Title of the Study: A Retrospective Analysis of the Pattern and Severity of Injuries in Victims of Road Traffic Accidents in Karachi, Pakistan during 2010-2011

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Abstract

Objective: To find out the socio-demographic profile, pattern and severity of injuries sustained in road traffic accidents.

Design: Retrospective hospital-based observational study.

Settings: Data were retrieved from the six government hospitals with medico legal officers during the period of two years i.e. from 1st January 2010 to 31st December 2011.

Participants: A total of 2221 official records of RTA which occurred in the study duration of 2 years were included in the sample of the study.

Main outcome measures: Patients socio demographic variables (age, sex, occupation, ethnicity, religion); type of vehicle; type of road user; time of RTA; outcome of RTA; whether the person was killed or injured, were recorded.

Results: The number of cases in the year 2010 and 2011 were 965 (43.44%) and 1256 (56.55%) respectively. Out of 2221 cases, 838 (37.73%) were killed while 1383 (62.26%) were injured due to RTA occurring in Karachi. Majority of subjects were between 16-30 years (50.96%) and males (94.01%) ($p<0.001$). Maximum number of cases were pedestrians (31.11%) hit mainly by the car (38.94%) ($p<0.001$). Head injuries were most common (59.4%) ($p<0.001$) leading to acute head trauma, the main cause of death in road accidents. Most cases were observed between 4 pm to 8 pm (51.62%) ($p< 0.001$).

Conclusion: Policies should be made based on the local evidence and research for the demographic, economical and other circumstances found in the developing countries.

Keywords: Road traffic; Accidents; Injuries; Severity; Mortality

Introduction

The growth of the transport system is to be a key element in economic development throughout the world. In the developing world, current trends in population growth, industrialization and urbanization are putting heavy pressure on the transport network in general and on road system in particular. One such unwanted effect, apparent only through cumulative statistics is Road Traffic Accident (RTA) which has become a growing and serious concern with deaths and injuries higher than the developed countries [1]. This marked increase in RTAs is associated with increase in the number of vehicles in these developing countries [2].

Road traffic accidents (RTAs) are a rising problem worldwide accounting for around 1.2 million deaths and over 50 million injuries annually [3]. About two third of these RTAs are in the third world countries [4]. It is expected that by the year 2020 they will rank third in the Global Burden of Diseases [5].

India has just 1% of the total vehicles in the world but it contributes to 6% of the global RTAs [6]. Estimates suggest that Delhi has the highest number of road crash fatalities in India [7].

Therefore, this study was conducted to study the socio-demographic profile of victims with road traffic injuries and pattern of injuries sustained. The time of accident, type of vehicle involved and the type of road user entailed in road traffic accidents were also identified in this study.

Methodology

The criminal law in Pakistan requires that the road traffic accident occurring anywhere which results in any sort of physical harm to any person be reported to the concerned medico legal officer in the setting of recognized government hospitals of the city. The details of these cases are recorded in an official record book maintained at each of these hospitals. In the event of death due to RTA, post mortem and autopsy reports are also included in this book. At the completion of each calendar year, these official records are submitted to the Police Surgeon Office.

We did a retrospective, cross sectional study to find out the number of cases of RTA involving deaths and injuries in Karachi reported in the six government hospitals with medico legal officers during the period of two years i.e. from 1st January 2010 to 31st December 2011. These hospitals were Civil Hospital Karachi (C.H.K.), Jinnah Postgraduate Medical Centre (J.P.M.C.), Abbasi Shaheed Hospital (A.S.H.), Sindh Government Hospital; Sardarabad, Malir, Sindh Government Hospital; Liquatabad, Sindh Government Hospital; Qatar, Orangi Town. The data concerning these hospitals were directly retrieved from the Police Surgeon Office, Karachi.

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For the purpose of the study, Road Traffic Accident was defined as "Any vehicle accident occurring on the road (i.e. originating on, terminating on, or involving a vehicle partially on the road) and resulting in injury or death to road users (i.e. driver, passenger and pedestrian)." Every accident meeting this criterion was included in the study irrespective of any socio demographic variables.

For the purpose of data collection, informed and written consent was taken from the office of police surgeon. The official records of patients were used to fill a structured Performa. This Performa was divided into four parts. The first part included socio demographic variables such as age, sex, occupation, ethnicity and religion. The second part included type of vehicle involved in the RTA, type of road user involved in the RTA and the time of RTA. The third part was related with outcome of RTA; whether the person was killed or injured as a result of RTA. In case of injury, the type of injury was noted while in the case of death, the contributory and ultimate cause of death was noted. In the last part of the Performa, the anatomical body parts involved in the RTA were noted. Data obtained in this way were entered in the SPSS version 17.0 and analyzed by using descriptive analysis.

