

Patterns of Orthopaedic Injuries among Motorbike Accident Admissions Presenting to a Tertiary Care Hospital in Kathmandu.

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ABSTRACT

Background: The anecdotal burden of morbidity secondary to motorbike accidents is thought to be enormous by personnel involved in trauma care. The objective of the present study is to ascertain patterns and association of injuries and causes of mortality in a cohort of motorbike accident victims.

Methods: A retrospective chart review of 1337 motorbike accident admissions B and B Hospital in Kathmandu between January 2009 and December 2010 was undertaken.

Results: Majority of victims were between 20 to 50 years [1230 (92%) males]. Lower extremity injuries comprised 816 (61% of total admissions). Tibia fractures were the most common injury in isolation, multiple injury, as well as polytrauma, and a vast majority of these were open fractures. Multiple injuries were seen in 82 (6.1%) patients and 33 (2.5% of Total) patients were polytraumatized. An amputation was necessary in 16 (1.2%) patients and emergent fasciotomy for compartment syndrome was necessary in 23 (1.7%) cases of tibia fractures and 39 (2.2%) of foot and ankle injuries. A floating joint injury was present in 24 (1.8%) patients. A fat embolism syndrome (FES) was diagnosed in 8 (0.6%) patients. The overall mortality was 0.45% (6 patients).

Conclusions: Motorbike accident is an important cause of morbidity and mortality in Kathmandu, and often involves a very productive age group. There is an imminent need to address this public health problem.

Keywords: Accident; injury; motorbike; multiple trauma; polytrauma.

INTRODUCTION

There is scant data specific to patterns of injuries sustained by motorbike accident victims.

Road traffic accident (RTA) is one of the major causes of death and disability globally with nearly 3,500 people dying on the world's roads every day and tens of millions of people getting injured or disabled every year with a staggering annual mortality of 1.3 million¹. Road Traffic Accident (RTA) is amongst the top five because of morbidity and mortality in South-East Asian countries². In Nepal, 'road accidents' constitute the eighth highest cause of annual mortality and almost sixty percent of this was found to involve the 15-44 years age group with a male to female ratio of 3:1.³

The present study aims to identify patterns of injuries, associations and causes of mortality in motorbike accident victims treated at a trauma centre in the Kathmandu valley. We believe this information is not only useful to better understand and find avenues for addressing this public health problem, but also to counsel patients and their families and prognosticate such injuries.

METHODS

A retrospective review of medical records of patients involved in motorbike accidents, admitted to our institution (B and B Hospital) between January 2009 and December 2010, was carried out. All data was de-identified prior to analysis. Ethical approval was taken

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from our hospital IRC. The motorbike rider as well as the pillion passenger was included in this study to identify possible patterns of injuries, system involvement, closed versus open injuries, multiple injuries, polytrauma and incidence and causes of mortality. Motorbike accident victims who were discharged from the emergency room after primary treatment were excluded from this study. Also, patients who were hit by a motorbike were excluded as were patients sustaining trauma from causes other than a motorbike accident (eg. car accidents, falls etc.). Microsoft excel 2007 was used for analysis.

RESULTS

Of 6099 cases presenting to the emergency department during the study period, 2680 (43.94%) cases were admitted under Trauma and orthopaedics out of which 1337 admissions (49.8%) were due to motorbike accidents, making this, by far the most common cause

of orthopaedic admission. The average age was 35 years, nearly 75% (1003) of the patients was between 20 to 50 years of age and an overwhelming 92% (1230) of these were males.

The most common fracture sustained was a tibia fracture with or without a fibula fracture which comprised 353 cases (26% of all cases). Out of this, 297 cases (84%) were isolated tibia (with or without a fibula) fracture and 56 cases (16%) were associated with other fractures (multiple injuries). Of the cases of RTA secondary to motorbike accidents (n=1337), 816 (61%) sustained lower extremity injuries. Out of this, 593 (44%) sustained isolated lower long bone fractures, half of which were tibia fractures followed by femur fracture, tibial plateau fracture, supracondylar femur fracture and tibial plafond fracture in that order. Majority 201 (68%) of isolated tibia fractures were open fractures and

Table 1. Breakdown of Lower extremity injuries, excluding those included in multiple injury. All percentages are in BOLD. Non-bold characters represent number of cases.

