ORIGINAL ARTICLE

Non-Fatal Limb Injuries in Motorbike Accidents

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ABSTRACT

Objective: To determine frequency and pattern of non-fatal limb injuries in motorbike accidents victims.

Study Design: Cross-sectional observational study.

Place and Duration of Study: Study was conducted at Jinnah Postgraduate Medical Centre (JPMC), Karachi, from October 2006 to March 2007.

Methodology: Trained data collectors prospectively collected data from the emergency department of JPMC, Karachi using structured pre-tested questionnaires. All motorbike accident victims presented to Emergency department with single or multiple bone injury in body extremities were included. Head injury patients who had first presented to neuro-surgery department were excluded. Motorbike accident victims with soft tissue injuries were also excluded from this study. Chi-square test was applied to find out statistical significance at 95% confidence level. P-value <0.05 was considered as significant.

Results: A total of 137 (39%) patients presented with tibial injury among the study sample of 348 patients, which was significantly higher than the bone injuries of the body part (p<0.001). Out of those, in 26% of patients, fibula was also involved along with tibia fracture. Other bone injuries included femur (16%), radius (9.2%), humerus (8.3%) and others. Radius was the commonest injured bone and in highest proportion among upper limb injuries (p<0.001). Overall, 66% of the injuries in motorbike involved lower limb fractures. The highest proportion of motorbike accidents were observed on Saturdays (31%). Majority of the accident victims were in the age group between 16 and 30 years (41% accident cases), 27% in age group 30 to 45 years, 15% in 45 to 60 years and 5% in >60 years. Those with less than 15 years accounted for 12% of cases.

Conclusion: Tibial bone is at the greatest risk in motorbike accidents probably due to its superficiality and exposed position while riding motorbike. Protective measures need to be taken for the prevention of disability associated with lower limb involvement in motorbike accidents.

Key words: *Tibial injury. Motorbike injury. Road-traffic accidents. Lower limb injury.*

INTRODUCTION

Road Traffic Accident (RTA) is considered as one of the leading causes of mortality and morbidity all over the world and is estimated to kill around 3,000 people everyday.[1,2] RTA is between second to sixth leading causes of death in age groups 15-60 years.[3] Although, a number of studies have been conducted and published on RTA in the past few decades, the estimation of the burden and the pattern of injuries due to motorbike accidents is relatively overlooked. Motorbike injuries account for health problem globally but the hazard in Asian countries is particularly noteworthy.[4] In Malaysia approximately 35-40% of all RTA involved motorcyclists, and 50-60% of deaths due to motor vehicle accidents involved motorcyclists.[5] Similarly, statistics are not very different in Singapore.[6] In Pakistan, RTA is the third most common cause of mortality among men in large cities (after circulatory disorder and T.B).[7,8]

Due to the dangerous outcomes, most of the research studies have been focused on head injuries associated with motorbike accidents, however, high burden of injuries and disabilities resulting from lower limb trauma is a hidden catastrophe.[9] Tibia and fibula are frequently injured in motorbike accidents due to their superficiality.[10] Many victims of motorbike accidents also suffer from other disabilities principally owing to the lower limbs involvement. On literature search from our part of the world, it was found that very few studies have addressed this particular issue of lower limb injuries associated with motorbike accidents.

The purpose of this study was, therefore, to determine frequency and pattern of limb bone injuries attributed to motorbike accidents.

METHODOLOGY

This cross-sectional, observational study was conducted at Jinnah Postgraduate Medical Centre, Karachi, from October 2006 to March 2007.

Sample size was calculated by Epi Info software on the basis of previous study,[9] keeping prevalence (of lower

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limb injuries in motorbike accident) of 58%, with 5% probability of type I error, 5% bound on the error of estimation and 80% power. Additional 10% sample was added for non-respondents.

Data was prospectively collected by house officers and medical students working in Orthopaedic Department of Jinnah Hospital, Karachi, using data sheets and questionnaire pre-tested on 35 (10%) patients in the pilot phase. Data was collected within 24-hour of patients' presentation in the Emergency room. Three days training was provided to all data collectors and purpose of the study, data collection procedure and methodology was explained to them.

