

Original research**A STUDY OF INJURIES SUSTAINED IN ROAD TRAFFIC ACCIDENTS, THEIR SEVERITY AND OUTCOME IN TERTIARY CARE HOSPITAL****Singh SP¹, Mahajan PC², Srivastav VK²**

1-PG, Department of community medicine, RMCH & RC, Kanpur

2-Professor, Department of community medicine, RMCH & RC, Kanpur

Abstract

Introduction: Accidents represent a major but neglected epidemic of non communicable disease in the present century that they are no longer considered accidental. But the part of price we pay for the technological progress, population burst, motorization and urbanization in the country. Today road traffic incidences (RTIs) are one of the leading causes of deaths, disabilities, and hospitalizations with severe socioeconomic costs across the world. **Objectives:** The present study analyses the age and sex distribution, severity and outcome of victims sustaining RTA injuries with seasonal and diurnal variations, influence of alcohol and type of vehicles. **Design:** Retrospective record-based study. **Materials and Methods:** The aim of this study was to audit retrospectively the severity and outcome of injury sustained by vehicle occupants admitted to Rama Medical college hospital & Research centre, (RMCH&RC) Mandhana, Kanpur, for a period of one year. Data were collected using the case sheets of 193 patients from the medical records section of hospital and analyzed using SPSS computer software version 21.0. Results were interpreted in terms of percentage, mean, chi square, t-test and analysis of variance (ANOVA). **Results:** The pattern and severity of injuries sustained by 193 Victims admitted to the emergency department of RMCH&RC, Mandhana Kanpur were retrospectively documented. Male victims 104 (74.35%) were more commonly involved than females 89 (25.65%) and majority of victims 141 (40.63%) were in age group of 20-30 years. Head and neck accounts for 125 (64.8%) cases which were the most common body regions injured. Among the body structure the internal organs 76(39.4%) were the most common to be affected. Based on severities, critical injuries involve whole body parts, severe injuries involve internal organs and moderate injuries involve skin & soft tissues. **Conclusion:** RTAs constitute a major public health problem in our setting. Urgent preventive measures targeting at reducing the occurrence of RTAs are necessary to reduce the morbidity and mortality resulting from these injuries.

Keywords: Road traffic accidents, Road traffic injuries, Abbreviated injury scale, victims**Introduction**

In year 2008 RTAs ranked as the fourth leading cause of death in the world. Injuries are responsible for approx 9 % (5.12 million) cases of death and about 16% of disabilities. Major cause of death were among persons

aged 10-24 years overtaking deaths due to diabetes and HIV/AIDS. Almost 1.24 million people **worldwide** die every year as a result of a road traffic accident and 20 million to 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury,

According to WHO without action, road traffic crashes are expected to result in the deaths of about 1.9 million people a year worldwide by 2020.^{1,2,3,4}

Every year in the world nearly 1.2 Million road accidents occur, 90 % takes place in developing world and 50 % worldwide fatalities and injuries occur in **Asia- Pacific region**. For every death 4 people suffer with severe disabilities, 10 people require hospital admissions and 30 people require emergency room treatment. According to the **National Crime Record Bureau (2010)**, the number of vehicular accidents was 430600 resulting in 133938 deaths and 470600 injuries, thereby accounting for 37.2% of all accidental deaths due to unnatural causes. In **Uttar Pradesh** the vehicular accident was 13,801 resulting in 6,647 deaths and 8,959 injuries in urban, 15,484 vehicular accidents 14,865 deaths and 6,554 injuries in rural. A total 29,285 vehicular accident 21,512 deaths and 15,513 injuries in **year 2013 -14**. The economic cost ranges from **1 % to 5 % of GDP for every nation** thus creating a big burden over the total budget of a country that can be utilized for other welfare works in a sense that just educating the people about traffic laws costs one tenth^{4,5,6,7}.

Taking a look at misery of RTAs, 50 % death happen within next 5 minutes due to visceral injuries including brain, heart and major blood vessels (on spot deaths), 35 % die in next 1 to 2 hours (bleeding injuries and complications) and rest 15 % die over next 30 days primarily due to sepsis and poor hospital care^{6,7}.

