Pattern of Injuries from Road Traffic Accidents Presented at a Rural Teaching Institution of Karachi

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Abstract The aim of the study is to study the pattern of injuries from road traffic accidents presented at the emergency department of a rural teaching institution in Karachi. This descriptive case series was conducted prospectively in the Emergency Department of Fatima Hospital and Baqai Medical University from 1 January 2012 to 21 March 2013. There were 385 patients in the series. All of the patients with recent injuries from road traffic accidents were included. Cases with injuries more than 72 h old were excluded. The majority of patients had lower limb injuries 172 (44.7%), followed by head and neck injuries 107 (27.8%), multiple injuries 62 (16.1%), upper limb injuries 22 (5.7%), abdominoperineal injuries 19 (5%), and chest injuries 3 (0.8%). Majority (229, 59.5%) of patients were given first aid treatment and discharged, while 151 (39.3%) patients were either admitted or referred to better equipped hospitals. Three patients were brought dead, and two patients left against medical advice. The lower limb injuries were the commonest road traffic accidental injuries, followed by head and neck injuries, multiple injuries, upper limb injuries, abdominoperineal injuries, and chest injuries.

Keywords Road traffic accidents · RTA · Injuries · Lower limb · Karachi

Introduction

Road traffic accidents (RTAs) account for significant but preventable cause of mortality and morbidity with resultant heavy economic burden on health-care system [1–7]. It results in death of about 1.2 million people annually worldwide with more than 90% deaths occurring in low-income and middle-income countries [2, 5, 8]. The total injured is estimated to be as great as 50 million [6, 9]. It is projected that RTA will be the second most common cause of disability-adjusted life years in the developing countries in the year 2020 [10]. China is the most populous country in the world and accounts for 13.5% of all deaths due to road accidents [5]. WHO 2009 report estimated RTA-related death in Pakistan as 25.3 per 100,000; however, the current statistics reported a decrease in RTA in Pakistan with death rate of 20.22% with a ranking of 67 among all the countries [11]. It is the 15th leading cause of deaths in Pakistan [12]. WHO reported death rate in other countries as follows: Iran 43.54%, Iraq 41.41%, Nigeria 35.39%, Saudi Arabia 25.33%, Malaysia 25.25%, Brazil 24.13%, India 20.74%, China 18.49%, Egypt 15.34%, Turkey 12.23%, USA 9.99%, Canada 5.86%, Australia 5.67%, Japan 3.28%, UK 2.97%, and Maldives 1.05% [12]. Injury data in developing countries is derived either from hospital register or police records, and both these sources actually underestimate the total burden of the injuries. In Karachi, there are large numbers of hospitals, and it is extremely difficult to collect data about all RTA from each hospital [4].

Fatima Hospital is a 500-bedded teaching hospital attached with Baqai Medical University, located in Gadap Town. Its Accident and Emergency Department consists of 15 beds, an ICU with 6 beds, minor procedure room, and an emergency operation theater. It is located on Super Highway at the entry point of Karachi. This is 136-km-long four-lane highway between Karachi and Hyderabad, with all types of high-speed vehicles.

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The pattern of injuries varies with the type and the speed of the vehicle, the position of the victim in the vehicle, the use of the protective gadgets, and whether the victim is a pedestrian. Very few local studies are available on the epidemiology and pattern of injuries in road traffic accidents. This study is carried out to find the pattern of injuries from road traffic accidents presented at emergency department of rural teaching institution in Karachi.

Methods

This descriptive case series is a prospective analysis of all road traffic accident cases reported in the Accident and Emergency Department of the Fatima Hospital and the Baqai Medical University, Karachi, from 1 January 2012 to 21 March 2013. With 95% confidence level, 0.5 standard deviation, and a margin of error (confidence interval) of $\pm 5\%$, a sample size of 385 is required. The inclusion criteria were all patients with recent road traffic accident injury, less than 72 h old. Cases older than 3 days and those that left against medical advice were excluded.

Approval of the study was obtained from the ethical committee of Baqai Medical University, and the study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained in all cases either from the patient (if conscious and adult) or from the attendant (if unconscious or minor). The data was entered into data sheet of SPSS on weekly basis using record from RTA proforma, patient's file, admission register, and operation theater register. Additional information also obtained from police or ambulance personnel. The variables noted and analyzed were patient's demographic data, accident site, position of the victim, vehicle type, use of protective gadgets, cause of accident, body region injured, type of injury, clinical stability, and mode of dispose (discharged, admitted, referred, or left against medical advice). The data was analyzed by SPSS version 16 on computer.

