

Pattern of Orthopaedic Injuries in Motorcycle Accidents

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ABSTRACT

Background: With increasing number of motor vehicles and population, trauma patients are increasing day by day. Motorcycle accidents are one of the major causes of disabilities and deaths in young males. **Objectives:** To determine the pattern of orthopaedic injuries and outcome of its treatment in patients presented to Allied Hospital Faisalabad after motorcycle accidents and to provide the baseline data to policy makers and other stakeholders who want to undertake necessary measures to improve road safety in the country. **Study design:** Descriptive cross sectional. **Setting:** Accident and Emergency (A&E) and orthopaedic department of Allied Hospital Faisalabad. **Duration of study:** January 2012 to December 2012. **Method:** All patients were admitted through Accident and Emergency department. The data was collected in retrospective way and was analyzed using SPSS version 17. **Results:** Total 1003 patients were included in this study. 859 were male (85.6 %) & 144 were female (14.4 %). The patient ages ranged

from 3 to 90 years with peak frequency of 21-30 years 318 (31.7 %). Businessmen 290 (28.9%), employee/public workers 224 (22.3%) and students 216 (21.5%) were the majority of victims. Collision of motorcycle with vehicles was the most common mechanism of injury 31.4% and Motorcycle riders 613 (61.1%) were the usual victims. Frequency of non-helmet use was 93.4% and of head injuries along with orthopaedic injuries were 33.1%. Most common orthopaedic injury pattern in motorcycle accidents was fracture of tibia and fibula 43.4%. Mean duration of hospitalization was 9.1 days. **Conclusion:** Road traffic accidents constitute one of most important public health problem in our society. Disabilities and deaths in motorcycle crash are increasing day by day. Preventive programs must be launched by policy makers of concerned departments and stakeholder at national level as solely a medical approach is insufficient to save precious lives of many people.

INTRODUCTION

Road Traffic Accidents (RTA) kill more than 1.7 million people in a year and injure or disable between 20 and 50 million and more¹. According to the World Health Organization (WHO) and World Bank data, these injuries are likely to rise dramatically by the year 2020^{1,2}. Road collisions are the second cause of death

among the youth (5-29 years old people) and the third cause of death among 30-44 years old people^{3,4}. The national injury survey in Pakistan has shown the yearly overall incidence of trauma to be 41 injuries for every 1000 persons⁵. This survey illustrates that road traffic accidents are one of major factor for injuries.

All over the world, motorcycle accidents are one of the major causes of road death and injuries^{3,6,7,8}. Motorcycles have come into extensive use as mode of transport and commuting to work⁹. The number of motorcycles has increased especially in large urban areas possibly due to increasing fuel costs, intense traffic and low purchase price for motorcycles^{10,11,12,13}. Despite being considered dangerous, motorcycles are an attractive and cheap option for leisure and/or work, particularly, in urban areas¹⁰. Motorcyclists are

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extremely vulnerable road participants who are exposed to severe, often fatal injuries¹⁴.

Faisalabad is the third largest industrial city of Pakistan. Recently, motorcycles have become popular mode of commercial use as well as personal transport due to its small size and convenience for low income individuals. Despite this, operation of motorcycle is characterized by reckless driving, over speeding, one wheeling, passengers overloading, lack of certified driver training and legal licensing by motorcycle riders. In addition to that riding without helmet use by rider and their passengers, poor law regulation and possible use of alcohol and prohibited drugs lead to severe injuries in motorcycle crashes. Motorcycle Road Traffic accidents are very common in Faisalabad due to large population, bad road condition, poor implementation of traffic rules and increasing use of motorcycles. Motorcycle riders would be more vulnerable in the event of a crash because of their lack of protection which would often result in suffering from more severe injuries than car drivers¹⁵. Motorcyclists are about three times more likely than car occupants to be injured in a crash and 16 times more likely to die^{16,17}. Contrary to a car crash, in a motorcycle crash, the riders often absorb all kinetic and compressive energy resulting from the crash^{16,18}. Among those who are injured in a motorcycle crash, injury to head and leg is much more prevalent^{3,7,19, and 20}. Motorcycles are considered to be one of the most dangerous modes of transportation because of increased risk of direct energy transfer to motorcycle riders and/or passengers. Helmet use consistently has been shown to reduce motorcycle crash related injuries and deaths, and the most effective strategy to increase helmet use is enactment of universal helmet laws²¹. The passage of universal helmet legislation requiring motorcycle riders of all ages to wear helmets is a timely and controversial issue with far reaching public health implications, especially, as the number of motorcycle fatalities continues to rise²².