We need to know more about the numbers, types, severity and outcome of injuries. This information will indicate just how serious the injury problem is and where, exactly,

preventive measures are most urgently needed.

Materials and Methods

The study is a retrospective analysis of cases of RTAs victims admitted to Rama Medical college hospital & Research centre Mandhana, Kanpur, during the period between Feb 2013 and Jan 2014 after getting ethical clearance. The information about the patients admitted as cases of RTAs were ascertained from the hospital records. Case sheets of RTAs victims from the medical records sections were read and the necessary details were sought in terms of age, sex, residence, season of accidents, place, alcohol intake, type and site of injury. The cases with incomplete details were not taken into consideration. The analysis was done by using SPSS.21 software run under Microsoft Windows 2007® and the results were interpreted in terms of percentage, mean, chi-square, and t-test and ANOVA. A total of 193 RTAs cases were studied and analyzed for the different variables.

The patients thought to be and not to be under the influence of alcohol was based on the clinical impression of the attending doctor, which was possible by smell of alcohol in breath. Injury patterns were identified using case sheets and Medico Legal Certificates (MLC) of the patients who seek medical care in hospital. For the purpose of this study, the pattern of injury was documented by dividing the body into body regions using **Abbreviated injury scale (AIS)**. Thoraco-spinal injuries were included with those of the thorax and those of the lumbar spine with the abdomen. The face was defined as that part of the head lying between the hairline and chin. Injuries of the shoulder and hip joint were included within the limb region.

Results

Table 1 The distribution of study subjects according to the age and sex.

Age group	Gender		Total
	Male	Female	
11-20 yrs	19	21	40
	47.5%	52.5%	100.0%
21-30 yrs	65	3	68
	95.6%	4.4%	100.0%
31-40 yrs	30	4	34
	88.2%	11.8%	100.0%
41-50 yrs	1	0	1
	100.0%	0.0%	100.0%
51-60 yrs	12	1	13
	92.3%	7.7%	100.0%
61-70 yrs	27	1	28
	96.4%	3.6%	100.0%
71 & above	9	0	9
	100.0%	0.0%	100.0%
Total	163	30	193
	84.5%	15.5%	100.0%

$\chi^2 = 153.911$ (p = 0.000)

The distribution of study subjects according to the age and sex is depicted in Table 1 Out of total 193 victims, 163 (84.50%) were males, while only 30 (15.50%) were female subjects. Highest number of victims were in 20-30 years age group, accounting for 68 patients 65 were males and 3 were females. On applying chi-square test, it was shown that age group 20-30 and 40-50 are statistically significant. Males are much more exposed to RTAs than females. Overall male and female ratio was **5.43:1**.

Figure 1, 2, 3 & 4 Circumstances leading to RTAs.

