

Descriptive Epidemiology of Traumatic Injuries in 18890 Adults: a 5-Year-Study in a Tertiary Trauma Center in Iran

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Background: Basic epidemiological data can provide estimates when discussing disease burden and in the planning and provision of healthcare strategies. There is little quantitative information in the literature regarding prevalence of traumatic injuries from developing countries.

Objectives: The aim of the current preliminary study was to reveal the prevalence and age and gender distribution of various traumatic injuries in a tertiary referral orthopedic hospital in Iran.

Patients and Methods: In a prospective descriptive study, all traumatic injured patients attending the Orthopedic Trauma Unit of our center in a five year period were included. Demographic details, the cause of injury, injury classification and treatment were recorded. For each of the five-year age groups and each gender we calculated the numbers with fractures, dislocations, soft tissue injuries, ligamentous injuries and lacerations and derived average age and gender-specific prevalence as well as seasonal variations.

Results: A total of 18890 adults were admitted, 13870 (73.4%) males and 5020 (26.6%) females. There were 8204 (43.4%) fractures. The male fracture age distribution curve was unimodal and there was a detectable bimodal pattern in females. Under 65 years males are 3 times more likely to sustain a fracture than females which decreases to equal risk over the age of 65. The most common fracture site was distal radius/ulna (13.8%), followed by tibial diaphysis (8.8%), proximal femur (7.8%), finger phalanges (6.4%), metacarpals (6%) and metatarsals (5.9%). There were seasonal variations in fracture incidence with peaks in February, March and October. The least number of fractures occurred in June.

Conclusions: The risk of traumatic injuries is higher among specific age groups with different patterns emerging for men and women. Thus, the descriptive epidemiology will provide useful information for treatment or injury prevention strategies, resource allocation, and training priorities.

Keywords: Epidemiology; Trauma; Fractures; Developing Countries

1. Background

Musculoskeletal traumatic injuries are among the most common injuries that happen in rapidly developing countries (1-4). It contributes to a large burden of morbidity and mortality as well as psychiatric aspects (1-5). Basic epidemiological data such as prevalence, injury pattern, fracture type, sex and age distribution can provide estimates when discussing disease burden and in the planning and provision of healthcare (4, 5). Thus, it is essential for public health officials of all countries to have a good understanding of the magnitude and characteristics of the national extremities trauma or fracture rates in order to develop and evaluate injury prevention strategies, resource allocation, and training priorities (6, 7). Such strategies include measures to prevent accidents, to control exposure to risk, to reduce the severity of injuries sustained and to improve medical care adjusted for specific gender and age groups. They can be implemented

by legislative or educational means to modify behaviors and the environment (6, 8). Successful strategies would be expected to alter the incidence, pattern and outcome of injury. Thus, epidemiological studies of injury need to be repeated at regular intervals in order to assess the current situation (9).

Nationwide databases can provide valuable resources for examining this issue in different populations. However, there is little quantitative information in the literature regarding prevalence of traumatic injuries within specific age and gender groups from developing countries (10, 11).

2. Objectives

The aim of the current preliminary study was to reveal the prevalence and age and gender distribution of vari-

ous traumatic injuries in a tertiary referral orthopedic hospital in Iran.

3. Patients and Methods

We began a prospective study of patients sustaining a traumatic injury in February 2005. All traumatic injured patients attending the Orthopedic Trauma Unit of Shariati Hospital of Tehran University of Medical Sciences in a five year period from February 2005 to October 2010 were included. The study was based on the Shariati Hospital registry. Demographic details, the cause of injury, injury classification and treatment were recorded prospectively on a computer database for subsequent analysis. The medical ethics committee of the orthopedics department of Shariati hospital approved this study, and informed printed consent from the patients was obtained after explanation during admission registration.

For each of the five-year age groups and each gender we calculated the numbers with fractures, dislocations, soft tissue injuries, ligamentous injuries and lacerations and derived average age and gender-specific prevalence.

We used SPSS version 18.0 for analysis of data noting frequency, injury type and sex and age related differences. Distribution curves corresponding to each gender and age groups were presented. To evaluate the significance of differences over time and between groups, we calculated odds ratios with 95% confidence intervals.