Results

We enrolled 385 RTA cases from 1 January 2012 to 21 March 2013. The sex distribution was 313 (81.3%) males and 72 (18.7%) females, with a male-female ratio of 4.35:1. The mean age of the patients was 28.2 years (std. deviation 12.69, std. error of mean 0.647, range 1–68 years). Figure 1 shows male and female distribution in each decade of life. The mean reporting time was 153 min (std. deviation 74, std. error of mean 4, range 30–690 min). Only 8.1% patients reached the hospital within the golden hour, about 49.9% within 2 h,

Fig. 1 Age and sex graph, in each decade of life

and 79% within 3 h; 1% of patients had taken more than 7 h to reach the hospital.

Table 1 summarizes the risk factors associated with RTA injuries. The most common age group was third decade (32.5%), followed by fourth decade (24.9%) and second decade (17.4%). The most accidents occur on Super Highway (61.8%), and the most common vehicle was motorcycles (73.5%). Victims were mostly drivers (53.5%). Most of the victims were not using protective gadgets (72.5%). The laborers, dependents, and students were the most injured groups (25.5, 23.6, and 22.3%, respectively).

Table 2 summarizes the cause of accidents and the mechanism of injury. Most accidents occurred from skidding of the vehicle (36.9%), followed by being hit by another vehicle (33.5%), overspeeding (9.6%), reckless driving (7%), bad road condition (6.5%), sleepiness (3.4%), mobile use (2.3%), and tire burst (0.8%). In 119 cases, injuries occur without any collision, whereas it occurred from head-on collisions in 117 cases. Table 3 shows the cause of accidents that occurred on the two different road types. Table 4 summarizes pattern of injuries. The lower extremity was injured most commonly (44.7%), followed by head and neck (27.8%). Lacerations were the most common injury. Lacerations without fractures were noted in 31.4% and with fractures in 24.2% cases.

Discussion

Globally, about 1.2 million deaths occur due to injuries from RTAs, and 90% of these occur in low-income and middle-

Table 1 Risk factors associated with RTA injuries

Risk factors	Frequency	Percent
Sex		
Male	313	81.3
Female	72	18.7
Age class		
0–10	33	8.6
11–20	67	17.4
21–30	125	32.5
31–40	96	24.9
41–50	42	10.9
51–60	17	4.4
61–70	5	1.3
Accident site		
Super Highway	238	61.8
Gadap Town roads	147	38.2
Vehicle type		
Cycle	10	2.6
Motorcycle	283	73.5
Car	24	6.2
Bus	29	7.5
Heavy vehicle	2	0.5
No vehicle (pedestrian)	37	9.6
Victim position in vehicle		
Driver	206	53.5
Passenger	142	36.9
Front seat	19	4.9
Back seat	123	31.9
Use of helmet/seat belt		
Yes	106	27.5
No	279	72.5
Occupation		
Professional	23	6.0
Office work	70	18.2
Laborer	98	25.5
Dependent	91	23.6
Business	17	4.4
Student	86	22.3

income countries [13]. The Asia/Pacific region comprises 54% of world's population and only 16% of world's vehicles,

Table 3 Cause of accident vs. site of accident

Cause of accident	Super Highway	Gadap Town roads	Total
Skidding	90	52	142
Hit	55	74	129
Overspeed	26	11	37
Reckless driving	26	1	27
Road condition	19	6	25
Mobile use	6	3	9
Sleepy	13	0	13
Tire burst	3	0	3
Total	238	147	385

but suffering 44% of RTA fatalities [14]. This study shows that males were injured the most (81.3%), while age-wise third (32.5%), fourth (24.9%), and second (17.4%) decades were affected in decreasing order (see Table 1). The findings are similar to those reported earlier in different regional settings [15–18]. The age and sex dominance reflects the nature of job and activities of these people. Younger people are mostly out of their homes and on road in pursuit of education and training, while males are mostly the sole earner for their families [17, 18]. They mostly used public transport (buses and minibuses), cars, motorcycles, or cycles for these traveling purposes [18]. Consequently, this is the loss of most economically active members of the society that subsequently results in economic burden both to the family and the nation.