Ethical Approval

An authorization to carry out the study was taken from the principal's office and the director of the research office through the institutional review board by submitting the structured synopsis containing objectives, design and methodology of the study. Further approval and authorization to collect the data related to our study was obtained from the Head Police Surgeon's Office and the medico legal officers of the hospitals from which the data was retrieved. The nature and design of the study was fully explained to these personnel and confidentiality in this regard was strictly maintained. Before starting the study, proper ethical approval was taken from the medico legal officers of the six government hospitals, collaborating with the study to record the details of the patients.

Statistical Analysis

All the analyses were performed using SPSS program version 17.0. A chi square (X2) statistic is used to investigate whether distributions of categorical variables differ from one another. We obtained a calculated p-value of 0.001 in the comparison of all categorical variables which means that there is only a 1% chance that this deviation is due to chance alone. Therefore, the null hypothesis is rejected and there is some factor other than the chance which is operating for the deviation to be so great.

Results

A total of 2221 official records of RTA which occurred in the study duration of 2 years were included in the sample of the study. The number of cases in the year 2010 and 2011 were 965 (43.44%) and 1256 (56.55%) respectively. Out of 2221 cases, 838 were killed while 1383 were injured due to RTA occurring in Karachi.

The minimum age of our study population was 2 year and maximum age was 70 years. The mean age of the persons involved in Road Traffic Accident was found to be 28.72 (+13.85). The age of all patients with RTA were divided into five age-groups. Out of these age-groups the proportion of age-groups most affected was from 16-30 years ($p < 0.001$) followed by the age group 31-45 years. The populations with age below 10 years and above 50 years were found to be not affected a lot. The involvement of age groups in each year is described in Table 1. Out of total 2221 persons, 2088 (94.1%) were males and 133 (5.99%) were females. The involvement of male sex was found to be significantly more than the female sex ($p < 0.001$). Total male to female ratio observed was approximately 16:1. The gender involvement for each year is depicted in (Table 1).

The most frequent road user involved in RTA was found to be pedestrians ($p < 0.001$) (Table 2) while the most common vehicle involved in RTA was car ($p < 0.001$) and motorcycle (Table 3), while the most frequent road user involved in RTA was found to be pedestrians

Years	2010		2011		Total	
Variables	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Age Groups (years)						
<15	130	13.47	175	13.93	305	13.73
16-30	487	50.46	645	51.35	1132	50.96
31-45	216	22.38	279	22.21	495	22.28
46-60	121	12.53	149	11.86	270	12.15
61-75	11	1.13	8	0.63	19	0.85
Gender						
Male	904	93.67	1184	94.26	2088	94.01
Female	61	6.32	72	5.73	133	5.99
Total	965	43.44	1256	56.55	2221	100

Table 1: Table shows the distribution of socio demographic variables of individuals in each year involved in the Road Traffic Accidents in Karachi, Pakistan.

Type of Road User	Killed		Injured	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Pedestrian	133	15.87	558	40.34
Bus Driver	76	9.06	48	3.47
Passenger	57	6.80	77	5.56
Cart Driver	19	2.26	38	2.74
Bicyclist	133	15.87	76	5.49
Motorcyclist	153	18.25	363	26.24
Car driver	247	29.47	64	4.62
Rickshaw Driver	20	2.3	159	11.49
Total	838	100	1383	100

Table 2: shows the Frequency and percentage of motor vehicular injuries and deaths in the type of road users involved in Road Traffic Accidents in Karachi, Pakistan.

(p<0.001) (Table 3). The most frequent time in which RTA occurred was found to be between 4 pm to 8 pm (p<0.001) as shown in (Table 4).

The frequency and percentages of the different types of injuries are shown in (Table 5). Acute head trauma was found to be the most common contributory cause of death in the persons who were killed as a result of RTA (p<0.001). The other causes of death are shown in (Figure 1).

