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FATAL ROAD TRAFFIC ACCIDENTS, STUDY OF DISTRIBUTION, NATURE AND TYPE OF INJURY.

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ABSTRACT

During one year study period medico legal autopsies were conducted on 950 cases of fatal road traffic accidents at the mortuary of SRN Hospital, MLN Medical College, Allahabad. M/F ratio 3:1. 33.68% of cases were in the age group of 25-44 years. Pedestrians were most vulnerable accounting for 35.79% of total fatalities followed by motorized two wheelers 30.53%. Heavy Vehicles were found to be mostly involved 58.52% of cases and most accidents 83.05% occurred on highways. Majority of cases sustained multiple injuries. Primary impact injuries were recorded in 455 cases and pedestrians 36.26% were mostly affected followed by pedal cyclists 20.88%. 505 cases sustained secondary impact injuries and pedestrians and motor cyclists were primarily involved. Of 697 secondary injuries, 29.99% were sustained by motorcyclists followed by pediastrians 22.67%. Mostly lower extremities 27.39% and pelvis 25.99% received the primary impacts; the head and neck 55.62% the secondary impacts, while secondary injuries were mostly located in the lower extremities 28.38%. Largest number of injuries were recorded in lower extremities 804 number, followed by head & neck 748 number. Vehicle occupants mostly sustained thoracic injuries. In majority of cases, the site of initial impact of the responsible vehicle was frontal (45.14%) followed by rear (25.83%) and side (7.01%). In 179 cases (22.02%) site of responsible vehicle were not known.

Key Words : Accidents, Head Injury.

INTRODUCTION

Amongst all traffic accidents, road traffic accidents claim largest toll of human life and tend to be the most serious problem world over. Worldwide, the number of people killed in road traffic accidents (RTA) each year is estimated at almost 1.2 million, while the number of injured could be as high as 50 million [1]. The Americas bear 11% of the burden of road traffic injury mortality [2]. Currently motor vehicle accidents rank 9th in order of disease burden and are projected to be ranked third in the year 2020. Nearly three quarter of deaths resulting from motor vehicle crashes occur in developing country[3]. In India, over 80000 persons die in the traffic crashes annually, over 1.2 million injured seriously and about 3,00,000 disabled permanently. In India, for individuals more than 4 years of age, more life years are lost due to traffic crashes than due to cardiovascular diseases or neoplasm [4,5]. The problem appears to be increasing rapidly in developing countries [6].

Injuries due to RTA depend upon a number of factors-human, vehicle and environmental factors play vital roles before, during and after a serious RTA. The important factors are human errors, driver fatigue, poor traffic sense, mechanical fault of vehicle, speeding and overtaking violation of traffic rules, poor road conditions, traffic congestion, road encroachment etc.

The primary role of autopsy surgeon is to find out the cause of automobile deaths may it be accident, shear ill luck, rash or negligent driving, suicide or homicide. Recording of injuries at post mortem may facilitate not only in the award of

compensation by the court but also in apprehending the defaulting drivers.

The present study has been carried out to study the distribution, nature and types of injuries received during fatal RTAs, and to suggest possible preventive measures.

MATERIAL AND METHODS

The present study was conducted at SRN Hospital mortuary attached to MLN Medical College, Allahabad, U.P. The study period was December 2003 to November 2004. The material for the present study included all dead bodies of fatal road traffic accidents brought to SRN Hospital mortuary. For the purpose of the present study, only those cases where proper records were available, were considered.

In the present study, a road traffic accident was defined as accident which took place on the road between two or more objects, one of which must be any kind of a moving vehicle[7]. Others were excluded. Only RTA victims dying within 21 days of accidents were included in the study.

A pretested proforma specially designed for this purpose was used to extract informations by interrogating police personnel accompanying the victims, as well as friends, relatives, neighbours and others who accompanied victim or where the victim was alive by interogating him, if the condition permitted. The history as regards the circumstances of the accidents and other relevant data about injuries to the victims, the site of impact etc were also collected. Data concerning the vehicles involved in the accident, their types etc were noted. Besides, paper sent by the police eg. inquest reports and FIR were also studied.