4. Results

During the five year period, a total of 18890 adults were admitted, 13870 (73.4%) males and 5020 (26.6%) females. There were 8204 (43.4%) fractures, 5930 (72.3%) in males and 2274 (27.7%) in females. The other 10686 (56.6%) limb injuries were classified into five groups of soft tissue injuries, lacerations, ligamentous injuries, dislocations and others (including burns, amputations, foreign body, infections, etc.) Table 1. Subgroups age and sex distribution curves are presented in Figure 1.

There was a higher prevalence of limb traumatic injuries in men than women in all age groups (Gender ratio M/F = 2.7) which is more significant in laceration and dislocation and less prominent in ligamentous injury subgroups.

The total male limb injury incidence was unimodal with peak at 15 - 25 years and females had a smaller peak. Whereas the total male fracture incidence peaked at 20 - 30 years, there was a detectable bimodal pattern in females. Under 65 year males are 3 times more likely to sustain a fracture than females which decreases to equal risk over the age of 65 years.

The most common fracture site was distal radius/ulna (13.8%), followed by tibial diaphysis (8.8%), proximal femur (7.8%), finger phalanges (6.4%), metacarpals (6%) and metatarsals (5.9%). The age and gender specific prevalence of all fracture sites are classified and shown in Table 2. According to the previously described distribution curves for the age and gender related incidence of fractures (12). Table 3 shows the common fracture sites and the curve in which they fall into.

