024	980-2935
7.	=100	1	=675	=979
Total Score		Socioeconomic class		
26-29		Upper (I)		
16-25		Upper Middle (II)		
11-15		Middle Lower middle (III)		
5-10		Lower Upper lower (IV)		
<5		Lower (V)		

Data was analyzed using the SPSS version 17. SPSS 17 was used for data entry and variables been age, gender, socio-demographic profile, month of year, day of week and time of day.. Operational definition of Road Traffic Accident used in study was as follows: A collision involving at least one vehicle in motion on a public or private road that results in at least one person being injured or killed [4,11].

3. RESULTS

3.1 Socio-Demographic Profile

Table-2 shows gender-wise distribution of socio-demographic factors. Largest number of patients belonged to 15-24 years age-group accounting for 46% of patients followed by 35-44 years age-group with 35.6%. In all age-groups males outnumbered females with overall males accounting for 376 (81.2%) of patients and females been 87 (18.8%) giving rise to male to female ratio of 4.3:1.

Table 2. Socio-demographic profile with gender

Age group (yrs)	Gender		Total N (%)
	Male N (%)	Female N (%)	
15-24	174(37.6 %)	39(8.4%)	213(46.0 %)
25-34	73(15.8 %)	12(2.6 %)	85(18.3 %)
35-44	129(27.8%)	36(7.8 %)	165(35.6 %)
TOTAL	376(81.2 %)	87(18.8 %)	463(100.0 %)
Residence			
Urban	152(32.8 %)	34(7.4 %)	186(40.2 %)
Rural	224(48.4 %)	53(11.4 %)	277(59.8 %)
Total	376(81.2 %)	87(18.8 %)	463(100.0 %)
Education			
Illiterate	10(2.2 %)	2(0.4 %)	12(2.6 %)
Primary	28(6.1 %)	7(1.5 %)	35(7.6 %)
Middle	34(7.3 %)	17(3.7 %)	51(11.0 %)
Highschool	127(27.4 %)	35(7.6 %)	162(35.0 %)
Secondary	65(14.0 %)	10(2.2 %)	75(16.2 %)
Graduate and above	112(24.2 %)	16(3.4 %)	128(27.6 %)
Total	376(81.2 %)	87(18.8 %)	463(100.0 %)
Occupation			
Unemployed	64(13.8%)	76(16.4%)	140(30.2%)
Unskilled	45(9.7%)	0(0%)	45(9.7%)
Semiskilled	99(21.4%)	2(0.4%)	101(21.8%)
Skilled	37(8.0%)	2(0.4%)	39(8.4%)
Clerical/ shopowner/farmer	119(25.7%)	5(1.2%)	124(26.9%)
Semiprof./prof.	12(2.6%)	2(0.4%)	14(3.0%)
Total	376(81.2%)	87(18.8%)	463(100.0%)
Socio-economic class*			
II (upper-middle)	8(1.7 %)	3(0.7 %)	11(2.4 %)
III (lower-middle)	179(38.7 %)	9(1.9 %)	188(40.6 %)
IV (upper-lower)	185(40.0 %)	70(15.1 %)	255(55.1 %)
V (lower)	4(0.9 %)	5(1.1 %)	9(1.9 %)
Total	376(81.2 %)	87(18.8 %)	463(100.0 %)

*As per Modified Kuppuswamy socio-economic scale [10]

Higher number of patients belonged to rural areas (59.8%) as compared to urban areas (40.2%). Majority of the patients were literate, of which educated upto high school and above constituted 78.8%. Educated up to high school (35.0%) was the largest group followed by graduate and above (27.6%). 30.2% of the patients were unemployed. However majority of them were either students or homemakers. Clerical, shop owner and farmers (26.9 %) formed the largest recognized group with regard to occupation. Maximum risk of RTA was found in upper-lower class (55.1%) i.e. class IV followed by lower-middle class (40.6%) i.e. class III as per Modified Kuppaswamy's socio-economic classification..

3.2 Month of Year

Maximum number of accidents were noted in the month of August 51 (11.0%) followed closely by July 47 (10.2 %) and September 46 (9.9 %). Least number of accidents were noted in the months of February and November with 30 (6.5 %) each. Rest throughout the year accidents were almost equally distributed. In every single month of year males dominated females with regard to share in number of patients (Figure. 1).

