Original Communication

A Cross Section Study of Road Traffic Accidents with Respect to Road Users Type, Offending Vehicles and Cause of Death Among Autopsies Conducted at Tertiary Hospital Mortuary, RIMS, Raichur

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Abstract

The present study was a cross section study conducted at tertiary hospital mortuary block of RIMS Hospital, Raichur during one-year period from 01-12-2014 to 30-11-2015. During the study period a total of 125 victims of Road Traffic Accident (RTA) with various severities of injuries who died and autopsied at mortuary of RIMS Hospital, Raichur were studied. The purpose of the study was to know the pattern of road users and offending vehicles, period of survival of victims following the accident and to establish the relation between the type of skeletal injury and cause of death.

Key words: RTA, Road users type, offending vehicle

Introduction:

The Global status report on road safety by the World Health Organization (WHO) published in 2013, is the second broad assessment of the status of road safety in 182 countries, building on the first Global status report on road safety published in 2009, the latter of which used data drawn from a standardized survey conducted in 2008. Large regional disparities exist in the death rates of road traffic accidents, the risk being highest in the African region (24.2 per 100,000 population), and the lowest in Europe (10.3 per 100,000). Young adults (between 15 and 44 years) account for almost 60 per cent of all traffic deaths, and half of the world's road traffic deaths occur among pedestrians (22 percent), cyclists (5 per cent) and motorcyclists (23 per cent). Proportion of deaths among different road user types show, however, considerable inter - and-intraregional variation.[1,2]

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Road Traffic Accident (RTA) is any vehicular accident occurring on the roadway (i.e. originating on, terminating on, or involving a vehicle partially on the roadway). This includes collision of an automobile with a pedestrian, another automobile or with a non-automobile on the roadway or fall from a moving vehicle causing injuries or death of involved individuals.

Pedestrian is any person involved in a vehicular accident who was not at the time of the accident riding in or on a motor vehicle, or animal drawn vehicle, or on a pedal cycle. Pedal cycle is any land transport vehicle operated solely by pedals (includes bicycle and tricycle). Pedal cyclist is any person riding on a pedal cycle or in a sidecar or trailer attached to such a vehicle. Motorcycle means two-wheeled motor vehicle, inclusive of any detachable sidecar having an extra wheel, attached to the motor vehicle. Motorcyclist is any person riding on a motorcycle or in a sidecar attached to such a vehicle. Light

motor vehicle means any public or private transport vehicle (passenger or goods) of unladen weight not exceeding 7,500 kgs e.g. auto rickshaw, car, jeep, taxi etc.

Medium motor vehicle means any public or private transport vehicle (passenger or goods) of unladen weight more than 7,500 kgs but not exceeding 12,000 kgs. E.g. Metador, Tempo, Van, Tractor, Cruiser, Bolero etc. Heavy motor vehicle means any public or private transport vehicle (passenger or goods) of unladen weight more than 12,000 kgs. E.g. Bus, truck, etc. Animal drawn vehicle is any non-motor vehicle driven by any animal. E.g. Tanga, Bullock cart etc.

Materials and Method:

The present study was a Prospective study. The study material comprised of victims of RTA who died in spot or died in RIMS Hospital & autopsied in the autopsy block (mortuary) of RIMS Hospital, Raichur during the 1-year period from 01 December 2014 to 30 November 2015.

Ethical clearance for the present study was obtained from the Institutional Ethical Committee RIMS, Raichur. In the present study information regarding the bio-data of the deceased and various characters regarding the circumstances of the accident like type of victim / road user, type of offending vehicle, time of death were gathered from all possible sources like police records, hospital records and also by direct interrogation with investigating officer, eye witnesses (if available), relatives and friends of the deceased accompanying dead bodies. In each case, a thorough external and internal examination was done for fractures and other injuries and opinion as to the cause of death was made after the examination. The data thus obtained was recorded in the predesigned and pretested Proforma, and analysed.

Results:

During the present study a total of 425 medico legal autopsies were conducted out of which 125 cases were of RTA with skeletal injury. All the victims of RTA had fracture of one or the other bone. Deaths due to RTAs accounted for (26.88 %) of the total medico legal autopsies conducted. (Table 1)

Table 1: Profile of Medico legal autopsies conducted during the study period

Type of Case	Number	Percentage
RTA with Skeletal injury	**125**	**26.88**
Poisoning	90	19.35
Burns	76	16.34
Drowning	17	3.7
Railways	47	10.1
Snake bite	11	2.3
Electrocution	10	2.1
Assault	8	1.7
Hanging	19	4.1
Natural Death	40	8.63
Others	22	4.8
	465	100

