

ORIGINAL ARTICLE

## Epidemiology of Fractures and Dislocations among Urban Communities of Eastern Saudi Arabia

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### ABSTRACT

**Background and Objective:** Fractures and dislocations are a significant public health and economic burden for any country, but current knowledge on the basic epidemiology of fractures in Saudi Arabia is very limited. This retrospective analysis was performed to determine the patterns of incidence of traumatic fractures and dislocations in the urban population of the Eastern Province of Saudi Arabia.

**Materials and Methods:** Data were collected on all fractures and dislocations admitted to the orthopaedic wards between January 1, 2004 and December 31, 2009. The inclusion criteria were all patients admitted after trauma. The data collected included was the type of accident, fracture and dislocations sustained, surgery undertaken either emergency or elective, implants used, associated injuries, complications, status of the union of the fracture at the time of the final review and complications.

**Results:** There were 1428 patients with 2056 fractures and dislocations. Five-hundred and eighty-four (40.89%) of the injuries were sustained in road traffic and motorcycle accidents. Lower extremity fractures were 830, upper extremity fractures were 555 and spinal fractures were 323. Of these, 202 (14.4%) patients had dislocations, a majority of which were hip joint dislocations. The overall complication rate was 166 (11.69%) and infections formed the majority. Delayed union occurred in 32, nonunion in 24 and malunion requiring surgery occurred in 17. Twenty-seven (1.31%) of fractures were missed.

**Conclusions:** This analysis shows that road traffic accidents are still a major cause of trauma in an urban population and lower extremities form the common site of fractures. Fractures and dislocations due to trauma are steadily increasing and the young are the most affected. We believe that injury prevention programs should be made mandatory to limit musculoskeletal injuries resulting from trauma. In the coming years, the number of these injuries will rise considerably with the increase in population.

**Key words:** Dislocations, urban communities, epidemiology, fractures, Saudi Arabia, trauma

### ملخص البحث:

أجريت هذه الدراسة الاسترجاعية لتحديد نمط حدوث الكسور الناتجة عن الإصابات وانخلاع المفاصل في منطقة حضرية بشرقي المملكة العربية السعودية. شملت الدراسة حالات الكسور والخلع التي تم إدخالها لمستشفى الملك فهد الجامعي بالخبر في الفترة من يناير 2004 إلى 31 ديسمبر 2009. وتضمنت كل أنواع الكسور والخلع ومضاعفاتها. تضمنت الدراسة 1428 مريضاً كانوا يعانون من 2056 كسر أو خلع مفصلي. كان قرابة نصف هذه الحالات بسبب حوادث الطرق. وخلصت الدراسة إلى أن حوادث الطرق مازالت تشكل السبب الرئيس للإصابات لدى الشباب. يرى الباحثون أن برامج الوقاية من حوادث الطرق أصبحت ضرورية لتقليل الإصابات. وبالنظر إلى تزايد النمو السكاني فالتوقع أن يزداد عدد الإصابات إذا لم تكثف الجهود لمنعها.

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## INTRODUCTION

Trauma, which is a major cause of morbidity and mortality in the world, presents a major economic burden. In the United States of America in the year 2000, 50 million injuries required treatment at the cost of \$406 billion. Males accounted for approximately 70% (\$283 billion)

of the total cost of injuries.<sup>[11]</sup> During the same year, the reported cost of hip fractures alone in the United Kingdom, was estimated at £726 million.<sup>[12]</sup> Apart from the economic cost, trauma is the leading cause of death and functional disability in the young.<sup>[13]</sup> The basic epidemiological data on the incidence of fractures due to trauma and their distribution in the population in Saudi Arabia is non-existent,<sup>[14]</sup> even though studies of road traffic accidents in the country are well-reported.<sup>[15-9]</sup> Epidemiology has been called the foundation, on which, public health decisions and evaluations are made. As fractures are the consequences of trauma, we believe epidemiology of fractures should have been done. Unfortunately, this important part of science has been neglected for a long time. There are a number of different ways, in which, the incidence of fractures in a population can be estimated. Since our institution is a prime tertiary care center in the Eastern Province, which has been serving the people for the past 30 years, we believe that an epidemiology of fractures could start from the data base of our hospital. On completion of this pilot study, we aim at providing new information on the epidemiology of fractures in the urban communities of Saudi Arabia.