All 950 dead bodies were examined in depth at postmortem for the presence of external injuries, internal injuries including bone and joints and finally characteristics of injuries were analysed regarding their nature, type, area of the body injured and distribution of injuries. Additionally, place of death of RTA victims, nature of treatment provided if any, and period of survival following accidents were also recorded.

RESULT

Table 1

Showing Age, gender and Types of Road-Users involved in Fatal RTA

S.No.	Age group Years	Victims Cases				Type of Road Users	Cases	
		Male	Female	No.	%		No.	%
1	<10	30	21	51	5.38	Pedestrian	340	35.79
2	10-14	59	46	105	11.05	Motorized	290	30.53
3	15-24	165	54	219	23.05	2-Wheeler		
4	25-44	270	50	320	33.68	Vehicle Occupants	214	22.53
5	45-64	150	35	85	19.47	Pedal Cyclists	52	5.47
6	65 & Above	39	31	70	7.37	Others	40	4.21
	Total	713	237	950	100	Unknown	13	1.37
						Total	950	99.9

Table 2

Showing different types of vehicles involved in fatal RTA, sites of accidents in relation to roads and number of vehicles involved

Vehicle Type	Cases		Types of Road	Cases		Vehicle Involved	Cases	
	No.	%		No.	%		No.	%
Heavy Vehicle			Highways	789	83.05	Single Vehicle	790	83.15
a) Truck, Oil Tanker	375	39.47						
b) Motor Bus	181	19.05						
Light Vehicles Taxi, Car, Jeep	205	21.58	Roads	150	15.58	Double Vehicle	140	14.74
Motorized 2-wheelers	157	16.53	Lane	6	0.63	Triple Vehicle	3	0.31
Other Vehicles	25	2.63	Other Places	2	0.21			
Unknown	7	0.74	Unknown	5	0.53	Unknown	18	1.89
Total	950	100	Total	950	100	Total	950	100

Table 3

Distribution of External injuries amongst different types of road users

ture of Ext. njury	Pedestrians		Pedal Cyclist		Motor Cyclist		Other		Unknown		Total Cases	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
imary npact njury	165	36.26	95	20.88	82	18.02	50	10.99	63	13.85	455	100
ondary npact njury	176	34.85	103	20.40	121	23.96	47	9.31	58	11.49	505	100
ondary njury	158	22.67	183	26.26	209	29.99	77	11.04	70	10.04	697	100

Table 4

Distribution of Primary and Secondary Impact-Injuries and secondary injuries on different parts of the body

Part of Body Injured	Primary Impact Injury		Secondary Impact Injury		Secondary Injury	
	No.	%	No.	%	No.	%
Head & Neck	37	4.71	396	55.62	315	19.18
Upper Extremities	123	15.67	102	14.33	301	18.33
Thorax	97	12.36	52	7.30	136	8.29
Abdomen	34	4.33	14	1.97	82	4.99
Back	75	9.55	10	1.40	192	11.69
Pelvis	204	25.99	45	6.32	150	9.14
Lower Extremities	215	27.39	93	13.06	496	28.38
Total	785	100	712	100	1642	100

Table 5

Showing crushing Injury amongst different types of road users and parts of body injured

Types of Road User	Crushing Injuries		Part of Body Injured	Cases	
	No.	%		No.	%
Pedestrian	149	42.20	Head & Neck	138	19.86
Pedal Cyclist	12	3.40	Thorax	98	14.10
Motor Cyclist	105	29.75	Abdomen	103	14.82
Vehicle Occupant	71	20.11	Back	17	2.45
Other	11	3.12	Pelvis & Buttocks	115	16.54
Unknown	5	1.42	Upper Extremities	18	2.59
			Lower Extremities	206	29.64
Total	353	100	Total	695	100

Table 6

Distribution of Avulsion (Degloving) and contre-coup Injuries amongst different types of Road users.