Out of 125 cases of fatal RTA, maximum 60 cases (48%) were motorcycle riders, followed by pedestrians 26 cases (20.8%) minimum were front seat passengers of four wheelers 6 cases (4.8%). (Table 2)

Heavy motor vehicle topped the list of offending vehicles 49 cases (39.2%) followed by MMV 36 cases (28.8%), LMV 13 cases (10.4%), Motor cycle 10 cases (8%), Others 10 case (8%), Unknown (Hit & Run) 7 cases (5.6%). (Table 3)

Most common vehicle causing motorcycle rider casualty was Medium Motor Vehicle (MMV-Cruiser, Innova, Bolero) 20 cases (33.33%), followed by Heavy Motor Vehicle(HMV-Bus, Lorry, Cranes) 16 cases (26.66%),

Table 2: Accident Victim / Road User Type

Accident Victim Type	No of Case	%
Rider	60	48
Pillion	10	8
Pedestrian	26	20.8
Driver	14	11.2
Front Seat Passenger	6	4.8
Rear Seat Passenger	9	7.2
Total	125	100

Table 3: Offending Vehicles		
Type of Vehicle	No of Cases	%
Motorcycle	10	8
LMV	13	10.4
MMV	36	28.8
HMV	49	39.2
Unknown	7	5.6
Others	10	8
Total	125	100

Table: 4 Vehicles Causing Motorcycle Rider Casualty		
Offending Vehivcle	**Number of Cases**	**Percentage**
Motor cycle	5	8.33
LMV	10	16.66
MMV	20	33.33
HMV	16	26.56
Unknown	2	3.22
Others	7	11.62
Total	**60**	**100 %**

Table: 5 Vehicles Causing Pillion Rider Casualty		
Offending Vehicle	**Number of Cases**	**Percentage**
Motor cycle	2	20
LMV	1	10
MMV	1	10
HMV	3	30
Unknown	3	30
Total	**10**	**100%**

Table: 6 Vehicles Causing Pedestrian Casualty		
Offending Vehicle	**Number of Cases**	**Percentage**
Motor cycle	3	11.53
MMV	8	30.72
HMV	12	46.08
Unknown	3	11.53
Total	**26**	**100 %**

Light motor vehicle (LMV-Auto, Tum Tum etc) 10 cases (16.66%), Others (hitting stationery objects like pole, wall etc) 7 cases (11.66%), Motorcycle with motorcycle 5 cases (8.33%), Unknown (Hit & Run) cases 2 (3.33%). (Table 4)

Most common offending vehicle causing pillion rider casualty was HMV 3 cases (30%) and unknown (hit & run) 3cases (30%). Motorcycle was the offending vehicle in 2 cases (20%), Light motor vehicle 1 case (10%), Medium motor vehicle 1 case (10%). (Table 5)

Most common offending vehicle causing pedestrian casualty was HMV 12 cases (45.15%) followed by MMV 8 cases (30.76%). Motorcycle was the offending vehicle in 3 cases (11.53%), Unknown vehicles was the offending vehicle in 3 cases (11.53%). (Table 6)

Most common offending vehicle causing Driver casualty was HMV 9 cases (64.28%) followed by LMV 2 cases (14.28%). MMV was the offending vehicle in 2 cases (14.28%), Unknown vehicles was the offending vehicle in 1 cases (7.14%). (Table 7)

In my study a total of 15 passengers died due to fatal RTA, out of which 6 were front seat passengers (FSP) and 9 were Rear seat passengers (RSP). The most common offending vehicle was Medium Motor Vehicle (MMV). (especially the Cruiser), in which 9 deaths were occurred followed by Light Motor Vehicle (LMV) in 5 cases and Heavy Motor Vehicle (HMV) 1 case. (Table 8)

In our study out of 125 cases of RTA, Spot death were observed in 43 cases (34.4%), 44 cases (35.2%) died on the way to hospital and in 38 cases (30.4%) died in the hospital. (Table 9)

Table:7 Vehicle s Causing Driver Casualty		
Offending Vehicle	**Number Of Cases**	**Percentage**
LMV	2	14.28
MMV	2	14.28
HMV	9	64.26
Unknown	1	7.14
Total	**14**	**100%**

Table: 8 Vehicles Causing FSP/RSP Casualty		
Offending Vehicle	**Number of Cases**	**Percentage**
LMV	5	33.30
MMV	9	59.94
HMV	1	6.66
Total	**15**	**100%**

Table 9: Place of Death of Victims		
Place	No of Cases	%
On the spot	43	34.4
On the way to hospital	44	35.2
In the hospital	38	30.4
Total	**125**	**100**

In our study, 44 victims (34.2%) died within 1 day (24 Hours) after the accident. The maximum number of deaths were observed between 1 day to 3 days (74 cases, 59.2%). 6 victims (4.8%) survived beyond 4 days but died within 1 week. Only 1 (0.8%) victim survived beyond 1 week but died within 2 weeks . (Table 10)

In the present study the cranial injury was observed in 45 cases, out of which in 39 cases (86.66%) the cause of death was attributed alone to cranial injuries where as in remaining 6 cases (13.33%) along with cranial injuries other fatal injuries were observed.