Discussion

Statistics for deaths and injuries due to road accidents in Karachi are based on the data provided by the Police surgeon office and is highly remarkable. Out of 2221 cases, 838 (37.73%) were killed while 1383 (62.2%) were injured due to RTA occurring in Karachi. Moreover, road traffic accidents were significantly increased within one year interval as the numbers of cases reported in 2010 were 965 (43.44%) and in 2011 were 1256 (56.55%). These large numbers of accidents and deaths pose a huge burden on the economy of the countries. By outlining the distribution of road traffic deaths by demographic variables, we found that age group of 16 to 30 years are the most vulnerable [8]. Youths are unable to handle complex traffic environments and greater speeding imposes greater fatalities in productive age groups. Males being more involved in driving therefore have higher fatalities. The percentage of road traffic deaths among car drivers estimated to be 29.47% which is consistent with study from Europe [9]. Stratification according to type of vehicle showed most involvement of cars (31.86%) and bus (31.74%) followed by truck (27.20%) [10,11]. Diffuse injuries were involved in 70.28% of the fatalities while acute head trauma was the main cause of death with cardio respiratory failure, the ultimate cause. This existing burden of road traffic deaths and increasing trend is necessary for developing effective interventions. Policies should be made based on the local evidence and research for the demographic, economical and other circumstances found in the developing countries. International efforts should be made to promote learning among developing countries about policies that can successfully reduce the fatalities from road traffic accidents in the developing countries.

The present observational, retrospective study revealed that most of the accidents occurred in the age group of 16-30 years (50.96%) with a lesser number among those less than 10 years (13.73%) and above 50 years (11.21%). Similar pattern of age distribution of road traffic accident victims has been observed in other studies from developing countries like Saudi Arabia, Mozambique and India [12-15]. Considering the higher frequency of accidents in the economically productive age group, it is very essential to plan the appropriate interventions for this age group as they have an economic impact. Higher frequency in young age is attributed to their youthful behavior as they more endanger themselves to the risk. Lower frequency of road

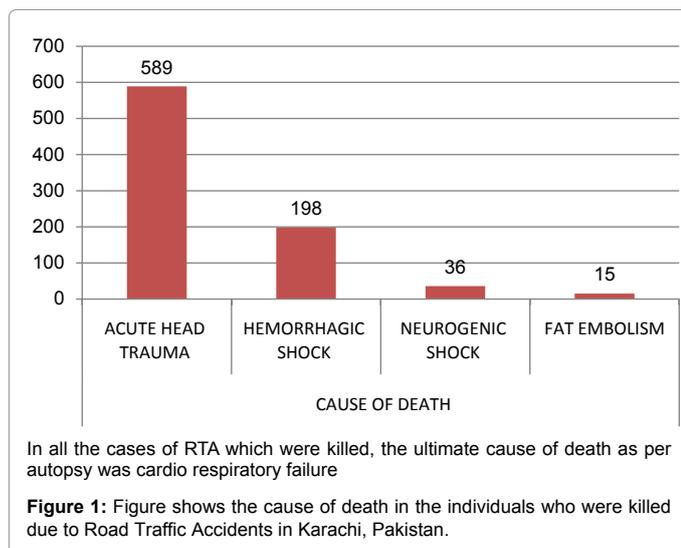| Type of Vehicle	Killed		Injured	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Car	267	31.86	598	43.23
Bus	266	31.74	78	5.63
Truck	228	27.20	211	15.25
Motor Bike	77	9.18	477	24.49
Rickshaw	0	0.00	19	1.37
Total	838	100	1383	100

Table 3: shows the Frequency and percentage of motor vehicular injuries and deaths in the type of vehicle involved in Road Traffic Accidents in Karachi, Pakistan.

Time of Accident	Killed		Injured	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
7 am to 12 pm	76	9.06	76	5.49
12 pm to 4 pm	171	20.40	326	23.57
4 pm to 8 pm	248	29.59	714	51.62
8 pm to 12 am	172	20.52	210	15.18
12 am to 7 am	171	20.40	57	4.12
Total	838	100	1383	100

Table 4: shows the Frequency and percentage of motor vehicular injuries and deaths in relation to timing of Road Traffic Accidents in Karachi, Pakistan.

Type of Injury	Killed		Injured	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Abrasion	0	0.00	386	30.73
a) Moving Abrasion	0	0.00	158	40.93
b) Imprint Abrasion	0	0.00	95	24.61
c) Friction Abrasion	0	0.00	133	34.45
Laceration	96	11.45	362	28.82
a) Split Laceration	70	72.91	180	49.72
b) Overstretch Laceration	12	12.5	112	30.93
c) Grinding Laceration	14	14.58	94	25.96
Contusion	38	4.53	232	18.47
Fracture	0	0.00	118	9.39
Multiple Injuries	115	13.72	285	22.69
Diffuse Injury	589	70.28	0	0.00
Total	838	100	1383	100

Table 5: shows the Frequency and percentage of type of injury that incurred due to Road Traffic Accidents in Karachi, Pakistan.