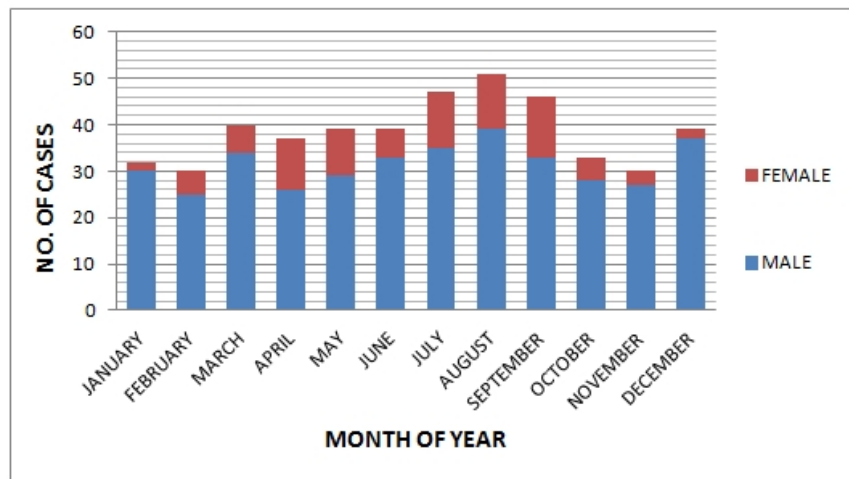


Figure 1. Distribution of accidents with month of the year

There is general trend of increase in the number of accidents from April onwards peaking around August then declining till November with increase again in December. However maximum accidents were reported from July to September which also corresponds with rainy season in India.

3.3 Days of Week

Highest number of accidents occurred on Friday 77 (16.6%) followed by Thursday 75 (16.2%). Accidents were equally distributed over other days. Least number of accidents 55 (11.9%) were noticed on Monday. Overall 132 (28.5%) of accidents occurred on weekends however no significant difference was noticed when compared with weekdays (p-value>0.05) (Figure. 2)

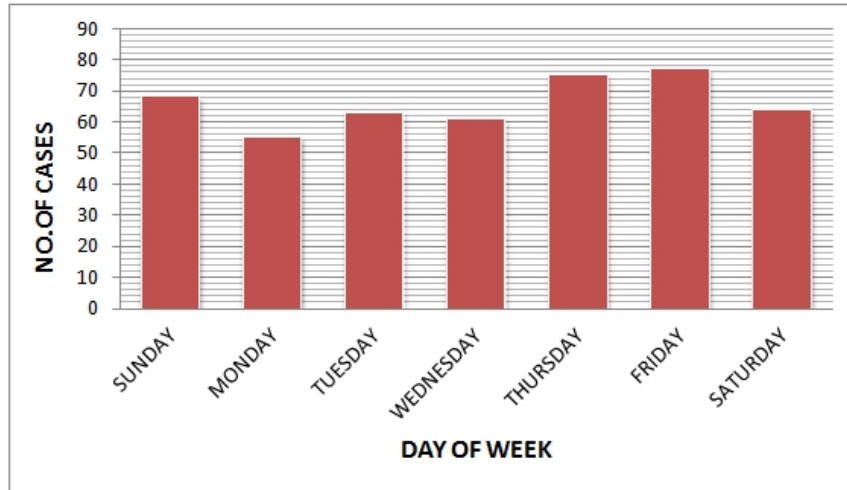


Figure 2. Distribution of accidents with days of week

3.4 Time of Day

Most accidents occurred either between 4.00-7.59 p.m. or between 8.00-11.59 p.m. Overall maximum accidents 129 (27.9 %) occurred between 8.00-11.59 p.m. followed next by 4.00-7.59 p.m with 127 (27.3%). Least number of accidents 36 (7.8%) were reported during 4.00-7.59 a.m. while none of the accident was reported between 12.00-3.59 a.m. (Table-3)

Table 3. Distribution of accidents with time-frame

Time-frame	N(%)
04.00-07.59	36(7.8%)
08.00-11.59	74(16.0%)
12.00-15.59	97(21.0%)
16.00-19.59	127(27.3%)
20.00-23.59	129(27.9%)
Total	463(100.0%)

A gradual and continuous rise in number of accidents has been noted with time of day starting from 4.00 a.m. and peaking around 4.00-7.59 p.m. and then flattening. This showed that as the day progressed risk of RTA increased (Figure 3).