5. Discussion

To our knowledge, this is the first large population based study carried out in Iran as a developing country in which a large group of patients in a long period of time have been evaluated. Due to lack of fracture surveillance systems in developing countries and inaccuracy of epidemiologic studies based on data from hospital coding systems, precise epidemiological study of fractures seems difficult (1, 4, 13, 14). We hereby report the prevalence of traumatic injuries and specially fractures in patients admitted to a major referral university hospital. Although the need for a national registry for trauma to help health service policies, medical education and researches is evident; we believe that our accuracy is comparable with that of other orthopedic data collection systems.

Table 1. The Prevalence and Gender Ratio of Limb Injuries

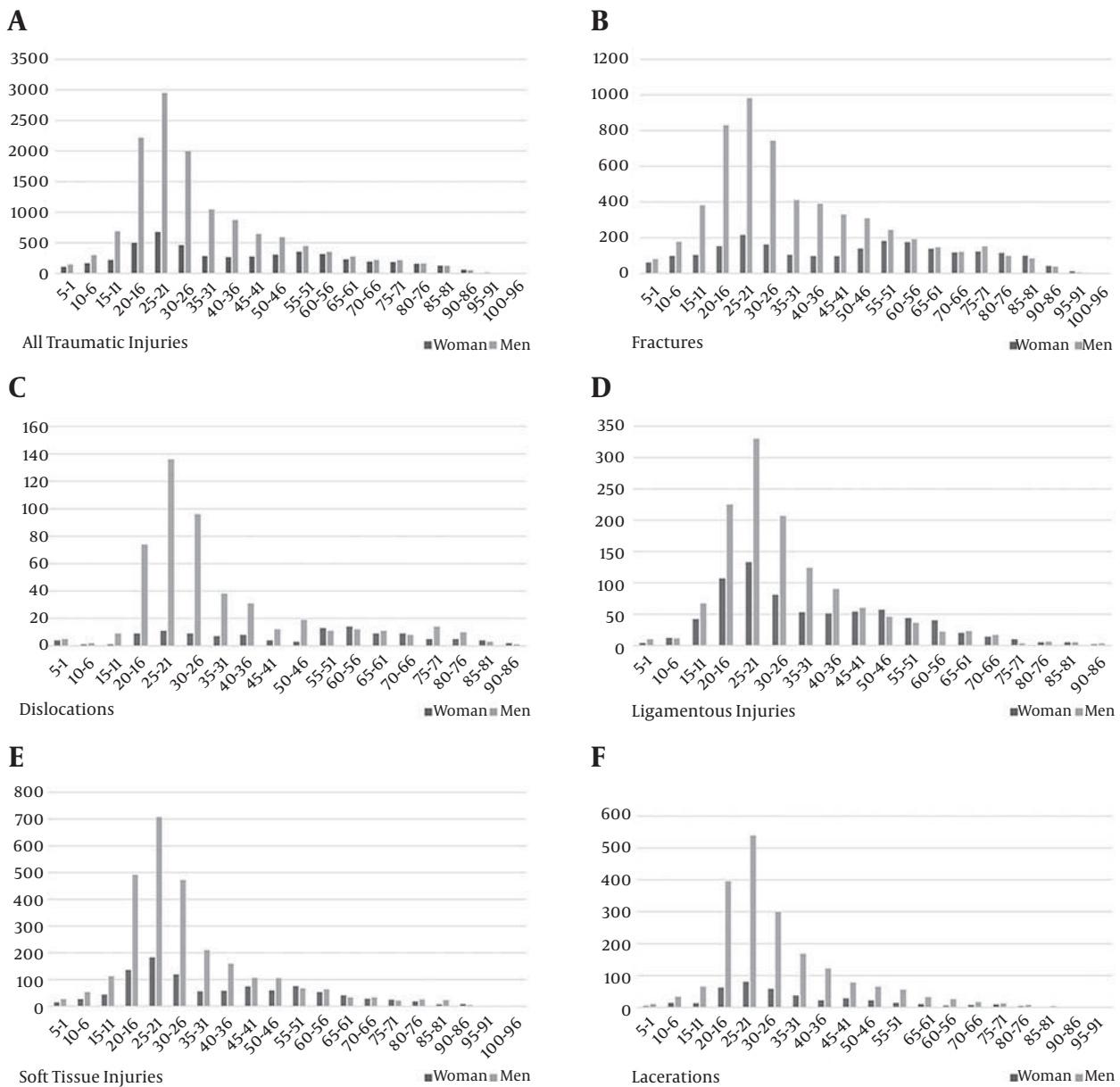
Injury Classification	Total Number	Male	Female	Gender Ratio, M/F	Prevalence (%)
Fractures	8204	5930	2274	2.6	44
Soft Tissue Injuries	3989	2900	1089	2.6	21
Lacerations	2419	2012	407	4.9	13
Ligamentous Injuries	2081	1329	752	1.7	11
Dislocations	628	508	120	4.2	3
Others	1569	1191	378	3.1	8
Total	18890	13870	5020	2.7	100