Death due to multiple injuries were accounted for 42 cases (33.6%) where in injury to lungs, pelvic bone fractures, thigh and leg bone fractures, abdominal and pelvic visceral injuries were observed in varying combinations.Death due to haemorrhagic shock was associated with 37 cases (29.6%). One person died due to Septicaemia. (Table 11).

Table 10: Period of Survival Following Accident		
Site	No of cases	%
< 24 Hours	44	35.2
1 day-3 day	74	59.2
4 days- 7 days	6	4.8
10 days- 14 days	1	0.8
Total	125	100

Table 11: Relation Between Fracture and Cause of Death		
Cause of Death	No of cases	%
Cranial Cause alone (Head Injury)	45	36
Multiple Injuries	42	33.6
Haemorrhagic Shock	37	29.6
Septicaemia	1	0.8
Total	125	100

Discussion :

Cause wise analysis of road accidents revealed that most of road accidents were due to over-speeding accounting for 36.8% of total accidents which caused 48,654 deaths and injuries to 1,81,582 persons. Dangerous/careless driving or overtaking caused 1,37,808 road accidents which resulted in 42,127 deaths and injuries to 1,38,533 persons during 2014. 3.2% of road accidents were due to poor weather condition. Driving under influence of drug/alcohol contributed 1.6% of total road accidents which rendered 7,398 persons injured and 2,591 deaths in the country. [3]

Profile of medico legal autopsies of fatal RTA (table no.1)

During the period of present study, it was observed that deaths due to RTA accounted for 26.88 % of total medico legal autopsies conducted i.e. more than 25% of unnatural deaths were due to RTAs. This result is **less** when compared with results of studies conducted at, Government Medical College, Jammu (48.92%)[4]; Government Medical College, Chandigarh (42.18%)[5] ; AIIMS, New Delhi (35.5%)[6]; PGIMS, Rohtak (29.8%)[7]; MLN Medical College, Allahabad (42.29%)[8] ; KMC, Manipal (36.50%)[9]; The results are **more** when compared with the results of studies conducted at RM College, Loni (24.1%)[10] Office of Judicial Medical Officer, Colombo (22.6%)[11]; P.D.U. Medical College and Associated Hospital, Rajkot (13.8%)[12].

The difference in the number of RTA related deaths observed in different studies can be explained by the fact that RTA depends upon various epidemiological factors like

geographical area, conditions prevailing in that region, category of road users, condition of road etc. Since Raichur is a very backward area High speed of driving by victims, bad road conditions with too many speed breakers with no proper signs, Improper enforcement by the traffic police might have contributed to this percentage of death.

Accident Victim/Road User Type (Table No.2)

In the present study motorcycle riders formed the largest group of victims (48%). Maximum number of rider casualties can be explained by the fact that our country is on a progressive path and the population is now able to afford purchase two wheelers further more banks offering purchase of vehicles on EMI basis has made it easier than before. Each house hold is having minimum of two to three vehicle this increase in vehicles creates congestion on roads, rash speed driving by youngster all lead to increase of casualty in this group.

Our study is similar to the results of study done at KMC Manipal, Karnataka were motor cyclists were involved in maximum number of cases (39.6%)[9]. However, in the following studies pedestrians were more than motorcycle riders, Government Medical College, Jammu (46.17%)[4]; Government Medical College, Chandigarh (42.14%)[13]; Greater Lusaka Zambia (46.34%)[14]; Maulana Azad Medical college, New Delhi (39.1%)[15]. In the study conducted at Brisbane Queensland maximum number of victims were car drivers (32.98%)[16] which is contrary to our result.

Offending vehicles(table no.3)

In our study the most common offending vehicle was heavy motor vehicle (39.2%). Involvement of Heavy motor vehicle in accidents can be attributed to their high speed, presence of single space roads, allowing HMV into the congested centre of the city roads, fatigability, intoxication etc. Similar finding was also observed in other studies conducted at Government medical college, Jammu[4], Government medical college, Chandigarh[5], AIIMS, New Delhi[6], PGIMS, Rohtak[7], RM college, Loni[10].