S.No.	Type of Road User	Avulsion Injury		Contre-coup Injury	
		No.	%	No.	%
1.	Pedestrian	50	34.01	61	71.77
2.	Pedal Cyclist	2	1.36	5	5.88
3.	Motor Cyclist	61	41.50	2	2.35
4.	Vehicle Occupant	33	22.45	15	17.65
5.	Other	—	—	2	2.35
6.	Unknown	1	0.68	—	—
	Total	147	100	85	100

Table 7

Showing Distribution of Visceral Injuries

Visceral Injures	No.	%
Brain	295	22.92
Heart & Vessels	123	9.56
Lungs	199	15.46
Liver	255	19.81
Spleen	146	11.34
Kidney	109	8.47
Stomach	45	3.50
Intestine	50	3.89
Urinary Bladder	65	5.05
Total	1287	100

Table 8

Showing Place of Death and treatment received by the victims

Place of Death	Cases		Types of Treatment	Cases	
	No.	%		No.	%
Spot	250	26.32	Specific Manage-ment	106	21.37
On way to Hospital	204	21.47			
Hospital	496	52.21	General Manage-ment	390	78.63
Total	950	100	Total	496	100

DISCUSSION

Road traffic accidents (RTAs) are increasing with rapid pace and presently these are one of the leading causes of death in developing countries. Vander sluis et.al [8] has reported that traffic is the most important cause of severe injuries and three quarters of severely injured cases who died during hospitalization are victims of traffic accidents.

In the present study, a total of 950 cases of fatal road traffic accidents (RTA) have been studied in respect to distribution, nature and type of injuries. The actual time of occurrence of the accident has not been recorded in most of the fatal RTA's hence no comment on the time of occurrence of accident in the present study. A majority of fatal RTA have sustained multiple injuries. EKe N et. al.,[9] have also reported occurrence of multiple injuries in 93.5% of the victims.

In the present study, a preponderance of males over females M/F ratio 3:1 have been observed. This is in contrast to ratio of 9:1 as has ben observed by Singh and Dhatarwal [10] Highest incidence of fatalities have occurred in the age group of 25-44 years (33.68%) followed by the age group 15-24 years (23.05%). Children below 10 years of age are least involved so also is the case with persons beyond 65 years of age. Our findings are in general agreement with those of other workers in the field [9,10] Kochar et. al.,[11] have reported that maximal fatal accidents have occurred in the age group of 31-40 years and a preponderance of males 85% and more incidences on Fridays. Whereas Singh & Dhattarwal [10] has observed that the commonest age group involved 21-30 years (27.3%) followd by 31-40 years (20.6%).

Pedestrians have been mostly involved followed by motorized 2 wheelers. Pedestrians being the common victims can be explained by the fact that there is a lack of proper footpath and presence of vendors and other commercial installations by the side of the roads. Moreover, majority of road users are pedestrians thus are comparatively more exposed to the risk of accidents, and are of low or lower middle socio-economic status, are illeterate and lack traffic sense. Our findings are in general agreement with those of other [9,10,11]. Mohan D4 has noted that in India, pedestrians, cyclists and motorcyclists are

the most vulnerable road users constituting over 70-80% of all road traffic deaths, and car occupants only about 5%. The author has also recorded that the patterns of traffic and crashes in India are very different from those in high-income countries. Eke Net.al.,[9] have observed that females constituted 41% of pedestrians and 21% of pedestrians are under 15 years of age and that female pedestrians below 15 years of age are more susceptible to death in RTA. Studies from developed countries have reported lesser involvement of pedestrians probably due to the fact that in developed countries motorization is to that extent that pedestrians are scarce on the road. In the present study motorized 2-wheelers are the second most commonly involved road user owing to less stability, higher speed, restless driving and thrill seeking habit.