We found that the most affected groups were laborers (25.5%), dependents (23.6%), students (22.3%), and office workers (18.2%). Again, this reflects the outgoing nature of their occupation, making them vulnerable to accidents. The laborers (manual workers) were the most injured group as they have to travel by public transport or motorcycles without any helmet because of limited financial resources. The dependents (who were not earning by themselves) include mainly housewives, elderly, and children, who were riding on the back seat of motorcycles, cars, or using public transport (buses and minibuses) and without using any protective gadgets. The

Table 2 Cause of accidents and the mechanism of injury

	With head-on collision ^a	Side collision	Without collision	Total frequency (%)
Skidding	18	5	119	142 (36.9)
Hit by another vehicle	117	12	0	129 (33.5)
Overspeed	17	11	9	37 (9.6)
Reckless driving	9	8	10	27 (7)
Road condition	3	14	8	25 (6.5)
Mobile use	5	2	2	9 (2.3)
Sleepy	3	5	5	13 (3.4)
Tire burst	0	0	3	3 (0.8)
Total (frequency, %)	172 (44.68)	57 (14.81)	156 (40.52)	385 (100)

^a At least one vehicle collides head-on

Table 4 Pattern of injury

Body region	Type of injury				Total (%)
	Abrasions	Lacerations (all)	Fractures (closed)	Bruising/hematoma	
Head and neck	14	68	14	11	107 (27.8)
Thorax	0	0	2	1	3 (0.8)
Abdomen and perineum	0	2	9	8	19 (5)
Upper extremity	7	12	1	2	22 (5.7)
Lower extremity	43	76	11	42	172 (44.7)
Multiple	7	40	10	5	62 (16.1)
Total (%)	71 (18.4)	214 (55.6)	32 (8.3)	68 (17.7)	385 (100)

students also used these modes of travel, but in addition, due to reckless attitude of youthfulness, they hate using protective gadgets and enjoy breaking rules. An Indian study also reported 29.6% dependent sufferers, as people of Pakistan and India shares nearly same socioeconomic and cultural values [18]. Regarding patients, we found that the drivers were injured more often (206 cases, 53.5%); this was followed by passengers (36.9%) and pedestrians (9.6%). The higher driver's injury was due to the fact that motorcycles were used as a mean of transport by students, laborers, and low-income people, and most of the times, they were traveling alone. An Ethiopian study reported passengers as the most commonly suffered (45.8%), followed by pedestrians (33.8%) and drivers (18.8%) [17]. A Nigerian study reported passengers in cars/buses as the most commonly injured (34.2%), followed by motorcycle drivers (26.7%) and motorcycle passengers (18.5%) [16]. Motorcyclists (283 cases, 73.5%) were the most injured group in this study, followed by pedestrians (37 cases, 9.6%). A study from Italy reported similar findings [19]. An Indian study reported pedestrians and two-wheel riders as the largest injured group (28.5% each) [18]. Another study from India reported 45.42% cases of two-wheelers' accidents [20]. The reason is that motorcycles are the most common, convenient, and cheap mode of short-distance travels being used by low-income group including laborers, office workers, and students. This accounted for its higher injury rate. Similarly, buses and minibuses are the cheapest mode of travel for long distances.

Regarding the vehicles involved, we found motorcycles (as stated above) as the most common vehicle involved in RTAs (73.5%); this was followed by buses (7.5%), cars (6.2%), and bicycles (2.6%). Surprisingly, the second highest involved was pedestrians (9.6%); this is mainly not only due to lack of education among pedestrians about the use of roads but also due to negligence and irresponsible behavior of drivers. The Nigerian study also reported motorcycles as the most commonly involved vehicles (52.6%), followed by minibuses (27.5%) and cars (12.1%) [16]. The Ethiopian study also reported motorcycles as the most commonly involved (31.2%),

followed by 21.7% due to Isuzu (pickup trucks) and 14.2% due to Bajaj (three-wheel motor rickshaw) related accident [17]. We found 238 cases (61.8%) of RTAs occurring on Super Highway (urban road) and 147 cases (38.2%) from Gadap Town (rural) roads. One Indian study reported 47.97% RTA cases on secondary systems, i.e., state highways and major district highways, followed by 27% on rural roads [18]. The Nigerian study reported almost equal frequency of RTA injuries on rural (interstate) and urban (intracity) roads (180 and 183 cases, respectively) [16].

In our study, only 8.1% patients reached the hospital within the golden hour, about 49.9% within 2 h, and 79% within 3 h; 1% of patients had taken more than 7 h to reach the hospital. In contrast, the Ethiopian study reported 78.4% cases presenting to the hospitals within 24 h to 1 week of the injury, followed by less than 24 h in 10.7% cases [17]. However, a study from Tehran (Iran) showed an average prehospital time interval of only 7.1 min which is much shorter than in our study [21]. The differences in reporting time following RTAs across the countries may be due to variation in infrastructure of the city including ambulance services, communication network, road infrastructure, and availability of nearby hospitals, as well as general awareness of the public [17, 20].