## MATERIALS AND METHODS

After approval from the Ethical and Research Committee, the data on all patients with fractures and dislocations admitted into hospital between January 1, 2004 and December 31, 2009 were collected through computer-based International Classification of Diseases codes using QuadraMed database system. The inclusion criteria were patients of all ages and gender admitted after trauma. Hence, all pathological fractures were excluded. The fracture patterns were classified according to the Orthopaedic Trauma Association System;<sup>[10]</sup> open fractures were classified using the Gustilo system.<sup>[11]</sup>

The medical records were reviewed and the data gathered included the mechanism of injury, age, and fracture level. The mechanism of injury was classified as road traffic accidents, motorcycle accidents, falls from height, sports-related and miscellaneous (crushing injury and assault) associated injuries and complications. The data were cross-referenced against data recorded in the ward admission log books and operating room registers for completeness and accuracy.

Management of patients was evaluated according to whether primary, conservative or operative treatment methods were employed. Failure of treatment was evaluated in terms of the need for secondary operative treatment, salvage internal fixation, infection, delayed or

mal- or non-union. The data were entered in the database and analyzed using software package for statistical analysis SPSS Inc. version 14., Chicago, Illinois.

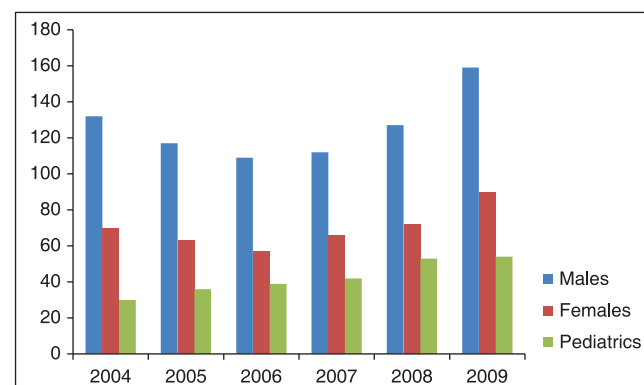
## RESULTS

There were 1428 patients with 2056 fractures and dislocations. There was a steady increase in the number of injuries per year of analysis [Figure 1]. The average age of males was  $28.9 \pm 14.6$  years,  $41.6 \pm 18.5$  years for females ( $P < 0.001$ ) and the pediatric average age was  $5.95 \pm 3.03$  years. In the male group, 582 of the patients were below the age of 40. Five-hundred and eighty-four (40.9%) of the cases resulted from motor vehicle and motorcycle accidents. The mechanism of injury is shown in Table 1. In males, the overall age distribution peaked around the second decade. Patients with fractures due to low-energy trauma were older men and women and the younger population had high-energy fractures.

Lower extremity fractures were 830, upper extremity fractures were 555 and spinal fractures were 323 [Table 2]. Two-hundred and two (14.4%) patients had dislocations; the majority of which were hip joint dislocations [Table 3]. Out of 756 extremity fractures, 357 (47.22%) were compound with 198 (55.5%) Gustillo Grade I, 100 (28%) Grade II and 59 (16.5%) Grade III. One-thousand one-hundred and two (77.17%) were surgically treated and the rest treated conservatively. The overall complication rate was 149 (13.5%). Superficial and deep infections were in 49(4.45%), 32 (2.9%) had delayed union, 31 (2.8%) had non-union and repeat surgery was required in 37 (3.4%). Twenty-seven (1.31%) fractures were missed.

## DISCUSSION

Our study showed that the trauma, particularly resulting from road traffic accidents remains a major cause of



**Figure 1:** Yearly numbers of male, female and pediatric patients with trauma.

Cause of injury	Males	Females	Pediatric
Motor vehicular accidents	305	103	26
Motor cycles	85	45	20
Pedestrians	61	71	29
Sports related	80	7	16
Fall from height	66	103	6
Fall at home	109	89	124
Industrial	39	0	0
Gun shot	8	0	0
Fire works	3	0	0
Street		0	11
School	—	—	12
Cycle	—	—	10

Site of fractures	Males	Females	Pediatric
Upper limb	293	137	125
Lower limb	502	189	139
Pelvis	85	42	4
Spine	161	153	9
Amputations	12	2	15

Site of dislocation	Males	Females	Pediatric
Hip	79	11	1
Shoulder	31	5	0
Elbow	14	9	4
Knee	2	0	0
Ankle	11	0	2
Wrist	6	0	0
Hand and feet	7	6	0

fractures and dislocations. Second, there has been a steady increase in the number of trauma cases over the years. Only a few studies have studied the epidemiology of fractures and dislocations in Saudi Arabia even though the number of these injuries are on the increase. Shaheen *et al.*<sup>[12]</sup> reported that 14% of all admissions were due to non-road accidents and that upper limb injuries were more common. In the past two decades, the pattern of fractures and dislocations in Saudi Arabia have changed. Our study showed that the commonest cause of fractures was road traffic accidents and that lower limb fractures and dislocations were the most common in all ages and sexes. Spinal injuries were the second most common.