Total Motorbike Accident Admissions (n=1337)									
Lower Extremity Injuries 61% (n=811)									
Foot and Ankle		Isolated Long Bone Fractures						Hip and Pelvis Injury	
10%(n=134)		44% (n=593)						6.3%(n=84)	
Malleolar Fracture: 43	Tibia/ Fibula Fracture		Femur Fracture		Patella Fracture	Supracon*	Tibial Plafond*	Femoral neck Fracture:18	Acetabular Fracture:16
	(n=297)	(n=134)	(n=64)	Supracon* Femur Fracture	Tibial Plafond* Fracture				
Phalangeal Fracture: 21	Open	Close	Open	Close	Open	Close	(n=30)	(n=8)	
Metatarsal Fracture: 36	68%	32%	10.50%	89.50%	13%	87%			Subtroch. Fracture:16
Fracture / Dislocation: 18	(201)	(96)	(14)	(120)	(8)	(52)			Intertroch. Fracture:11
Ankle Sprain: 16	Gustillo I: 47		Gustillo I: 1		Gustillo I: 0				Pelvis Fracture:10
	Gustillo II: 71		Gustillo II: 8		Gustillo II: 1				Femoral head Fracture:5
	Gustillo IIIA: 25		Gustillo IIIA: 3		Gustillo IIIA: 6				Hip Dislocation:6
	Gustillo IIIB: 49		Gustillo IIIB: 2		Gustillo IIIB: 0				Sacrum Fracture:1
	Gustillo C: 9		Gustillo C: 0		Gustillo C: 1				Greater Troch. Fracture:1

Table 2. Breakdown of Upper extremity injuries, excluding those included in multiple injury. All percentages are in BOLD. Non-bold characters represent number of cases.

Total Motorbike Accident Admissions (n=1337)				
Upper Extremity Injuries 21% (n=278)				
Hand and wrist Fracture	Shoulder Girdle Fracture	Forearm Fracture	Humerus Fracture	Elbow Fracture
8% (n=108)	5.7% (n=76)	3.9%(n=52)	1.7%(n=23)	1.4%(n=19)
Distal Radius Fracture:49	Clavicle Fracture: 29	Radius +		
Carpal Fracture:12	Prox. Humerus Fracture: 21	Ulna Fracture: 38		
Metacarpal Fracture :21	Acromio-clavicular Joint Injury: 14	Isolated radius Fracture:5		
Phalangeal Fracture: 26	Scapular Fracture:11	Isolated Ulna Fracture:9		
	Floating Shoulder:1			

Table 3. Breakdown of Polytrauma injuries. All percentages are in BOLD. Non-bold characters represent number of cases.

Total Motorbike Accident Admissions (n=1337)						
Polytrauma 2.5%(n=34)*						
(Columns below show number of particular fracture cases in isolated and combined systemic involvement)						
Chest (9)	Head (11)	Abdomen (4)	Chest + Head (5)	Chest + Abdomen (2)	Head + Abdomen (2)	Chest + Head + Abdomen (1)
Tibia Fracture: 6	Tibia Fracture: 8	Tibia Fracture: 3	Tibia Fracture: 3	Tibia Fracture: 1	Tibia Fracture: 0	Tibia Fracture: 1
Femur Fracture: 4	Femur Fracture: 4	Femur Fracture: 2	Femur Fracture: 2	Femur Fracture: 0	Femur Fracture: 1	Femur Fracture: 0
Pelvis Fracture:1	Pelvis Fracture: 1	Pelvis Fracture: 3	Pelvis Fracture: 0	Pelvis Fracture: 1	Pelvis Fracture: 0	Pelvis Fracture: 0
UE Fracture: 6	UE Fracture: 4	UE Fracture: 4	UE Fracture: 0	UE Fracture: 0	UE Fracture: 1	UE Fracture: 1

83 (42%) of these were Gustillo III A and above. Open femur fractures constituted 14 (10.5%) of total femur fractures. A hip or pelvis fracture was sustained on 84 (6.3%) patients, 134 (10%) had isolated foot and ankle injuries, and 64 (4.8%) had a patella fracture. An upper extremity injury was by sustained on 278 (21%) patients, the hand and wrist areas were involved most commonly. A complete breakdown of extremity involvement in motorbike accident admissions is shown in Table 1 and Table 2.