We found that the most frequent cause of accident was skidding of vehicle (motorcycle) which leads to higher rate of motorcyclist injuries. Out of 142 slippage injuries, 119 occur without any collision, while 18 suffered head-on collision and 5 side collisions. Slippage may occur due to wet road, bad carpeting, speed breakers, overspeeding, and mobile phone use. An Indian study reported negligence of traffic rules (24.0%) as the most common cause of RTAs, followed by excessive speed (23.14%), with injuries occurring from side-on and head-on collision [15]. Overspeed is a major contributing factor to both the occurrence and the severity of road traffic injuries [22]. The Nigerian study reported most injuries occurring from head-on collisions, which they suggested as may be due to the poor state of the roads and poor driving technique and impatience [16].

The use of safety devices like seat belt, air bag, and helmet reduces the fatality of injuries in RTA [19]. However, we found that only 27.5% of injured were using these safety devices. Wong and Leong [23] reported that only 10.44% victims were using helmet during driving the two-wheeler, while Amit [20] found that only 4.25% victims were using helmets and none were using seat belt. This may be due to lack of knowledge (from illiteracy), lack of proper driver's training (by obtaining driving license through illegal means), or lack of penalty fear (due to weaknesses in law enforcement agencies). This fatal negligence can be changed through mass education/awareness campaigns [20] in educational institutions, work places, and public places (like shopping plazas and picnic places). Media can play a leading role in this regard. Driving license should only be issued after attending driving school and clearing both driving skills and knowledge tests. Finally, the traffic police should work for enforcement of the use of safety devices with heavy penalties for violators. Other actions that can help reduce RTA and its fatalities include increasing standards of road carpeting, installing road signs at appropriate places, installing speed monitoring cameras, installing street lights, seat belt warning in vehicles, providing seat belts in public transports, and enforcing helmet use for the motorcycle pillion riders [16, 18, 22, 24]. Drivers need to be educated on tire management, tackling different weather conditions and respecting other user's right [18, 24].

Regarding the site of injury, we found lower extremities as being the most commonly involved (172 cases, 44.7%); this was followed by head and neck region (27.8%), multiple injuries (16.1%), upper extremities (5.7%), abdomen, pelvis, and perineum (5%), and thorax (0.8%). The Ethiopian study also reported lower extremity as the major injury site (47.4%), followed by upper extremity injury (32.8%) [17]. Lacerations (without fractures) were the most frequent type of injury (31.4%), followed by lacerations with fractures (24.2%), abrasions (18.4%), bruising/hematoma (17.7%), and closed fractures (8.3%). A study from France reported open wounds as the most frequent injury categories, followed by fractures, dislocations, and sprains [15]. The Nigerian study reported soft tissue injuries (71.9%) and fractures as the most common type of injuries and head and neck as the most common injury site [16]. More than a third of their patients had multiple injuries, and tibia and fibula were the most common bone fractured [16]. The Indian study reported head, neck, and face as the most frequent injury site (32.44%), followed by the upper extremities (21.01%) and the lower extremities (19.68%) [18]. They also found abrasions as the commonest injury type (56.38%), with contusions (22.34%) and lacerations (21.27%) occurring almost equally [18]. A study from Saudi Arabia reported upper and lower extremities and the head as the most often injured body regions [24].

Regarding the outcome, 229 patients (59.5%) were discharged after treatment in the emergency department, while 145 patients (37.7%) were referred due to lack of expert services available at that time. The emergency department of

BMU was mainly run by house officers, with lack of residents and consultants round the clock. Its location is outside the main city area, and because of the infrastructure and law and order situation of Karachi, the consultants were reluctant to visit the emergency during night times. As a result, house officers had no option but to refer the patients to other facility within the city. The Nigerian study reported 72.5% patients treated and discharged from the A and E Department, but there were no referrals [16]. They reported mortality of 4.7%, as compared to ours of 0.8%, which was within the expected worldwide range of 0.5–6% [16]. Head injury was the cause of death in all of our three cases, which is similar to that reported by the Indian study [18].

The major ambulance operators on Super Highway were well aware of the infrastructure and limited facilities available at Fatima Hospital. So, their tendency is to transfer major and serious injured cases straight to a better tertiary care facility within the city. This accounts for low incidence of thoracic and abdominoperineal injuries, a major limitation of this paper. Another limitation is the lack of reliable information about drug abuse and alcohol consumption. Other limitations of the study are small sample size and non-inclusion of urban areas of the city, which limits the generalization of the results.

Conclusion

Motorcycle accidents due to skidding of the vehicle were the most common accident type. Lacerations from lower extremity injuries were the most common injury pattern. However, these injuries are preventable. Law enforcement agencies and media should work together in educating people regarding the use of safety devices and road rules.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval “All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.”

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