In the present study, heavy vehicles (truck, oil tanker, motor bus etc.) are more commonly involved in fatal RTA followed by light vehicles (taxi, car, jeep, van etc.). This can be attributed to their high speed, greater momentum, presence of single space roads, overtaking, volume of traffic etc. The finding are in conformity with Singh & Dhattarwal[10]. Our findings are in variance with EkeN et.al.,[9] who have observed that car and buses are commonly involved in the casualities followed by motorcycles, lorries etc. Gerberich et.al.,[11] has noted that farm vehicle fatalities being a significant problem in U.S. During 1988-1993, in rural areas, 444 farm-vehicle occupants are killed, in addition, 238 occupants of other vehicles or pedestrians are killed in collisions with farm-vehicles. However, in the present study, minimal involvement of farm vehicles (tractor tractor trolleys, thrasher etc.) have been observed even in rural area. In our study, involvement of oil tankers is a notable feature. Moreover a larger involvement of heavy vehicles in our study may be due to the fact that G.T. road (highway) is passing through this region. Our findings are in agreement with those of others[10] who have also reported that heavy vehicles are responsible for maximum fatalities.

Our study has not explored the role of contributing factors like alcohol in fatal RTA, although role of alcohol in impairing driving ability is well documented. Kochar et-al.[11] have reported 28.3% of fatal RTA has a history of having consumed alcohol within 6 hours before the accident. Soderstrom [13] has observed that there is etiological relation between alcohol use and the causation of vehicular crashes (both fatal and non-fatal) and it is well established. However, EkeN et.al.[9] have observed that contribution of alcohol in fatal RTA is relatively uncertain as only 6 cases have been documented. Drivers fatigue or sleepiness owing to prolonged hours at wheels in hostile environmental conditions can be an important contributing factor. Garbarino et.al.,[14] has attributed more than 20% of road accidents to driver sleepiness, and that drivers with obstructive sleep apnoea show 2-7 times increased risk of motor vehicle accidents.[15] Further, literature on road traffic, suicides (pedestrian or drivers suicide) and natural deaths is quite scarce. Routley et.al.,16 have noted that driver suicides and natural driver deaths are relatively minor components of road traffic fatalities. Other workers have reported that cellular telephones are important contributing factor for RTA since their use can affect both cognitive and motor skills involved in driving.

In the present study, largest number (83.05%) fatal RTA have occurred on highways and very few have occurred in lanes and other places. This can be explained on the basis that highways are most busy roads with heavy traffic loads especially by heavy vehicles, whereas in lanes volume of traffic is fairly low and very few heavy vehicles can pass through. Our finding are in agreement with others[10,17]. Further, in great majority of fatal RTA (83.15%) only one vehicle is involved and in 0.31% of cases three vehicles are involved simultaneously. In 1.89% of cases no clues are available for number of vehicles involved in RTA.

A great majority of fatal RTA victims have received multiple external injuries. Singh & Dhattarwal have also recorded involvement of multiple body parts in each case. Abrasion, laceration, fractures, dislocation, head and visceral injuries were more commonly observed in fatal RTA. Our finding are in general agreement with those of other.[10] As far as the distribution of impact injuries amongst different types of road users is concerned, primary impact injuries are noted in 455 cases, secondary impact injuries in 505 cases where as secondary injuries are recorded in 697 cases. Pedestrians are mainly involved in primary and secondary impacts; whereas motorcyclists are mainly involved in secondary injuries, followed by pedal cyclist and pedestrian. More incidence of

secondary injuries amongst motor-cyclists and pedal cyclist may be attributed to a greater distance of fall in them.

Since a single crash may lead to multiple primary impacts in a victim hence, in the present study out of 455 cases of primary impacts a total of 785 primary impact injuries have been recorded on the different parts of the body. Lower extremities and pelvis, are mostly involved followed by upper extremities and shoulder, whereas abdomen, head and neck are least involved. In contrast, in secondary impact injuries head and neck are mostly involved followed by upper extremities and lower extremities. Least involvement of back and abdomes is observed. Out of 1642 secondary injuries, maximum injuries are recorded in lower extremities, followed by head and neck and upper extremities. It is observed that number of secondary injuries is fairly high in fatal RTAs. Crushing injuries are responsible for more incidences of secondary injuries.