Soft tissue injuries requiring admission comprised on 84 (6.2%) patients. A spine injury was sustained by 19 patients (1.4% of total) and 13 of these involved the thoracolumbar spine. Two patients with thoracolumbar

spine fracture-dislocation had complete paraplegia (ASIA A) on presentation which did not recover. A detailed breakdown of non-extremity and polytraumatic injuries is shown in Table 3 and Table 4. There were 6 patients (1.7%) out of a total 353 tibia fractures and 3 patients (2.2%) out of a total of 134 foot and ankle injuries, who presented with a compartment syndrome, and all required emergent fasciotomy.

An amputation was necessary in 16 patients (1.2%). Most of these involved crush injuries of the foot (7 patients) and hand (5 patients), followed by below knee (2 patients), above elbow (1 patients) and a Syme amputation (1 patient). Out of this, 2 cases presented with traumatic finger amputations which was

Table 4. Breakdown of non-extremity and multiple injuries. All percentages are in BOLD. Non-bold characters represent number of cases.

Total Motorbike Accident Admissions (n=1337)			
Spine Injuries	Soft Tissue Injury	Multiple Injuries*	Crush Injuries
1.40% (n=19)	6.20% (n=84)	6.10% (n=82)	2.10% (29)
Compression Fracture = 10		Tibia/Fibula 67% (56)	
Burst Fracture = 5		Femur 37% (31)	
Fracture/Dislocation = 4		Patella 11% (9)	
		Others 7% (6)	
		Tibial Plateau Fracture 4.8% (4)	
		Humerus Fracture 4.8% (4)	
		Spine Fracture 4.8% (4)	
		Pelvis Fracture 2.4% (2)	
		Bilateral Tibia Fracture 2 (2.4%)	

Table 5. Associations and probable causes of death among motorbike accident mortalities (6 Out of 1337) = 0.45%

S. No.	Bony and soft tissue injuries	Associated system involvement	Possible cause of death	Comments
1.	Pelvis Fracture and Humerus Fracture	Blunt abdominal Injury Traumatic Brain Injury	Hypovolemic shock Cardiorespiratory failure ARDS	Polytrauma
2.	Femur shaft fracture	Blunt Chest trauma	Cardiorespiratory failure	Polytrauma
3.	Tibia fracture with traumatic foot amputation	Blunt Chest trauma Traumatic Brain Injury	ARDS Cardiorespiratory failure	Polytrauma
4.	Ipsilateral femur and tibia fractures (Floating knee)	Bladder Injury	Pulmonary Embolism Cardiorespiratory failure	Multiple trauma
5.	Crush injury of the leg	Haemo-pneumothorax	Septic Shock Cardiorespiratory failure	Polytrauma
6.	Open femur and pelvis fractures with popliteal artery injury	Urethral injury	Septic shock Cardiorespiratory failure	Multiple trauma

refashioned surgically. The indication for amputation in the other cases was non-viability of part due to damaged circulation, infection or both.

There were 7 cases (0.6% of total) of fat embolism syndrome (FES), all of whom recovered with supportive care. There were 6 mortalities (0.45%) out of which 4 patients were polytraumatized and 2 had multiple

fractures.

