

# Magnitude and determinants of osteoporosis in adult population of South Sharqiya region of Oman

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## ABSTRACT

**الأهداف:** من أجل تقدير حدوث كسور الورك كمؤشر لهشاشة العظام في السكان العمانيين اللذين يبلغون من العمر 40 عاما فما فوق في المنطقة الشرقية الجنوبية من عُمان. كما أوصينا بسياسة للتحذير من هشاشة العظام في هذا المجتمع.

**الطريقة:** شملت الدراسة المرضى اللذين تلقوا العلاج على ايدي أطباء وجراحي العظام نتيجة تعرضهم لكسر الورك الناجم عن السقوط خلال خمس سنوات، في الفترة مابين سبتمبر 2002 وحتى أغسطس 2007م، بمستشفى صور - عُمان. تم الحصول على معلومات المرضى قبل العملية الجراحية مثل: إصابات العظام، الحالات المرضية المشتركة، التاريخ السابق لحدوث الكسور ونوع المعالجة. استعملنا السكان لمنطقة الدراسة من أجل حساب حدوث الكسور خلال العام.

**النتائج:** شملت الدراسة 147 مريض (70 ذكراً - 77 أنثى) تزيد أعمارهم عن 40 عاماً تعرضوا لكسر الورك. كانت نسبة تعديل العمر لحدوث كسر الورك خلال العام في السكان البالغين من العمر 40 عاماً فما فوق في المنطقة الشرقية الجنوبية بنسبة 0.14%. أجريت العملية الجراحية لدى 96 مريض (65.3%)، استخدم مسمار الورك الديناميكي (DHS). أجريت عملية تقويم المفصل النصفي بواسطة الطرف الصناعي البديل (AMP) في 37 مريض (24.5%). تعرض 18 مريضاً (12.2%) لكسور في العظام في السابق.

**خاتمة:** كانت نسبة حدوث الكسور في الورك عالية. يمكن أن تكشف برامج فحص مسامية العظام والتدخلات الوافية لمجموعة المرضى ذوي الخطورة العالية وتمنع حدوث مثل هذه الكسور لهم في المستقبل.

**Objective:** To estimate the incidence of hip fractures as an indicator for osteoporosis in the >40 years old Omani population of the South Sharqiya region of Oman. We also recommended a policy for addressing osteoporosis in this community.

**Methods:** Orthopedic surgeons noted and treated patients with hip fracture that were due to a fall over

5 years (September 2002 to August 2007) at Sur Hospital, Oman. Their preoperative information, such as bone involved, co-morbidities, history of fractures, and the type of treatment were collected. We used the population of the study area to calculate the annual incidence of fractures.

**Results:** In our study, 147 persons (70 male, and 77 female) of >40 years with hip fractures were included. The age adjusted annual incidence rate of hip fracture in >40 population of South Sharqiya was 0.14%. While operating on 96 (65.3%) patients, we used dynamic hip screw. Hemi-arthroplasty with Austin-Moore prosthesis was performed in 37 (24.5%) patients. Eighteen (12.2%) patients had previous bone fractures.

**Conclusions:** The incidence of hip fracture was high. Osteoporosis screening programs and adequate interventions could detect the high-risk group and prevent such fractures in the future.

*Saudi Med J 2008; Vol. 29 (7): 984-988*

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*Received 23rd December 2007. Accepted 2nd May 2008.*

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If a person's bone mineral content (BMC) or bone mineral density (BMD) that is measured by dual-energy x-ray absorptiometry is 2.5 SD below the mean value among young adults of that population, the person is defined to suffer from osteoporosis.<sup>1</sup> It is characterized by low bone mass and micro-architectural deterioration of bone tissue that leads to enhanced bone fragility and increased risk for fracture.<sup>2</sup> Although fragility fractures can involve the entire skeleton, it commonly affects the

bones of the wrist, spinal vertebrae, and hip. The incidence of vertebral and hip fractures increases exponentially with advancing age. Osteoporotic fractures are major causes of morbidity and disability in the elderly and at this age, hip fractures can even lead to premature death. In addition, they impose a considerable economic burden on the health services, costing many billions of dollars each year. Hence, a public health approach to deal with this problem is essential. Osteoporotic fractures are a significant public health burden and are likely to increase in future generations. Lifetime risk of osteoporotic fractures is as high as 40-50% in women and 13-22% in men. Life expectancy is increasing worldwide, and it is estimated that the number of individuals aged 65 years and older will increase from the current figure of 323 million to 1,555 million by the year 2050. These demographic changes alone can increase the number of hip fractures from 1.66 million in 1990, to 6.26 million in 2050 globally.<sup>3-7</sup> In addition to low bone mass, several other risk factors, both skeletal and non-skeletal cause osteoporotic fractures. They may act independently or work together. In the former group, physical frailty, propensity to fall and a history of fracture are predictors of osteoporotic fractures. In addition, the risk of fracture in a person with a given BMC or BMD is positively associated to age. Thus, a review of osteoporotic fractures should include not only the magnitude, but also these known risk factors to determine their role in management of osteoporotic fractures.<sup>8,9</sup> Incidences of hip fractures and osteoporosis have been reported from Middle Eastern countries,<sup>10-13</sup> however, reports are limited from Oman. South Sharqiya, the eastern region of Oman was our study area, Sur city is its regional headquarter. The regional hospital receives referred patients from 18 primary health institutions. The orthopedic department has 4 qualified orthopedic surgeons offering care to patients with fractures. The institution has modern surgical facilities. No other orthopedic facility is available in the region. The health services in our institution are offered free from cost to the 138,000 Omani population. Nearly 21,000 persons (15% of total Omani population) in the region are of more than 40 years of age.<sup>14</sup> We conducted a study to estimate the incidence of hip fractures as an indicator for osteoporosis in the >40 years old Omani population of South Sharqiya region of Oman. We also recommended a policy for addressing osteoporosis in this community.