FIG No.1

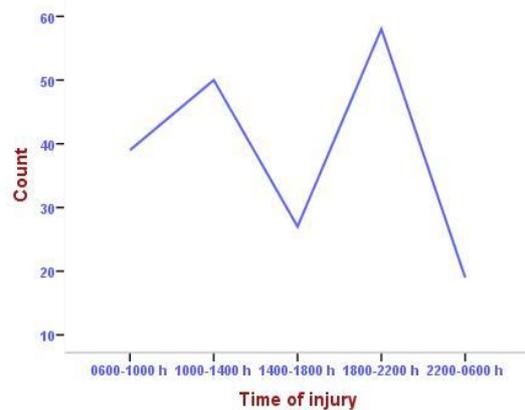


FIG No.2

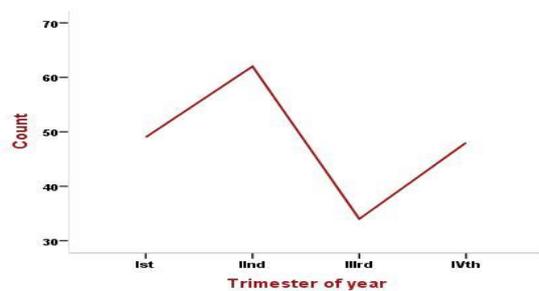


FIG No.3

Influence of alcohol %

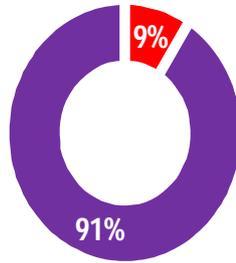
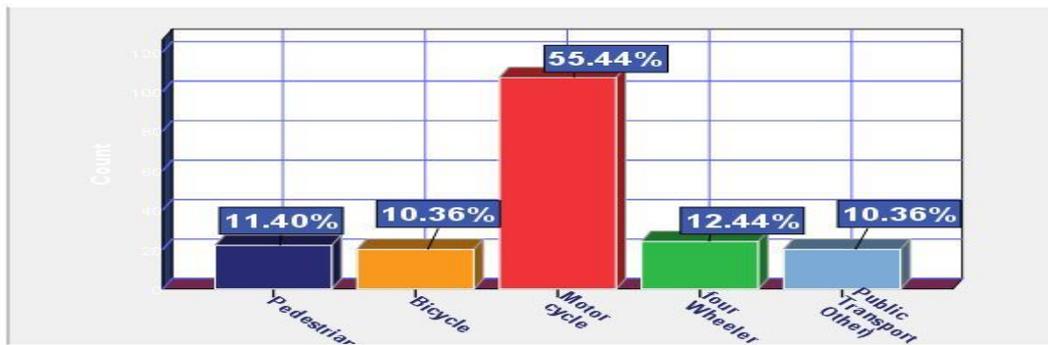


FIG:4 Victims travelling by Vehicle Type



Various factors were attributed to the causation of these injuries as it is shown in fig 1,2,3 that maximum number of accidents took place during summer season (32.10%) with diurnal variation of peak, maximum number of accidents 58 (30.10%) between (1800-200 hrs). A total of (8.9%) injured patients were intoxicated with alcohol. at the time of accidents, all were males.

Table 2 Circumstances leading to accidents as per ICD-10 for (condition and circumstances in RTAs) **

Mode of traveling	ICD-10*	Collided With/Fall/Slip/Toppled					Total
		Fall/Slip /Toppled	Two wheeler	Three wheeler (Tempo)	Four wheeler	heavy Vehicle	
Pedestrian	V00-09	0	1	21	0	0	22
		.0%	4.5%	95.5%	.0%	.0%	100.0%
Bicycle	V10-19	0	0	0	10	10	20
		.0%	.0%	.0%	50.0%	50.0%	100.0%
Motor cycle	V20-29	34	17	36	0	20	107
		31.8%	15.9%	33.6%	.0%	18.7%	100.0%
four Wheeler	V30-39	4	0	0	3	17	24
		16.7%	.0%	.0%	12.5%	70.8%	100.0%
Public Transport (Other V50-99)	V40-49	20	0	0	0	0	20
		100.0%	.0%	.0%	.0%	.0%	100.0%
Total		58	18	57	13	47	193
		30.1%	9.3%	29.5%	6.7%	24.4%	100.0%

* ICD-10 for (Conditions and circumstances in RTAs.) $\chi^2 = 215.181$ p=0.000

** <http://www.icd10data.com/ICD10CM/Codes/V00-Y99>

Table 3 Distribution of body regions injured in the accident (MR*)

Site of Injury	Frequency	Percent
Other	8	4.1
Head	125	64.8
Face	21	10.9
Abdomen/Pelvis	11	5.7
Upper Extremity	12	6.2
Lower Extremity	16	8.3
Total	193	100.0

Table 3 showed that Head/neck accounts for 125 (64.8%) cases which were the most common body regions injured, lower limb & upper limb (14%) and the Maxillofacial injuries (11.4%). were also common. The relatively low proportion of other injuries 08 (0.85%) is also note worthy which includes missing tooth, amputation, burn, and genital injuries.