The prevalence of finger phalanx fractures recorded in our series is lower than in other reported studies (6, 15, 16) probably because many such patients are managed in the community without reference to the orthopedic trauma service and fail to be registered. Also the prevalence of vertebral fractures in our study was far lower than others. Our center is not a referral center for vertebral fractures and these fractures are treated in the region by neurosurgeons as well. However, our findings on age and gender incidence agree with those of other observers (15, 17, 18).

As in previous reports, we found that the most common fracture site was the distal forearm and proximal femur,

finger phalanx and metacarpal fractures were among common fractures (15, 16, 19, 20). But comparing our results with those, some differences were to be expected given the differences in climate and demographics, as well as high energy trauma pattern in developing countries. Particularly the prevalence of diaphyseal fractures was higher in our population which may be due to high frequency of motor cycle accidents in developing countries (11, 21). Our data confirm that there is considerable variation in the incidence of fractures by age and sex. However, the distribution curves were almost similar to previous reports except for carpal and metacarpal fractures.

Figure 1. Overall and Subgroups' age and Sex Distribution Curves



A) All traumatic injuries, B) Fractures, C) Dislocations, D) Ligamentous injuries, E) Soft tissue injuries, F) Lacerations.

Table 2. The Prevalence and Gender Ratio of Fractures

Fracture Classification	Male	Female	Total Number	Gender Ratio (M/F)	Prevalence (%)
Distal Radius/Ulna	756	365	1121	2	13.8
Tibial Diaphysis	612	112	724	5.5	8.8
Proximal Femur	356	279	635	1.3	7.8
Finger Phalange	394	133	527	3	6.4
Metacarpal	407	90	497	4.5	6
Metatarsal	329	159	488	2	5.9
Ankle	323	119	442	2.7	5.4
Carpus	310	112	422	2.7	5.4
Forearm	227	71	298	3.2	3.6
Clavicle	231	61	292	3.8	3.5
Femoral Diaphysis	182	53	235	3.4	2.9
Proximal Tibia	182	57	239	3.2	2.9
Pelvis	118	95	213	1.2	2.6
Proximal Humerus	130	84	214	1.5	2.6
Fibula	160	36	196	4.4	2.4
Humeral Diaphysis	121	59	180	2	2.2
Distal Humerus	116	57	173	2	2.1
Proximal Forearm	122	44	166	2.8	2
Calcaneus	101	23	124	4.4	1.5
Toe Phalanges	87	22	109	4	1.3
Patella	72	23	95	3.1	1.1
Distal Femur	52	34	86	1.5	1
Spine	66	18	84	3.7	1
Acetabulum	63	17	80	3.7	0.92
Scapula	57	15	72	3.8	0.9
Midfoot	31	12	43	2.6	0.53
Distal Tibia	29	7	36	4.1	0.42
Talus	20	13	33	1.5	0.41
Cesamoid	1	1	2	1	0.02
Others	273	105	378	2.6	4.6

Table 3. The Distribution Curves of Common Fracture Sites

Fracture Site	Distribution Curve
Distal Radius/Ulna	A
Tibial Diaphysis	B
Proximal Femur	F
Finger Phalange	B
Metacarpal	C
Metatarsal	A
Ankle	A
Carpus	D

General predominance of men is in line with previous results (11, 15, 16, 19-21). The reason for this predominance

is probably a combination of biological factors and social, gender-related differences related to activity and risk taking. Identification of these factors was not possible in this study, but it could be of value in the future (e.g. to help identify fracture-prone individuals in both sexes, and to aid in targeting of preventive measures).

Fractures occurring in people aged over 65 years and particularly over 75 years of age should be considered as fragility fractures, given the high prevalence of osteoporosis in these age groups. This assumption is confirmed by the finding that most of fractures are suffered by elderly women in this age group and the change in the male to female ratio from 3:1 to 1:1 after the age of 65. We found a steep rise in the incidence of wrist fractures, in women only, which begin as early as 45 years of age and peaks at 65 years with smaller increases in proximal hu-

meral, proximal tibia, pelvis, metatarsal and ankle fractures which confirmed previous reports (8, 22-24). None of these increases were seen in men. Riggs and Melton describe a similar pattern, but with an increase only after 50 years of age and considered it to be due to postmenopausal osteoporosis (25).

Other reports confirm the steep rise in the incidence of fractures in women after the age of 40 years (15, 26-28).

The incidence of hip fractures showed a similar pattern in both genders, being uncommon in the young, with an exponential increase from the age of 65 years (Rockwood's distribution curve F). There are three interacting factors: bone strength, the risk of falling, and the efficiency of neuromuscular responses which protect the skeleton. In the age group 50 to 74 years, Cooper et al found that reduced bone mass was a strong independent risk factor for hip fracture, but that over 75 years, osteoporosis may be less important than impairment of protective neuromuscular responses (29).

The epidemiology of diaphyseal fractures has been less well studied. Shaft fractures of cortical bone are considered to be associated with severe trauma, therefore having a different age incidence than cancellous bone fractures (21). In our study tibial diaphyseal fractures were the second common fracture which were not associated with a decrease in bone mass or the earlier onset of the menopause as in similar studies (7, 15, 23).

There was a seasonal variation in fracture incidence in our study with peaks in February-March and October. The traffic-related injuries occurred for the most part in April to October whereas falls reached their peak in late winter, February and March. Seasonal variations for all fractures have been described by other authors (19, 20, 30). We found that June is the month with the lowest number of fractures which can be explained by schools and universities and national examinations season. Knowledge of seasonal variations in fracture incidence might help in strategy planning as in resources allocation, preventive measures targeting and public health education (31).

Although the strength of this study was the use of a large sample, this study should also be interpreted in light of its shortcomings. It involved one center only, so our interpretation of the results can only be applied to a specific population. We did not focus on mechanism of injuries, medical comorbidities and other risk factors which could be of value in the future.

To the best of our knowledge this is the largest reported study of the epidemiology of traumatic injuries from a developing country. We have reported age, sex, and fracture specific prevalence rates for traumatic injuries and specially fractures in 18890 adults admitted in a tertiary referral hospital. The risk of traumatic injuries is higher among specific age groups with different patterns emerging for men and women. Thus, the descriptive epidemiology will provide useful information for treatment or prevention strategy planning of fractures.

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