During 2014, two wheelers have accounted for maximum fatal road accidents, contributing 26.4% of total road accidental deaths, followed by trucks/lorries (20.1%), cars (12.1%) and buses (8.8%). 14.4% and 13.5% of deaths due to two wheel vehicles were reported in Tamil Nadu and Maharashtra respectively. 17.7% of deaths due to trucks/lorries and 15.5% of deaths due to accidents by cars were reported in Uttar Pradesh and Tamil Nadu respectively. Buses were responsible for 15.9% and 13.4% of fatal road accidents in Tamil Nadu and Uttar Pradesh respectively.[3]

Motor Cycle Rider Vs **Offending Vehicles(Table No.4)**

When we observe the table no.4, it is clear that the motor cycle rider causality was caused by all vehicles i.e Medium, Heavy and Low motor vehicles in various proportions. The congested roads, allowing heavy motor vehicles in the city limits, high speed and uncontrolled motor cycle riding, not following the traffic rules and avoiding helmets for various reasons might have increased the death rate in motor cycle riders in RTA.

Study conducted by Naveen kumar at.al in Varanasi observed that 37% of death has occurred in two wheeler riders.[17]

Jan Mohammadi et.al in a study at Northern Iran observed that the death of Motor Cycle Riders was of 84.1% among total RTA.[18]

Michael Fitzharis, Rakhi Dandona conducted a study on 378 motorised two wheeled vehicles (MTV) users were enrolled in a study of whom 252 (66.7%) were riders.[19]

Pillion rider vs **offending vehicles(table no.5)**

Jan Mohammadi et.al in a study at Northen Iran observed that the death of pillion riders was of 15.7% among total RTA.[18]

Pedestrians vs **offending vehicles(table no.6)**

Most common offending vehicle causing pedestrian casualty was HMV 12 cases (45.15%) followed by MMV 8 cases (30.76%). Motorcycle was the offending vehicle in 3 cases (11.53%), Unknown

vehicles was the offending vehicle in 3 cases (11.53%).

In an analysis of 101 pedestrian traffic deaths done at Czechoslovakia, higher occurrence of fracture of pelvis, femur and tibia was observed in accidents involving light motor vehicles and relatively more skull fracture, thoracic cage fracture and fracture of upper limb bones were seen in accidents involving medium and heavy motor vehicles.[20]

Pedestrians' deaths in road accidents were reported as 17.5% and 12.5% in Maharashtra and Kerala respectively.[3]

Study conducted by Kyada HC et.al in Rajkot city observed that pedestrians were the commonest victims of RTA.[21]

Drivers vs **offending vehicles (table no.7)**

In the present study it was observed that occurrence of fracture of bones was higher in collision with heavy motor vehicles. This may be because of greater degree of force of impact due to large mass and more speed of heavy motor vehicles.

Front seat passengers/rear seat passengers vs **offending vehicles (table no.8)**

In my study a total of 15 passengers died due to fatal RTA, out of which 6 were FSP and 9 were RSP. The most common offending vehicle was MMV (especially the Cruiser), in which 9 deaths were occurred followed by LMV in 5 cases and HMV 1 case.

The unrestrained passenger moves forward after collision and results in various skeletal injuries. The suddenness and force of impact will determine the severity of the injuries and survival of the victim. The violent impact of collision is more in rear seat occupants compared to front seat occupants since they are aware of what will happens next compared to rear seat occupants.

Place of Death (Table No.9)

In 54.8 % on the spot death cases heavy motor vehicles were the offenders. 84.1 % cases opted for treatment at tertiary centers. Injuries to chest/abdomen/pelvis proved to be fatal within 1 day. Deaths on the way to hospital were due to coma and hemorrhagic shock. These facts highlight the need for availability of prompt resuscitative measures and an approach of zero tolerance for traffic related hazards. This study finds that motor vehicle occupants suffered more severe injuries than the pedestrians. Whilst on the spot injuries requires preventive measures, a systematic approach needs to be incorporated to minimize deaths which occur on way to hospital and in the hospital. This study finds that on the way to hospital deaths were due to coma and hemorrhagic shock due to lack of prompt resuscitative measures in dealing with such emergencies. The success of the pre-hospital trauma management hinges on immediately making a triage and transport decision. Severely injured patients should be immediately transported to an appropriate hospital for definitive care using the "Load and go" philosophy, with all remaining care provided en route. Valu able pre-hospital care including a head to toe examination continuous monitoring, placement of subsequent intravenous access, and environmental control can be provided while the patient is being transported.[17]

In a study conducted by Singh YN et.al considering the place of death of the RTA victims, it is found that deaths in hospitals is highest (54.86%) which is more than the half of the total victims.[22]

Period of survival following accident(table no.10)

In our study, maximum number of victims (35.2%) survived for a period of less than 24 hours. This finding emphasizes the fact that the first 24 hrs following the accident is the most crucial period, which decides the outcome in such cases.