**Methods.** The head of the technical committee of Sur Hospital permitted the use of hospital records to carry out this retrospective study. Approval was obtained from the local ethics committee prior to the commencement of study. Informed patient consent was received from all study participants. To maintain confidentiality we used a unique identification code for each patient and de-linked his/her name from other

medical information. Our review criteria included case records of 1) all Omani patients, 2) with the diagnosis of a 'hip fracture', 3) above 40 years of age, 4) admitted to Sur Hospital, Oman, 5) over 5 years (September 2002 to August 2007). Hip fractures sustained due to a fall only were included in our study. Hip fractures due to any other significant trauma were excluded. Orthopedic surgeons, and staff nurses of the department of Sur Hospital were our study investigators. Information on demographic variables like age, gender, area of residence, medical conditions, past history of any fracture, and associated fractures were noted from the computerized case records. The case records are maintained by using Al Shifa software of Health Information and Management System. It is designed by the computer department of Ministry of Health, Oman. Hip fracture was defined radiologically as a fracture trait of the proximal femur that could be sub-capital, in the femoral neck, or in the trochanteric and intertrochanteric area. Types of treatment given were also recorded. All intertrochanteric fractures who accepted treatment at Sur Hospital were treated surgically by dynamic hip screw fixation (DHS). The intracapsular neck femur fractures were also treated surgically. Depending upon the age of the patient, the fracture geometry and bone stock, those requiring osteosynthesis were treated by closed reduction and fixation with either DHS or 7 mm cannulated screws. The Orthopedic surgeons used 'Austin-Moore prosthesis' to treat patients in need of hemiarthroplasty. Fractures of the greater trochanter of femur were managed conservatively.

The data were computed using XL Microsoft® software. The Statistical Package for Social Studies (SPSS 15) was used for parametric univariate analysis. We calculated frequencies and percentage proportions of different variables. The annual incidence rates of fractures were calculated by using the population of catchment area in this age group for the year of admission and treatment. The population statistics of the region was based on projections according to Census 2003.<sup>15</sup> The cases were grouped into '40 to 49', '50 to 59', '60 to 69' and '70 years and more'. The population figures in these age groups for males and females of South Sharqiya region were used for calculating the crude incidence rate in this age group. The annual age gender adjusted incidence rate of South Sharqiya was also calculated using the indirect standardization method.

**Results.** One hundred and forty-seven persons of >40 years of age with fractures (70 male and 77 female) were admitted for treatment of hip fractures sustained due to a fall. The mean age of the male patients with hip fracture was: 71.73 years (SD 11.306 years). While mean age of female patients with hip fracture was: 69.75 years (SD 10.775 years). The characteristics of our

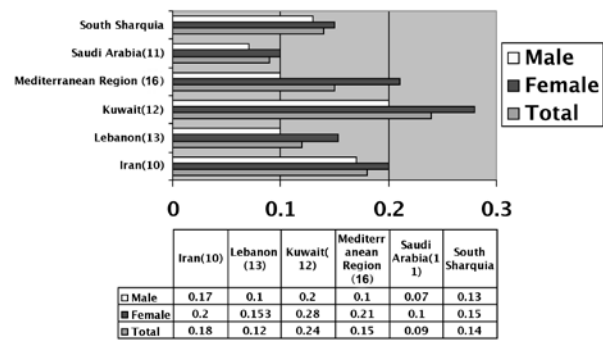
**Table 1** - Preoperative profile and management of patients with major fractures in Sur hospital of South Sharqiya region of Oman.