In majority of cases front of the vehicle is found responsible for initial impact followed by rear of vehicle and then side of vehicle. Involvement of front of the vehicle may be due to heavy traffic volume, overtaking, and violation of traffic rules. It appears that road users are at fault in majority of cases. This is in contrast to Singh & Dhattarwal [10] who have noted that drivers are at fault in majority of case (55.6%) compared to others.

A total of 353 cases of crushing injuries are recorded. As far as, distribution of crushing (run-over)injuries amongst different types of road-users is concerned, pedestrians and motorcyclist are primarily involved. Lower extremities, head and neck, pelvis and abdomen in the descending order bear the maximum brunt. The possible mode of crushing injury is being ejected out of the vehicle and then run over or coming under wheels or crushed by an overturned vehicle. Our observation that heavy vehicles are more frequently responsible for crushing injuries hence this may justify a higher incidence of crushing injuries in our study. Moreover, heavy vehicles have six or more wheels, it is quite natural that more than one body areas of the victim are injured in run over injuries. Other workers have also observed that lower extremities are mostly involved in run over injuries.

As regards degloving or avulsion injuries, it has been noted that motorcyclists followed by pedestrians and vehicle occupants are primarily involved. Distribution of contre-coup injuries again have shown the maximal involvement of pedestrians. Literature on these aspects is fairly limited.

Multiple visceral injuries (internal injuries) are quite common following fatal RTA. Table-8 has depicted various visceral organs involved in a accident. In majority of cases, brain has been chiefly injured followed by liver, lungs and spleen respectively. Traumatic intra-cerebral hemorrhages are not infrequent in fatal injuries sustained in traffic accidents. Front impact is responsible for brain injury followed by lung and liver injuries. Rear impact too has caused a lot of brain injuries. Thus, in front or rear impact vulnerability of brain is well established. A higher incidence of brain injury has also been reported by other workers [8, 9,10].

In our series, head injury alone is the cause of death in 29.16% of cases whereas head injury together with thoraco-abdominal injury is responsible for 13.68% of cases. Injury to non-vital part is responsible for only 7 cases 0.74%. Our finding pertaining to head injury is at variance to those of Singh & Dhattarwal[10] who have reported on incidence of 50.4% of head injury. Severe brain injury is the most important cause of death, is held by vander sluis[8] as well. In this study, all 950 cases has sustained injuries, this is in contrast to the findings of EKe N et.al.,[9] who have observed that as many as 100 RTA victims had no evidence of violence on them on physical examination and on autopsy 37 victims had no physical injuries. The authors have opined that they may have died from natural causes; existing disease especially in elderly may be the cause of death in a RTA.

In the present study, we have observed that 250 cases (26.32%) died on spot. This is in contrast to Singh & Dhattarwal[10] who have reported a lower incidence of 15.4% died on the spot. Our study reveals that a total of 52.21% of RTA victims have been admitted in the hospital whereas 21.47% have died on way to hospital. Of the 496 admitted victims only 106 have received specific treatment including major surgeries. This emphasizes the need for setting up specialized trauma centres in all big cities of the country and proper faster transportation of RTA victims to save the precious

lives.

Regarding period of survival of fatal RTA victims, we have noted that a great majority of victims have died within 24 hours hence first 24 hours are quite crucial for RTA victims. 308 cases survived beyond 24 hours but they too later succumbed to injuries within a period of 21 days. Our findings are in general agreement with those of Singh & Dhattarwal[10].

It may be concluded that there is a urgent need to address the epidemic of carnage on the roads. In many cases fatal RTAs are caused by human errors and are therefore preventable. A strictor licensing policy especially for four wheelers, a greater awareness about traffic rules, cultivation of road traffic sense, curbing drug abuse, and a proper road network conforming to the volume of traffic will go a long way in curbing the incidence of fatal RTAs. Moreover, the recommendations from the world report on Road Traffic Injury Prevention should be considered and promptly implemented.

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