Another issue, which intensifies the attention to motorcycle crashes, is the involvement of children, teenagers and active economic population in these kinds of accidents^{3,23,24}. Every year a lot of people die in their productive age due to such type of accidents and hence leading to significant socioeconomic impact both at household and national level. Pedestrian's injuries are also very common due to collisions by

motorcycles because less precautions and safety measures taken by them while crossing roads or walking along the road side. Older adults involved in motorcycle crashes are prone to more severe injuries than younger adults²⁵. Most of these injuries are brought to tertiary care public hospital, so there is enormous burden on these hospitals⁵. Traditionally, research on road traffic injuries (RTI) has focused on the traffic environment and the vehicles^{26,27}. However, little attention has been given to road risky behaviors and perceptions of road safety by pedestrians, as risk factors associated with high pedestrian injury rates²⁶. Pedestrians, particularly adolescents, often show risky behaviors when crossing the roads, such as not checking for oncoming traffic^{26,28}. In developing country like Pakistan road crossing is very difficult task because majority of roads have limited pedestrian facilities therefore compelling individuals to mix with heavy traffic travelling at various speeds, therefore; pedestrians are more prone to fatal injuries and death. In US in 2009, there were approximately 4000 deaths and 60,000 injuries due to pedestrian motor vehicle collisions^{29,30}. This may be due to a number of factors, including lack of pedestrian facilities in road design, poor knowledge and practice of road safety measures by the general population, reckless behavior of motorists, high speed driving and low levels of vehicle ownership³¹.

Safety education for youth could be an important factor in preventing road injuries as it has been shown that driver's and pedestrian's road safety knowledge, both are poor and inadequate in low and middle income countries^{26,32}. Educational campaigns may be one way to increase rider compliance with traffic laws and safety precautions while promoting good driving practices^{33,34,35}.

Objectives

- To determine the pattern of orthopaedic injuries and outcome of its treatment in patients presented to Allied Hospital Faisalabad after motorcycle accidents.
- To provide the baseline data to policy makers and other stakeholders who want to undertake necessary measures to improve road safety in the country.

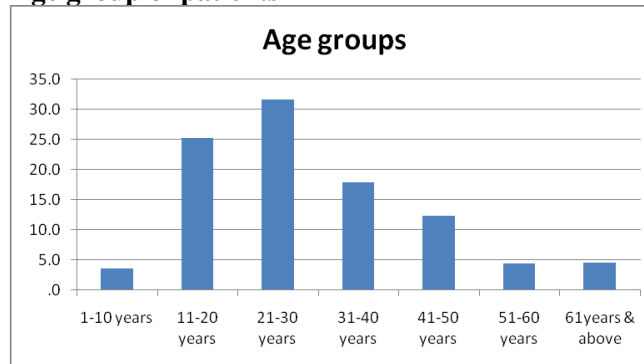
MATERIAL AND METHODS

This was a descriptive cross sectional retrospective study based on roads traffic motorcycle crash patients of all age groups and gender presented to the Accident and Emergency (A&E) and orthopaedic department of Allied Hospital Faisalabad from January 2012 to December 2012. All those patients included in study who got orthopaedic injuries in motorcycle accidents irrespective of their age and gender. Head injury patients with Glasgow coma scale less than 8 and patients who were not injured in motorcycle accident were excluded. Allied Hospital is a 1200 bedded, tertiary care and teaching hospital affiliated with Punjab Medical College, Faisalabad. All trauma patients with inclusion criteria were admitted in emergency and resuscitated according to Advance Trauma Life Support (ATLS^R) protocol. After patient's stabilization, they were managed accordingly in emergency followed by shifting to orthopedic department for further management. Injury patterns were noted on the basis of clinical assessment and radiological findings of X-rays. Variables studied were Age, Gender, Occupation, Helmet use, Head injury, Mode of Injury (motorcycle vs. motorcycle, motorcycle vs. auto rickshaw, motorcycle vs. other vehicle, motorcycle vs. pedestrian and other collisions), Injury host status (Rider, Passenger or Pedestrian), Body region injured (fracture type based on clinical as well as radiological findings) type of fracture (open or close) and side of body injured (right or left). Outcomes were measured through the duration of hospitalization. All patients were followed up till discharge or death. Data was analyzed using SPSS version 17.0.