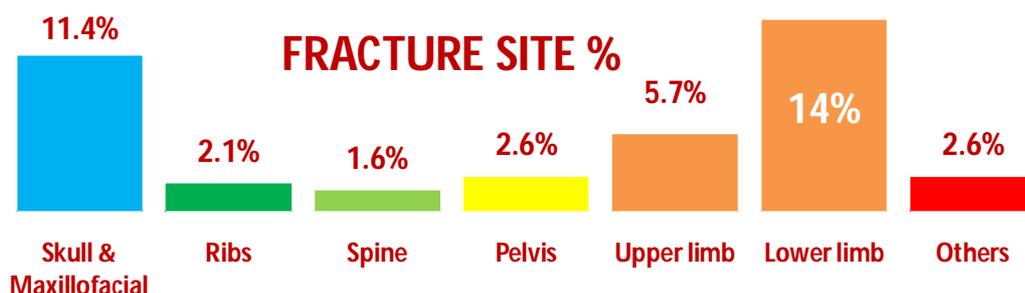
Table 4 Distribution of external injuries

Type of External Injury	Injury Side		Total
	RT	LT	
Bruises	9	0	9
	100.0%	.0%	100.0%
Abrasion	11	0	11
	100.0%	.0%	100.0%
Laceration	24	9	33
	72.7%	27.3%	100.0%
Blunt injuries	48	31	79
	60.8%	39.2%	100.0%
Crush/ Degloving injuries	3	1	4
	75.0%	25.0%	100.0%
Poly trauma	57	0	57
	100.0%	.0%	100.0%
Total	152	41	193
	78.8%	21.2%	100.0%

$$\chi^2 = 57.638 \quad p = 0.000$$

A detail analysis of various injuries on the body of victims revealed that external injuries seen in 193 victims, the most common pattern was poly trauma (57), blunt injuries(48), lacerations observed in(33) , abrasions 11, followed by bruises 9 and only 3 crush/degloving injuries Right side 151(78.8%) were more common than 42 (21.2%) on left side of body as shown in Table 4.

Figure 5 Site of fractures among the victims



As shown in Figure 5, the commonest site of fracture was the lower limbs (13.99%), followed by upper limbs (11.40%) and skull/maxillofacial bones (5.70%). The less common sites were ribs (2.1%) spine (1.55%), and pelvis (2.59%).

Table 5 Distribution body structures injured in road traffic accident cases

Body structure	Frequency	Percent
Whole part	13	6.7
Nerve	3	1.6
Vessel	3	1.6
Internal organ	76	39.4
Bone	60	31.1
Skin	38	19.7
Total	193	100.0

Table 5 Shows body structures as per abbreviated injury scale (AIS). Most of the injuries to body structures were internal organs 76 (39.4%) followed by bones 60 (31.1%) and skin 38 (19.7%), lesser number of whole part injuries including brain 13 (6.7%) nerve and vessels each 3 (1.6%) only.

Table 6 Distribution severity of injuries in road traffic accident cases

Body structure injured	Severity of Injury				Total
	Moderate	serious	Severe	Critical	
Whole part	0 .0%	0 .0%	7 53.8%	6 46.2%	13 100.0%
Nerve	0 .0%	0 .0%	2 66.7%	1 33.3%	3 100.0%
Vessel	0 .0%	0 .0%	1 33.3%	2 66.7%	3 100.0%
Internal organ	0 .0%	43 56.6%	32 42.1%	1 1.3%	76 100.0%
Bone	13 21.7%	24 40.0%	23 38.3%	0 .0%	60 100.0%
Skin	29 76.3%	9 23.7%	0 .0%	0 .0%	38 100.0%
Total	42 21.8%	76 39.4%	65 33.7%	10 5.2%	193 100.0%

Table 6 Shows severity pattern of RTIs out of total 193 victims, 42 (21.8%) were sustained moderate 76 (39.4%) serious injuries followed by 65 (33.7%) severe injuries. Rest 10 (5.2%) critical injuries. Most of the severe injuries were of internal organs (32) and bones (23). Critical injuries were involved like whole part injuries (6), vessel injuries (2), nerve and internal organ injuries(1)case of each. Serious injuries of internal organs were (43), bones (23)as well as (9) cases of skin and soft tissue injuries. Moderate injuries involved the body structures like bones in (13) cases and skin in (39) cases.