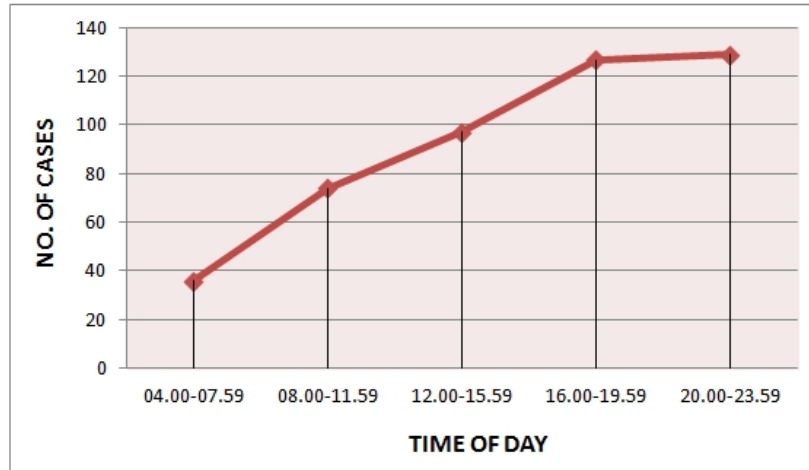


Figure 3. Frequency curve of accidents with time-frame

4. DISCUSSION

Maximum number of patients belonged to 15-24 year age-group. This finding was similar to study done by Agnihotri [12] who found that 49% of patients were in the 16-30 year age group. Similarly Khan [13] in study at Aligarh noted that the peak incidence was observed in the age group 15 - 24 years comprising 34.46% of all patients. Male preponderance was also noted by Wong [14] where males comprised 82.8% of all patients. Similarly Jha [15] found 83% of patients to be male and 17% to be female and Patil [11] discovered that there were (82.3%) male and (17.7%) female casualties in their study.

Higher number of patients belonged to rural areas (59.8% as against 40.2% in urban areas). Mishra [16] also noted higher (65.83%) of victims were from rural areas and 34.17% from urban areas. Similarly Ackaah [17] noted 65.6% of all fatalities occurred in the non-urban environment as against 34.4% in the urban area.

Majority of the patients were literate, of which educated upto high school and above constituted 78.8%. Mishra [16] reported majority of victims had secondary education (49.16%) or were graduates (39.15%).

Similar occupation profile was noted by Jha [18] where highest number of victims were students (20.7%), followed by farmers (19.5%). House wife constituted 18.2% of victims. Increased risk in students may be due to high risk behavior of young individuals and have easy access to vehicles be it parents' vehicle or that of peer group.

In a cross-sectional study Tiwari [19] noted 49.9% of victims belonged to upper lower class, 27.2% belonged to lower middle followed by upper middle, lower and upper class In the present study maximum cases occurred during and around rainy seasons. Results similar to this study were also noted in a retrospective study at the Dhaka where most accidents 90 (11.07%) occurred in September which is the rainy season in Bangladesh, when the road becomes muddy and slippery causing more accidents [20]. Another study in Riyadh City found highest percentage of accidents took place during the months of September, August and October [21]. Mishra [16] also found 81.66% of RTA occurred in rainy and cloudy

conditions. More of the accidents took place on weekdays. This is in corroboration with findings of Pikoulis [22] who noted that motor vehicular accidents were more frequent on weekdays. However studies by Jha [18] and Ackaah [17] found most accidents occurred over weekends or Saturdays. Increase in proportion of accidents over weekends in these studies may be due to increase in social gatherings and late night parties and at instances associated with drunken driving over weekends but it is subject to further research. No significant difference was evident in incidence of vehicular accidents over weekends and weekdays. This was also noted by Kumar [23]. As the day progressed risk of RTA increased. This needs further research. However Mishra [16] also noted that during weekdays maximum accidents occurred between 3 to 7 p.m. Ackaah [17] observed that over half (52.6%) the fatalities occurred between 14:00 and 22:00 hours, with the highest single hour being 19:00–20:00 hour contributing approximately 10% of all fatalities. Kumar [23] noted that peak time for fatal accidents (7.26 %) was between 10 PM and 11 PM followed by 9 PM to 10 PM (6.01%). Increase in accidents at peak hours may be due high traffic observed during these hours which coincides with closing time of offices and coaching hours of students and increase in fatigue as the day progresses which leads to poor concentration and predisposes individuals to risk of RTA.

5. CONCLUSION

Maximum cases of RTAs in and around Aligarh district were noted around August, July and September which together constitute rainy season in this part of India. There may be many factors which contribute to increase in accidents during rains which needs further research.

Almost three quarter of all accidents noted occurred during weekdays and no significant increase noted during weekends which is a common finding in big cities and developed countries. This may be due non-availability of large malls, picnic spots and resorts in and around Aligarh district. As there are no appealing destinations to celebrate weekends the risk of RTAs is not increased over weekends.

The present study noted as the day progressed the risk of accident increased. Further research is required to look into the cause of this increase.

ACKNOWLEDGMENT

We owe our heart-felt gratitude and indebtedness to all those who worked with us to make this study feasible.

CONSENT

Not applicable.

ETHICAL APPROVAL

The study was approved by colleges' ethics committee.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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