All patients presented to Emergency Department with motorbike injuries with single or multiple bone injury in the body extremities, confirmed by radiography, were included in the study by convenient sampling. Large and small joints dislocation cases were also included.

Head injury patients were excluded who first presented to neurosurgery department. Motorbike accident victims with only soft tissue injuries were also excluded from this study (confirmed by clinical examination and radiography).

The studied variables were demographics, time of injury, time from injury to hospitalization, cause and nature of injury, status of patients on motorbike (driver/passenger) and definitive anatomical injury diagnoses obtained from radiology reports.

Dependent variables included bone injuries in body extremities as the primary defined outcome. Independent variables included age of the patients, gender, marital status, time and day of injury and status of patients on motorbike as driver or passenger were also analyzed as associated factors.

All patients were conscious at the time of presentation in Emergency department with limb injuries due to motorbike accidents. Informed oral consent was taken from all patients after explaining the purpose of the study. Study protocol approval and permission was granted by Jinnah Postgraduate Medical Centre. Data was double entered in Epi Info by a computer operator and then validation of data entry was also done in Epi Info.[11] Statistical analysis was done using SPSS version 14.[12] Chi-square test was applied on proportions to test the statistically significant difference for occurrence of tibial injuries in comparison to the proportions of other bone injuries at 95% level of significance. P-value >0.05 was considered as insignificant.

RESULTS

A total of 137 (39%) patients were presented with tibia bone injury in the study sample of 348 patients, who were injured in significantly higher proportion as compared to bone injuries of the other body parts ($p<0.001$). Out of those, in 91 (26%) patients, fibula was also involved along with tibial injury. Other lower limb injuries included femur in 55 accident cases (16%), metatarsal in 12 cases (3%), pubic bone in 6 cases (2%), medial and lateral meleolus in 6 cases for each (2%), ankle injury in 5 victims (1%), patella in 5 cases (1%) and others (Table I). Overall, 66% of injuries in motorbike involved lower limb fractures, which was significantly higher than upper limb injuries ($p<0.001$). In upper limb injuries, radius bone was injured in 32 cases (9.2%) which was in significantly higher proportion as compared to other upper limb bone injury ($p<0.001$). Radius along with ulna was fractured in 13 (4%) patients. Other injured bones included humerus (8.3%), clavicle 15 (4%), metacarpal 5 (1%) and others.

Table I: Pattern and frequency of injuries in body extremities from motorbike accident.

Type of bone injured	n	(%)
Upper Limbs	117	34
Radius	32	9.2
Ulna	7	2
Radius + Ulna	13	3.7
Humerus	29	8.3
Phalanx	4	1.1
Clavicle	15	4.3
Elbow dislocation	5	1.4
Scapula	1	0.3
Metacarpel	5	1.4
Acromio clavicular joint	4	1.1
Scaphoid	2	0.6
(x^2 statistic, p-value)	(421, <0.001*)	-
Lower Limbs	231	66
Tibia	46	13.2
Tibia + Fibula	91	26.1
Femur	55	15.5
Ankle	5	1.4
Pubic bone	6	1.7
Patella	5	1.4
Femur + Tibia/Fibula	1	0.3
Calcanium	1	0.3
Medial/lateral meleolus	6	1.7
Hip dislocation	3	0.9
Metatarsal	12	3.4
(x^2 statistic, p-value)	(108, <0.001*)	
Total	348	-

** Significant p-value*

Highest proportion of motorbike accidents was observed on Saturdays (31%). Of these 348 patients, 236 (68%) were riding motorbike at the time of accident and 112 (32%) were passengers sitting on the motorbike. Male to female ratio of the injured victims was 9:1. Age between 16 and 30 years (41%) was found in the majority of accident cases, 27% in the age group of 30-45 years, 15% in 45-60 years and 5 % in >60 years. Those of age under 15 years accounted for 12% of cases (Table II). The age representation included both motorbike riders and passengers on motorbike.

Table II: Demographics and associated factors of patients coming to the emergency department with motorbike accident-related limb injuries (n=348).