Multiple fractures were sustained by 82 patients (6.13%) and 56 (68%) of these had a tibia fracture including one case of bilateral tibia fracture. A femur fracture associated with a concurrent tibia fracture was the most common combination and was seen in 15 cases i.e. 15 cases (11%) of total femur fractures (n=134) and 14 cases

(4%) of total tibia fractures (n=353). The tibia fracture was ipsilateral to the femur fracture in 71% (11 cases) and contralateral in 26% (4 cases). Injuries involving other systems were seen in 99 patients (7.4 % of total). Out of these, 34 patients (2.5% of total and 34.4% of those with associated injuries) qualified as polytrauma, defined as a combination of a major system injury associated with major bony injury (Table 2). Head injury (n=50) constituted 16 cases of traumatic brain injury (TBI), 14 cases of contusion, 8 of dural hematoma and 12 lacerated wound on the head. Out of these 24 cases i.e. 48% (16 TBI and 8 dural hematoma) qualified as polytrauma. Chest injury (n= 34) constituted 19 cases of rib fractures and blunt chest trauma and 15 cases of haemo and pneumothorax. Out of these 16 cases i.e. 47% (15 haemo / pneumothorax and 1 multiple rib fracture with flial chest) qualified as polytrauma. Abdominal injury (n=15) constituted splenic rupture in 2 cases, liver laceration in 3 cases and blunt abdominal injury in 10 cases. All these cases qualified as polytrauma. Again, tibia fracture was the most commonly associated fracture in polytrauma patients followed by femur fractures, upper extremity fractures and pelvis fractures, either in isolation or in combinations (Table 3).

Out of eight patients (0.6% of total) with established FES requiring ventilator support, 2 had isolated femur fracture, 3 had a floating knee injury, 2 had isolated tibia fracture and one had an acetabulum fracture plus a humerus fracture. All required ventilator support from which all recovered eventually. The actual incidence of subclinical FES may be much higher than this. Floating joint injuries described as a fracture above and below a joint, comprised on 24 (1.8% of all injuries) patients and a vast majority of these 20 (83%) cases were floating knees followed by floating elbow on 3(13%) cases and floating shoulder 1(4%) case. When compared with all floating knee and floating elbow injuries admitted during this study period, it was found that 71% (n=28) of all floating knee injuries and 25% (n=12) of all floating elbow injuries were due to motorbike accidents.

There were 19 mortalities out of a total 2680 admissions (0.7%) in the orthopedic department during the study period. Motorbike accident admissions contributed to 6 (31.58%) mortalities during this period. Thus, the percentage mortality in motorbike accident admissions (n=1337) was 0.45 %. Four out of the six patients who died were polytraumatized and the remaining two had multiple fractures. Three of the six patients who died (50%) had associated major chest injury. A detailed breakdown of the injuries and possible causes of death in these six patients is given in the Table 5.

DISCUSSION

A road traffic injury is a fatal or non-fatal injury incurred as a result of collision on a public road involving at least one moving vehicle¹. If current trends continue, road crashes are predicted to become the fifth leading cause of death by 2030¹. In Nepal, "injury" contributes to 9% of total mortality annually and is the third leading cause of death³.

Road traffic accident (RTA) is an emerging public health problem in Nepal. Although conclusive data on the causes of RTA's is scant, the two wheeler vehicles seem to be implicated most often owing to their ubiquity in transport, poor roads and haphazard traffic. Rapid disorganized urbanization, exponential growth in the numbers of motor vehicles, non-abidance of traffic rules and higher velocity of traffic are all possible factors contributing to the increasing burden of RTA's in developing countries⁴. Pedestrians, passengers and cyclists are involved commonly in third world RTA's as opposed to drivers in the developed world⁴. A study showed road traffic accident's to be the major cause of death amongst medico legal autopsy cases⁵. In a study conducted in Eastern Nepal over a one year period (n=870), Jha et al reported that 30% of road traffic accidents involved the 20 -29 years age group⁶. Laborers (27.6 %) and students (24.1 %) were the ones most involved⁶. Rao et al reported that majority of RTA's had injuries around the head and face (34.64 %) followed by the lower limbs (25.19 %), upper limbs (13.38%), chest (8.26%), skin (9.05%), abdomen (3.14%) and spine (6.29%)⁷. In their study, the motorcyclist constituted the majority of cases (41.73%) followed by the passengers of bus, minibus and trucks (34.25 %) with a male to female ration of 5.4:1⁷. Gunjan et al found that bony injuries were common with RTA's and these were often associated with multiple injuries, blunt injuries, abrasions and lacerations. They found lower extremity involvement in 45.39 % cases, multiple sites in 26.95 %, upper extremity in 13.5% and head and neck involvement in 14.2%. The majority of victims (75%) were 18-37 years old males (86 %). Two wheelers and light motor vehicles were involved in most cases (63%)⁸.