RESULTS

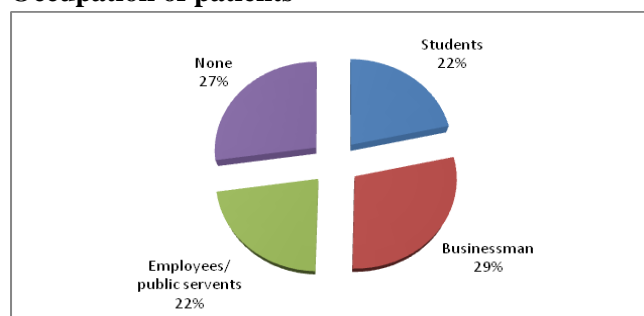
Total 1003 patients were included in this study who sustained road traffic injuries during the study period of one year. 859 (85.6 %) patients were male. 144 (14.4 %) were female (M: F Ratio of 6:1). The age of injured patients was between 3 and 90 years with mean of 46.5 years with peak frequency of 21-30 years 318 (31.7 %).

Figure-1
Age group of patients



Most of the patients were businessmen 290 (28.9%) followed by employee/public servants 224 (22.3%) and students 216 (21.5%).

Figure-2
Occupation of patients

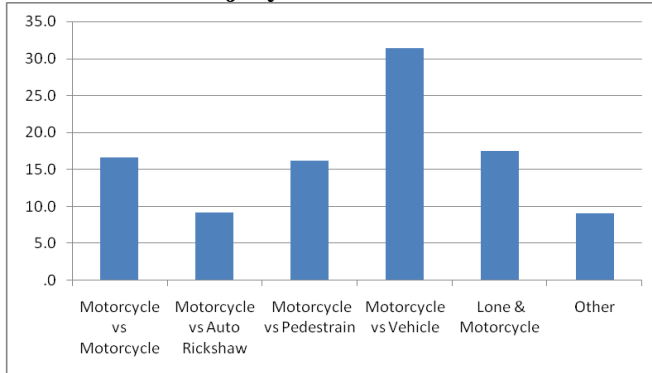


Collisions of motorcycle with motor vehicles (four wheeled motorized vehicles) were responsible for mechanism of injury in majority of trauma victims accounting for 315 (31.4%) patients.

Table-1
Frequency & percentage of the mechanism of motorcycle accident

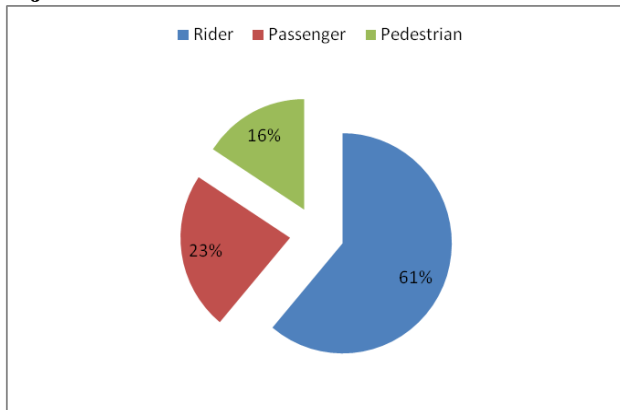
Mechanism of injury	Frequency	Percentage
Motorcycle vs. Motorcycle	167	16.7
Motorcycle vs. Auto Rickshaw	92	9.2
Motorcycle vs. Pedestrian	162	16.1
Motorcycle vs. Vehicle	315	31.4
Lone & Motorcyclist	176	17.5
Motorcycle vs. Others (Cart, wall, tower, donkey cart etc.)	91	9.1
Total	1003	100

Figure-3
Mechanisms of Injury



Majority of injuries were sustained by motorcycle riders 613 (61.1%) followed by passengers 232 (23.1%) and pedestrians 155 (15.5%).