Characteristic	Number of injured patients (n)	Percentage of injured patients
Gender		
Male	296	85
Female	52	15
Marital status		
Unmarried	155	45
Married	184	53
Unknown	9	2
Age		
0 -15	42	12
16-30	141	41
31-45	95	27
46-60	51	15
60 +	17	5
Day of accident		
Monday	6	2
Tuesday	94	27
Wednesday	15	4
Thursday	61	18
Saturday	109	31
Sunday	63	18
Driver/passenger		
Drivers	236	68
Passengers	112	32
Time of accident (hours)		
00.01-06.00	24	7
06.01-12.00	52	15
13.01-18.00	129	37
18.01-00.00	111	32
Time to reach hospital		
0-1 hour	141	41
1-2 hours	109	31
2-3 hours	34	10
> 3 hours	18	5
Unknown	46	13

DISCUSSION

Motorbike accidents can give rise to bone injuries of any body part, however, it has been determined in the study that lower limbs' bones are particularly more prone to injury in motorbike accidents. This is more applicable on tibia, which was significantly more injured in this study population as compared to other bone involvement. In other studies from developing countries where motorbike is an important mean of traveling, tibia fracture has been reported most commonly as a result of road traffic accidents of motorbike rider.[13] Another study from a developing country also determined 66% of lower limb injuries in motorbike accidents (consistent with the results of this study) and revealed similar pattern of bone injuries as tibia was fractured in highest proportion of cases followed by femur injuries, though study had a limitation of small sample size.[14] This study revealed consistent results with larger study sample. On the other hand, one study from a developed country reported metatarsal as the most frequent injury bone among lower limbs injuries due to motorbike accidents.[15] This variation in the pattern of injuries between developing and developed countries may be due to difference in motorbike structure and vehicle laws in different countries. Nevertheless, most of the studies reported greater occupational loss and psychological trauma when lower limb injuries were involved. For the prevention of mortality and morbidity associated with motorbike injuries, it is noteworthy that head injuries have reduced significantly where strict helmet laws are implemented while riding motorbike.[16-18] Thus, it can be considered that lower limb protectors can also be a cost-effective intervention for the reduction in frequency and severity of lower limb injuries. Yet, effectiveness of such intervention needs to be evaluated through evidence based future studies.

A Swedish cohort study pointed out towards the heavy burden of accidents involving young motorbike riders (age 16 to 30 years).[19] The same age group is observed to be the most vulnerable for motorbike accidents in our part of world[20] and this study has also shown the highest number of motorbike injuries in the same age group. The major hazard regarding involvement of this age group is the economic burden as this age group is considered as the foundation of economy of individual houses as well as of the country. Furthermore, particularly lower limb injuries would put behavioural and social impact on individuals. In this regard, Lower Extremity Assessment Project (LEAP) in United States has elaborated on the demographic and social effects of lower limb injuries.[21] Frequency of accidents decreases with the increment in age groups pointing towards the possibility that with rise in experience of motorbike driving, chances of accidents decreases. Another problem is that high traffic load is mostly seen on weekends, which are responsible for highest number of accidents on Saturdays as the chances of collision increases with high traffic load and several studies revealed that collision of vehicle is responsible for most of the road traffic accidents.[13,22,23]

In this study, most of the accident victims were motorbike drivers and only few of the cases involved passengers. This was one of the limitations of the study that exact number of passengers were not known who were riding during the accidents. Only those were taken into account who were injured and fulfilled the inclusion criteria. This study was conducted in one tertiary care hospital only; larger multi-centric studies can estimate the exact prevalence of motorbike injuries along with lower limb involvement. Moreover, this was a cross-sectional study, a follow-up studies can also elaborate the economic and social burden due to motorbike injuries and the disabilities developed in the motorbike accident victims.

CONCLUSION

In this study, tibia was found to be at greatest risk in motorbike accidents probably due to its superficiality

and exposed position while riding motorbike. Protective measures need to be taken for the prevention of injuries and disability associated with lower limb involvement in motorbike accidents and leg protectors may help in this regard, however, further studies are warranted.

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