Figure 6 Victims need ICU care.



Figure6 Shows about 30.1% victims require ICU care and rest 69.9% can be treated in casualty ward.

Figure 7 Duration of hospital stay fatality and outcome



Figure 7 Shows out of total 10 victims expired 6persons expired on day14 rest 3expired on Day 8 and only 1person expired on same day after admission in hospital. This distribution of Victims death depicts fatality pattern of victims due to severity and complications/internal bleeding on same day (within 2 - 4 hrs). Rest on day 8 and 14 due to sepsis/poor hospital care. Duration Of hospitalization shows recovery pattern and thus severity of injury and structure of body part involved. One way t- test is highly significant for duration of stay in hospital.

One-Sample Test

Test Value = 0						
95% Confidence Interval of the Difference						
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Duration of hospital stay(in Days)	17.503	192	.000	6.21244	5.5124	6.9125

Table 7 Fatalities and outcome

Disposal of pt	Frequency	Percent
Expired	10	5.2
Improved & discharged/ Referred to higher centres	183	94.8
Total	193	100.0

$\chi^2 = 155.073$ p = 0.000

Table 7 Shows fatality and outcome of victims admitted in hospital 10 (5.2%) expired and183 (94.8%) were improved and discharged/referred to higher centers

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Duration of hospital stay(in Days)	1093.297	3	364.432	19.267	.000
	3574.993	189	18.915		
Disposal of pt	4668.290	192			
	2.311	3	.770	20.301	.000
Site of Injury	7.171	189	.038		
	9.482	192			
Site of Injury	38.121	3	12.707	2.220	.087
	1081.941	189	5.725		
	1120.062	192			

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
	6.043	3	2.014	4.631	.004
Injury Side	82.206	189	.435		
	88.249	192			
	151.648	3	50.549	62.760	.000
Body structure injured	152.227	189	.805		
	303.876	192			
	1.682	3	.561	4.479	.005
Gender	23.655	189	.125		
	25.337	192			
	190.565	3	63.522	24.681	.000
Age group	486.430	189	2.574		
	676.995	192			
	3.160	3	1.053	.524	.667
Type of External Injury	380.125	189	2.011		
	383.285	192			
	47.306	3	15.769	2.738	.045
Site of Fracture	1088.549	189	5.760		
	1135.855	192			
	87.790	3	29.263	28.610	.000
Admit in hospital Ward	193.319	189	1.023		
	281.109	192			
	35.059	3	11.686	10.725	.000
Trimester of year	205.946	189	1.090		
	241.005	192			
	52.711	3	17.570	11.776	.000
Time of injury	281.984	189	1.492		
	334.694	192			
	2.001	3	.667	9.337	.000
Alcohol influence	13.501	189	.071		
	15.503	192			
	78.332	3	26.111	13.506	.000
Mode of traveling	365.378	189	1.933		
	443.710	192			
	8.057	3	2.686	1.156	.328
Collided With/Fall/Slip/Toppled	439.166	189	2.324		
	447.223	192			

Discussion

RTAs constitute a major public health problem in all over the world. In this review, the majority of RTA victims were young in their most reproductive and productive years of life and showed a male preponderance. The results of the present study revealed that 163 (84.5%) of the victims were males and the rest 30 (15.5%) were females. The highest number of victims 141 (40.63%) were from 20 to 30 years of age group. In males, the maximum numbers of cases were seen in the age group 20-30 years.³ 114 (44.19%). Overall, male to female ratio is 5.43:1. The reason for high incidence of RTAs in males reflects their high activity levels and participation in high-risk activities such as recklessness driving/riding, over-speeding and drunken driving without wearing any protective gears. It is due to greater male exposure on streets⁵⁻⁹. On the contrary, females are involved in various indoor activities mostly due to cultural background and extra precaution taken by family members to keep them safe. However, other studies observed that the peak age of male victims was in the 4th decade, with the mean at 33 years.^{10,11}