In the study conducted at GTB Hospital, Shahadra, New Delhi[23], 66% of victims died on the spot. Of the remaining victims, majority (45.44%) died within 24 hours, which is significantly higher than our result.

In other study carried out at MLN Medical College, Allhabad[8], maximum number of victims (40.21%) succumbed to the injuries sustained within 24 hrs after the accident. In another study conducted at Manipal, Karnataka[9], highest number of victims

(35.2%) died within 24 hours after the accident. The results of above studies are in general agreement with the results of our study.

Relation between fracture and cause of death(table no.11)

In the present study the cranial injury was observed in 45 cases, out of which in 39 cases (86.66%) the cause of death was attributed alone to cranial injuries where as in remaining 6 cases (13.33%) along with cranial injuries other fatal injuries were observed.

In our study 33.6 % of victims died due to multiple injuries. Deaths due to multiple injuries are injuries which are difficult to decide which was the most serious and mortal injury which lead to death of the victim, as in the crushed head with extrusion of brain or rupture of the aorta etc but in such cases it is quite acceptable to use the term 'multiple injuries', preferably listing several of the most lethal.[24]

In our study 29.6% of victims died due to hemorrhagic shock. Fracture of multiple bones was present in all the victims who died due to hemorrhagic shock. This may be due to the sudden and severe loss of blood because of injury to neighbouring blood vessels by the fractured bones. (The blood loss is, one to two litres in fracture of multiple ribs, one to three litres in open fracture of thigh, half to two litres in closed fracture of thigh, half to one litre in closed fracture of lower leg, quarter to half in fracture dislocation of ankle and two to two and half litres in fracture of pelvis [5]). From the above results, it can be said that fractures in one or the other way, are associated with fatal outcome.

In the study done at Birmingham accident Hospital, Birmingham[25], the skull was fractured in 72% of all head injury cases.

According to a study done at GTB Hospital, Shahadra, New Delhi[23], during January - December 2003, head injury was the most common cause of death (60.96%) and fracture of skull was present in 80% of the victims who died due to head injury.

In another study undertaken at Government Medical College, Jammu[26], head injury was responsible for majority of deaths (62.96%) and associated skull fracture was present in 93.18% cases.

Fatal RTA were more prevalent on the secondary road system (47.97 per cent) and especially involved pedestrian and two wheeler vehicle users.Numbers of skeletal injuries (199) and internal organ injuries (202) exceeded the total number of victims (98) clearly indicating the multiplicity of injuries. The majority of RTA victims (n=46, 46.93%) died due to head injury. The study showed that most deaths in RTA, brought to a tertiary care rural hospital, took place either on the spot or within 24 hours of injury which is very alarming and highlights the need to take urgent steps to establish good pre-hospital care and provision of trauma services at site.[27]

Most of the diseased are riders (60%). Head and neck (56.22%) is the most common part to receive injuries in two wheeler accidents. Head injury (47.48%) is the most common cause of death. Most of the people are died between 6 to 24 hours (27.27%) after the accident.[28]

An epidemiologic survey done by Ding SL et al of 2451 consecutive victims of traffic accidents, coming to or managed at, the emergency care department of a large Taipei metropolitan hospital in 1990. Major head injury fatalities occurred within one week of the collision.[29]

A fracture of skull with associated brain injury is the most common cause of death but multiple injuries constitute a typical feature of motorcycle accidents. The use of crash helmets has reduced fatalities at low speeds but afford little or no protection at high speed. A full face helmet is better that and open face helmet.[26]

In a study done by Banerjee KK et al out of 470 autopsies, 344 victims had traumatic fatality. The leading type of trauma was road traffic accident (RTA) (52%). Majority 258 of the victims had head injuries followed by thoracic injuries (169) and abdomen (125). Of

the associated with trauma 24% of victims were died within the first three hours and majority 79% of the victims were reached the hospital and survived for a different interval.[23]

Conclusion:

Increased motorization, rampant encroachment of roads, nasty tendency of violating traffic rules and anarchic traffic systems have greatly contributed to rapid increase in RTAs. Population explosion is a catalysing factor for a number of accidents. Good conditioned roads, following traffic rules and awareness about RTA in the people will definitely bring down the incidence of RTA.

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