Figure-4
Injured Host status



Most of motorcycle injured victims were without helmet while riding 937 (93.4%) and only 66 (6.6%) used helmet. Isolated musculoskeletal injuries were found in 671 (66.9%) victims while 332 (33.1%) acquired associated head injuries. All head injured patients were without helmet at the time of injury. Among the pattern of orthopaedic injuries, the majority of fractures were of the lower limb bones followed by the upper limb. Among the lower limb fractures, tibia and fibula were most commonly affected 435 (43.4%). Dislocations of joints were least common pattern of injuries. Fractures of right side of body were more commonly found in 616 (60.4%) as compared to left side 373 (37.2%). Majority types of fractures were close 834 (83.2%) as compared to open fractures 169

(16.8%). Fracture of tibia and fibula were the most common open fracture in motorcycle injuries.

Table-2
Frequency & percentage of pattern of orthopaedic injuries in motorcycle accident

Pattern of injuries	Frequency	Percentage
Shaft of humerus	26	2.6
Radius & ulna	29	2.9
Distal radius	13	1.3
Olecranon process ulna	3	.3
Supracondylar humerus	7	.7
Shoulder joint dislocation	4	.4
Clavicle	9	.9
Metacarpal	2	.2
Phalanges of hand	1	.1
Elbow dislocation	2	.2
Hip dislocation	15	1.5
Ankle dislocation	8	.8
Neck of femur	13	1.3
Shaft of femur	187	18.6
Supracondylar femur	16	1.6
Supracondylar intercondylar femur	25	2.5
Proximal tibia	38	3.8
Lateral condyle tibia	15	1.5
Medial condyle tibia	3	.3
Shaft of tibia & fibula	435	43.4
Medial malleolus	7	.7
Bimalleolar	15	1.5
Bimalleolar ankle dislocation	2	.2
Tarsals	4	.4
Metatarsals	8	.8
Acetabulum	5	.5
Pelvic #	1	.1
Pertrochanteric femur	22	2.2
Patella	30	3.0
Neck of humerus	4	.4
Head of fibula	3	.3
Subtrochanteric femur	4	.4
Epiphyseal injury	6	.6
Tibia	28	2.8
Condyle of femur	9	.9
Knee joint dislocation	2	.2
Styloid process radius	1	.1
Traumatic auto amputation	1	.1

The duration of hospitalization ranged from 1 day to 61 days (mean 9.1 days). The patients with multiple fractures, head injuries or associated other injuries were found to have long duration of hospitalization. Majority of patients were discharged 881 (87.6%) after definitive management, 111 (11.1%) patient left against medical advice and 11 (1.1%) patients expired.

DISCUSSION

Motorized two-wheeled vehicles account for a large proportion of road traffic in Pakistan and riders of such vehicles have a high risk of road injuries³⁷. The young males in their most reproductive and productive years were found to have high occurrence of motorcycle accidents which has been attributed to wide range of risky activities performed by this class of people. Males have more exposure to traffic as driver as well as passengers as they have to travel long distances to work and are more often involved in the use of automobile as leisure activities. In Pakistan, a large proportion of motorcycle riders are male, most of them use it for commercial purposes. There is increased tendency in young males to have reckless riding without wearing helmet, over speeding, overloading and riding under the influence of alcohol and/or drug addiction.