Maximum number of cases 62 (32.20%) was recorded in the summer months, which was also observed in other studies similar and different observations due to different terrain and climatic conditions of study areas. Reasons behind present study observation is rural clientage of study hospital, occupation of victims being farming as summers are off season for farming thus increasing activities and movement.¹²⁻¹⁶ Two wheelers were most common mode of travelling 55.44%.¹⁷

Most of the accidents took place at 1800-2200hours and also second peak observed in morning between 600-1000 hours.¹⁸

In the present study, (9%) of the male victims involved in RTA had consumed alcohol. This is a higher proportion than 4.6% and 8%, reported by others from Delhi.^{7,19}

There was a higher rate of face and head injuries in the present study. A possible explanation might be that motor vehicle occupants did not use head gears and seat belts, resulting in forward jerk during a collision and higher rate of injury. Abrasions and lacerations were the commonest types of injuries among the external injuries noted in this study. Similar results were also observed by others researchers.^{5,10} Common sites for injuries were the lower and upper limbs and face.^{5,6}

Among fractures, present study found that the commonest site of fracture was the lower limb 38 (38.34%), followed by upper limb 34 (34.340%) and skull/maxillofacial 10 (10.10%). The more fractures on lower extremity is again due to interaction of gravitational force and velocity of the vehicle at the time of accidents.⁵

But in another study, it was reported that the highest number of fractures was in upper limbs followed by lower limbs and facial bones¹⁰. In contrast, result of other study showed that the commonest injury was fracture of bones particularly of the head and face and closely followed by the lower extremity²⁰.

The present study also indicates that injuries and fractures were more common on right side in both upper and lower extremities.²¹

Severity of injuries according to body structures injured as per abbreviated injury scale (AIS)²² out of total 193 victims, 42 (21.8%) were sustained moderate 76 (39.4%) serious injuries followed by 65

(33.7%) severe injuries. Rest 10 (5.2%) critical injuries.¹⁹ Most of the severe injuries were of internal organs (32) and bones (23). Critical injuries were involved whole part injuries (6), vessels injuries (2), nerve and internal organs injuries (1) case of each. Serious injuries of internal organs were (43), bones (23) as well as (9) cases of skin and soft tissue injuries. Moderate injuries were involved the body structures like bones in (13) cases and skin in (39) cases. Persons who sustained minor injuries treated in OPDs not included in study. Such association of severity with body structures injury was found statistically significant ($\chi^2=181.410$ $p = 0.000$). There are three broad groups of severity simple, grievous and dangerous/fatal (anti mortem assessment of injuries are jurisdictional importance) which are not of prognostic value. No such comparison studies carried out in past showing such relation. Further out of total 31.8% injured required ICU care and rest treated in general wards. Outcome of victims and duration of hospital stay shows that a total 10 victims expired of which (6)persons expired on day(14) rest (3)expired on Day 8 and only (1)person expired on same day after admission in hospital. This distribution of Victims death depicts fatality pattern of victims due to severity and complications/internal bleeding on same day (within 2 - 4 hrs). Rest on day 8 and 14 due to sepsis and poor hospital care.¹⁸ Analysis of variance (one way ANOVA) was found significant with dependent variable. Severity of injury for all the 15 variables except time of injury, site of injury and mode of injury.

Conclusion

The result of this study enables a health care to predict fracture site of injury and severity. Strict enforcement of road safety drink and

drive prohibition regulations and improving emergency medical may prevent untimely deaths and disabilities caused by RTAs.²²

Awareness campaigns concerning safety rules targeted at the high-risk group. The fact that the economically productive age-group were mostly involved. There is urgent need of public policy response with special reference to education, engineering, environment, and emergency care of road accident victims.

Limitation

The analysis of the details of the riders in vehicles was not possible due to insufficient information from the hospital record in relation to their seating, wearing of seat belt, and amount of alcohol consumption, and so on. Urban rural comparison could not done because hospital catchment area dominated by rural population. The other limitations of this study were the extent of internal injury which was not analyzed up due to referral to higher centers.

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CORRESPONDENCE ADDRESS

Dr. S. P. Singh, Junior resident, Department of community medicine
Rama Medical college Hospital & Research Center, Kanpur, UP
Email: drmajsatyaprakash@gmail.com