In a study of 4890 long-bone fractures, Meling *et al.*<sup>[13]</sup> found that the overall incidence in males was lower than in females; van Staa *et al.*<sup>[14]</sup> found that a total of 103,052 men and 119,317 adult women sustained fractures. Both

research groups reported a higher incidence of fractures in females than in men. In Saudi Arabia, females do not drive motor vehicles and may therefore, not be involved in road traffic accidents as drivers. This is reflected in our hospital-based analysis which indicated that male to female ratio was 1.8:1 in patients below the age of 40. The management of compound fractures has always remained a challenge because of serious morbidity. The reported incidence varies from 2.6<sup>[15]</sup> to 11.5/100,000 persons<sup>[16]</sup> and the majority of them are found in the lower extremities.<sup>[17]</sup> Court-Brown *et al.* (1998)<sup>[18]</sup> reported that the majority of compound fractures were due to high energy trauma and that only 22.3% of compound fractures were caused by road traffic accidents or falls from height. In this study, over 60% of the open fractures were the result of road traffic accidents and falls from height. Secondly, compound fractures were the cause of infection in 90% of our patients.

The epidemiology of acute traumatic dislocations is the least studied issue in orthopaedic practice. In a 6-year analysis, Yang *et al.*<sup>[19]</sup> estimated an annual incidence of 42.1/100,000 population of all joint dislocations and road traffic accidents as the most common cause. Shoulder joint was the commonest in 15.2/100,000 population. Studies in the literature cite the incidence of shoulder dislocation as between 11.2 and 23.9/100,000 person-years, and that males were affected more than females.<sup>[20,21]</sup> In this study, the prevalence of the joint dislocations was 14.4%, which is within the reported incidence of traumatic joint dislocations. However, the startling difference from the reported literature was that the majority of the patients 79 (5.53%) admitted into hospital had a hip joint dislocation and 31 (2.17%) had shoulder dislocations. There is a possibility that most of the shoulder joint dislocations may have been dealt with at the emergency room and did not require hospitalization. Nevertheless, owing to the severity of trauma in road traffic accidents and falls from heights, major joints like the hips seem to dislocate more easily than any other joints.

Based on the epidemiological studies around the world, strategies have been developed. The results of this study showed that for a majority of patients, the injuries were the result of RTA which validates our recommendation to put in measures for the prevention of RTA. Ansari *et al.* (2000)<sup>[7]</sup> found that human error was the cause of 80% of the accidents. Preventive measures such as speed limits and control, as well as fines have been implemented but have not achieved the expected outcome. We believe that two-tier stringent laws need to be promulgated; one of the regulations should ensure that drivers are properly

trained, and the second is that driving licences should be suspended for certain offences.

This study has limitations and strengths. One limitation is that the study was retrospective. The second is that since this study involved only patients on admission, those patients who were transferred to other hospitals for lack of beds and for other reasons could not be included. If all these patients had been included, the numbers would have been much higher and given a better representation of the various injuries. There is dearth of data of fractures and dislocations in the Saudi Arabian society. The strength of this study is that the insight of this 6-year data gives into the changing pattern of traumatic fractures and dislocations. This could help policy makers to plan for future prevention programs to reduce road traffic and other accidents.

## CONCLUSION

This study shows that the overall incidence of fractures and dislocations appear to have steadily increased over the years, which means an escalation of the burden on health services. Secondly, as the majority of the injured are in the prime of life, fractures and dislocations always cause morbidity, loss of education time and economic hardship during the long periods of recuperation. No doubt since our study is based in one hospital, the largest and the busiest in the region, there is a clear indication of what could be happening in other urban areas of the country as a whole in terms of numbers, causes, types of fractures and dislocations. This cannot be taken lightly. We believe that this study could also help the authorities to design strategies to minimize the incidence of fractures and dislocations, thereby reducing the economic burden. Secondly, young Saudi orthopedic surgeons should be advised to take subspecialties in trauma care. The responsibility rests on the administrators and the young surgeons to appreciate the importance of trauma surgery and the management of trauma in the society and the country as a whole.

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