In all the cases of RTA which were killed, the ultimate cause of death as per autopsy was cardio respiratory failure

Figure 1: Figure shows the cause of death in the individuals who were killed due to Road Traffic Accidents in Karachi, Pakistan.

accidents below 10 years and above 50 years could be explained by the fact that children are less commonly involved in driving and are under the control of the elders during travel and lesser mobility of elderly people.

Majority of those injured in the present study were males (94.01%) with a male: female ratio of 16:1. This is in consistency with other studies from Germany [16] and India [17,18]. Males being more involved in the outdoor activities and vehicle driving, therefore contributed themselves more towards accidents. Greater preponderance of males than females is also due to the fact of more crash driving, fatigue, greater alcohol consumption, talking on cell phone, inattentive behaviour, drugs intake and more risk taking attitude while driving [19].

In this study the pedestrians constituted (56.21%) of the main road users involved in RTA, followed by motorcyclist (44.49%). It was found that the present results are quite comparable with results from studies by other researchers. The higher preponderance of pedestrians is also been observed in other studies [20-22]. These findings categorize pedestrians and motorcyclist as the most vulnerable road users due to their lack of protection in the event of a crash. Densely built up and busy urban environments are areas where pedestrians are most at risk. Pedestrians are mainly exposed to the risk of road accident when crossing a road in urban areas. Therefore, extra precautionary measures should be taken by these road users while on the road.

The analysis of road accidents in Karachi showed that cars and trucks are the most frequently involved in vehicle pedestrian accidents where the major collision partner of a pedestrian is a car (75.09%) followed by trucks (42.45%). In the study from China, the number of passenger cars involved in the pedestrian accidents was observed around 60% to 85% of the reported vehicle pedestrian accidents [23]. Car and truck accidents are mostly attributable to the excessive speeding, drunk driving, changing lanes without signalling and less stability of the vehicle. There is great potential of reduction of the accidents and fatalities by enhancing safety consciousness of all road users, improving the traffic administration, and strictly implementing the traffic laws.

The study also showed that frequent time in which RTA occurred was between 4 pm to 8 pm (43.31%) i.e. in the evening [24] followed by 2 pm to 4 pm (22.37%) i.e. in the afternoon. In the evening it is due to heavy traffic load because people are off from their work and heading

towards their home, while in after noon it may be due to increase number of van and school buses on the road.

The analysis also showed, the higher number of reported accident cases occurred on week days (Monday-Fridays) (55.60%), when compared to weekends (Saturdays and Sundays) (44.4%) [24]. This could be because people celebrate Sunday as holiday and relax at home and traffic load only observed during evening hours and on week days it may be because people are in a hurry to go to various places to join their working places and on a way back to home.

In the present study, the regions most commonly affected externally were head and face followed by extremities (upper and lower limb). This is analogous to findings of earlier studies from USA, Sweden and India where lower limb and head injuries were reported to be most common injury sites for pedestrians [25-28]. Regarding type of injury, among killed diffuse injuries were frequent. While in injured cases majority of the patients had abrasions and lacerations [29]. Total cases of fracture reported were 118 making referral to the orthopaedics department.

The association of fatality was very appreciably coupled with the presence of head injury at the time of accident [30], followed by hemorrhagic shock. Ultimate cause of death was found to be cardio respiratory arrest. Early documentation and localization of intracranial haemorrhages guides the neurosurgical intervention and prompt management of these patients.

Prompt treatment of head injuries involves immediate Glasgow Coma Scoring, Radiological Evaluation, Surgical Intervention and Intensive Care in all appropriate cases, as the first few minutes are crucial for the final outcome. The Advanced Trauma Life Support (ATLS) 16 guidelines should be adhered to, while treating all cases of suspected head injury.

Conclusion

Data regarding the socio-demographic and injury profile of victims of RTAs in Karachi may therefore, help policy makers to evolve plans aimed at prevention of RTAs and provision of immediate care for victims of RTAs.

Conflict of Interest

All the authors declare that they have no conflicts of interest. Also, there is no financial or non-financial source to support our research.

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