In our study, almost 50% of all trauma admissions involved motorbikes. Almost 75% of the victims were between 20 to 49 years of age and 92% of these were males. One could assume that massive losses in productivity would be incurred with

involvement of this age group. Motorbike accidents most often led to lower extremity injuries, shaft of tibia fracture being by far the most common isolated fracture as well as that associated with multiple trauma and polytrauma. That a tibia (or other) fracture, in the setting of high velocity motorbike accidents, can be a surrogate indicator of an underlying multiple trauma and/or polytrauma, cannot be overemphasized.

A sideways injury caused by slipping sideways, sideways collision at road divergence/junctions or getting hit by another vehicle sideways was often found to be the predominant mechanism. Such mechanisms especially pose risk to the lower extremity. This may be the reason why ipsilateral injuries were found to be more common than contralateral injuries. Many of these cases constitute high velocity injuries and 6.13% patients were found to be multiply injured and 2.5% patients polytraumatized. A fifth of injuries (21%) in our study occurred around the upper extremity and injuries around the wrist and hand were the most common in this category. Hip, pelvic and spinal injuries though less common, pose unique challenges in management with the possibility of mortality or significant morbidity. The soft tissue injuries included in this study are only those that required admission (6.2%) and the actual incidence of soft tissue injuries including those that are dealt with and discharged by the Emergency room would be much higher.

A special mention must be made of “moving violations” described by the dictionary as “any of various traffic violations committed while a vehicle is in motion, as speeding, driving through a red light, or going the wrong direction on a one-way street”. The list of possible moving violations is exhaustive⁹ and highlights the fact that this has to be addressed and dealt with firmly by concerned authorities in order to reduce the burden of motorbike related injuries. An important moving violation amongst bike riders in Nepal is overtaking from the wrong side. Empowering witnesses (bystanders or other vehicle passengers) may be useful to identify such violators and prosecute them so that serious injuries can be prevented or mitigated. We believe that the present study could be useful in better defining the epidemiology of motorbike accidents in the Nepalese population, with a special focus on patterns of musculoskeletal and systemic injuries sustained by the motorbike rider.

There are some important limitations to the present study. This is a retrospective, facility-based study that only provides a snapshot of patterns of injuries in motorbike accident victims. Although it can be inferred that huge losses in productivity may be incurred by motorbike accidents, we have not studied the actual economic impact of the same. Also, this study did not look at the differences in injuries sustained by the rider versus the pillion passenger and whether victims involved were using a helmet or not. Such information may be very useful in raising awareness about the importance of helmet use as well as for controlling the quality of head protective devices available in the market. Also, we have not looked at the length and cost of hospital stay as well as details of surgical management which can often be protracted and include multiple procedures. These may be directions for future research on this subject and may add valuable information to what previous authors and the present study have provided, to raise awareness and tackle the problem of motorbike accidents on our roads.

CONCLUSIONS

The ubiquitous motorbike accident was found to be the most common cause of orthopedic admissions. Lower extremity fractures were the most common injury, shaft of tibia fractures being by and large the most common fracture. The majority of tibia fractures were open injuries. The hand and wrist followed by the shoulder girdle were involved in most upper extremity injuries. Most mortalities involved polytrauma victims with major system involvement and half of these involved major chest injuries. Also, the foregoing data may provide an evidence-based approach to counselling the patient and his/her family regarding chances and causes of morbidity and mortality at the outset, which can be useful not only during the course of often protracted treatment, but also from a medico-legal standpoint.

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