Businessmen, employees and students were the most injured because they have to rush through busy traffic roads to reach their businesses centers, companies, firms and educational institutes respectively. Similar type of observation was noted by Naddumba (2002) in Kampala, Uganda. Solagrebu *et al.* (2006) also reported similar observation in Nigeria³⁷. Businessmen are usually involved in such type of activities in which they have to move from one place to another for buying and selling their products. Majority of time they used to travel on motorcycle as it is fast and cheapest mode of travelling through busy roads in such a big city likes Faisalabad. Students also sustain severe injuries in most of motorcycle accidents as they are moving through heavy traffic to and from their schools or institutes. Students are one of the large populations of the country who involved in motorcycle crash injuries; therefore an upgraded transportation system for the students can precludes their need for

motorcycle travelling. This policy not only reduces the incidence of motorcycle injuries but also decrease the exposure of lot of students to road accidents. As Faisalabad is industrial city of Pakistan, majority of people come here from all over Pakistan to work in various mills, industries, institutes as employee. Exposure of these people contributes a lot motorcycle associated road traffic accidents and leads to disability or death.

The majority of fatalities occur in young male riders within the productive age group of 20–39 years¹⁶. Common cause of injuries in young riders is to ride without helmet and other protective gears and violation of traffic rules. The passengers are second most common victims in motorcycle accidents followed by pedestrians. Similar results were obtained from study conducted in Karachi⁵. The injuries to the pedestrians are due to compelling less safety measures, careless behavior while crossing roads, low general public awareness about road use and avoiding habit of walking on pavement even if they are present. The deficiency of footpaths along most of the roads in our country has augmented the liability of pedestrians to majority of motor vehicles.

Head injuries are second most common injury pattern in motorcycle accident because most of riders and passengers did not practice to wear helmet and other safety gears while riding. These riders are exposed to severe head injuries while riding without helmet. Head injury leads to highest mortality in these victims⁵. Using helmet would decrease injuries to head and face by 50% and would decrease severe head injuries dramatically^{3,38}. In this study frequency of helmet use is less than studies conducted on national and international levels^{5,10}. Head injuries and mortality rate can be reduced among victims of motorcycle accidents by enforcement of traffic law, proper public educational campaign at mass level through media regarding helmet use and self-safeties while riding.

Collisions of motorcycle with other vehicles were noted to be major mechanism of injury³⁶. This is followed by injuries to lone motorcyclist because of fall from motorcycle due to slippage. In developing countries, where road condition is bad, chances of

motorcycle collisions with other vehicles, motorcycle and with pedestrians are more common due to over loading of vehicles and motorcycles with passengers or luggage as well as less safety measures for pedestrians alongside roads. Since there is increased tendency of over speeding, one wheeling and traffic law violations among motorcyclists, this leads to devastating outcomes in the form of musculoskeletal, visceral and head injuries. Proper driving training, strict enforcement of traffic laws, inclusion of traffic rules in syllabus of primary and secondary education, awareness campaign regarding road safety, good road condition and proper placement of road lamps can reduce the incidents of such vehicles collisions.

Most common pattern of orthopaedic injuries are fracture of lower limb bones particularly tibia followed by fractures of upper limb. This is because of direct energy transfer to the motorcycle riders and/or passengers during a collision. This study found that the right side of the body of trauma victims is most likely to be injured. Majority of open fractures are noted in lower limb predominately tibia fractures. This result is comparable with other studies^{5, 31}. In all types of motorcycle accidents, lower proportion of injuries below 10 and above 60 years of age is due to their less exposure to the external environment⁵.

The duration of hospitalization is very important method to measure the morbidity of trauma patients³⁷. Prolonged duration of hospitalization is accompanied by increased consumption of hospital resources, decreased productivity of population due to time consumed in long hospital stay and disability of trauma victims. Prolonged duration of hospitalization, in this study, was attributed to presence of head injuries, multiple fractures and co-morbidities to the patients. Majority of such patients were managed conservatively with skeletal or skin traction and others were managed with operative methods after their fitness for surgery.

CONCLUSION

Road traffic accidents constitute one of most important public health problem in our society. It causes high mortality and morbidity particularly in young males in productive age group and hence socioeconomic burden

on individual family and health system at national level. Majority of these accidents are preventable by educational campaign of general public, enforcement of traffic rules, provision of facilities for passengers and upgraded monitoring system for transportation and drivers. Preventive programs and actions must be launched by policy makers of concerned departments and stakeholders at national level. Solely a medical approach is insufficient to save the lives of victims of such accidents.

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