Patient profile	Persons with fracture n (%)
<b>Type of proximal femur fracture</b>	
Neck femur	49 (33.3)
Intertrochanteric	94 (63.9)
Greater trochanter	4 (2.7)
<b>History of major fractures</b>	
Yes	18 (12.2)
No	129 (87.8)
<b>Co morbidities</b>	
Diabetes	29 (19.7)
Hypertension	22 (15)
Others	27 (18.4)
Nil	69 (46.9)
<b>Medical treatment for osteoporosis given in past:</b>	
Yes	55 (37.4)
No	90 (61.2)
Missing	2 (1.4)
<b>Surgery</b>	
Dynamic hip screw	97 (66.7)
Austin moore prosthesis	36 (24.5)
Others (cannulated screws, excision arthroplasty, conservative treatment)	11 (7.5)
Refused treatment	2 (1.3)

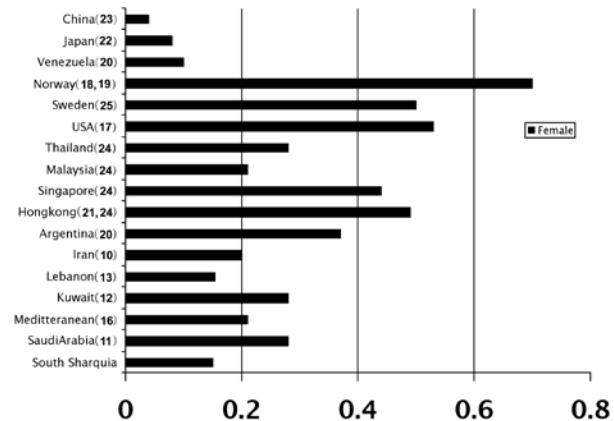
**Table 2** - Annual incidence of hip fracture in Sur Hospital of South Sharqiya region of Oman.

Determinant*	Population at risk	No. of hip fractures	Incidence rate	95% Confidence Interval
<b>Male</b>				
40 to 49	25,156	0	0.00	
50 to 59	17,346	10	0.06	0.02 - 0.09
60 to 69	11,783	20	0.17	0.10 - 0.24
≥ 70 years	6,692	48	0.72	0.52 - 0.92
<b>Total Male</b>	60,978	70	0.13	0.10 - 0.16
<b>Female</b>				
40 to 49	27,421	2	0.01	0.00 - 0.02
50 to 59	16,084	10	0.06	0.02 - 0.10
60 to 69	9,730	30	0.31	0.20 - 0.42
≥ 70 years	6,575	48	0.73	0.52 - 0.94
<b>Total Female</b>	59,809	77	0.15	0.12 - 0.18
<b>Laterality</b>				
Right		70	0.058	
Left		77	0.064	
<b>Year<sup>14</sup></b>				
2002	22,670	11	0.05	
2003	21,808	29	0.13	
2004	17,969	31	0.17	
2005	18,025	27	0.15	
2006	19,966	28	0.14	
2007	20,649	21	0.20	
<b>History of major fractures</b>				
Yes		18	0.01	
No		129	0.11	
<b>Total</b>	120,787	147	0.12	0.1216 - 0.1218

\*Apart for the 'Year,' incidence for other determinants were calculated for the entire study population



**Figure 1** - Incidence of hip fractures amongst >40 years of age population in Middle Eastern Countries.



**Figure 2** - Incidence of hip fractures amongst >40 years of age female population in different countries.

patients and their preoperative and management details are given in Table 1. Two thirds of patients had an intertrochanteric type of hip fracture. One third of patients had fracture of neck femur of intra-capsular type. Very few cases had 'greater trochanter' type of fracture. The age-gender adjusted annual incidence of hip fracture in South Sharqiya was 0.14%. The population at risk, number of persons with hip fracture, annual incidence rates and their 95% confidence intervals are given in Table 2. The incidence of hip fractures of females of >40 years of age was 0.15%. We compared the incidence of hip fracture among >40 years old of our study with the Middle Eastern population (Figure 1).<sup>10-13,16</sup> We also compared the incidence of hip fracture among >40 years old females in different countries as reported in the literature (Figure 2).<sup>10-13,16-25</sup> The incidence of hip fractures in >40 years of age noted in our study matches that reported in other countries of the region.

**Discussion.** In our study, the incidence of hip fracture in the >40 years old population of South Sharqiya was 0.14%. It was not different among males

and females. It matched the rates in populations of the same age-group of other Middle Eastern countries. The incidence in our study was much higher than that reported in Asian countries, and lower than in industrialized countries. Sur Hospital is the only hospital in the South Sharqiya region and definitive treatment of hip fractures is provided in this hospital. Hence, all patients sustaining a hip fracture are referred to Sur hospital. Computerized medical records in Sur Hospital ensured accuracy, avoided duplication, and minimized attrition in our study. Due to geographical considerations, patients with hip fractures residing at Masirah Island although belong to South Sharqiya region are routinely sent by flight to Muscat. The population at risk in Masirah Island is only 6,000 persons. Hence even after their exclusion, our study is likely to be representative of the South Sharqiya region of Oman. There were few limitations in our study. We had a small sample of cases. The population at risk was based on the 2003 census in Oman, the data of 2004 onwards are based on estimates. One could argue the difference in years could be due to accurate population in 2003 and 2004 compared to other years. In addition, the population of South Sharqiya differs in race, language, occupation, and lifestyle compared to the residents of the urban Oman and residents of interior regions of Oman. Hence, extrapolation of our results to the Omani population should be carried out with caution.

The definitions and diagnostic criteria differ in countries, and hence it is difficult to compare the incidence and prevalence of osteoporosis estimated in different studies. However, the magnitude of hip fracture has been reported to be the most fitting indicator of morbidity and mortality of bone due to osteoporosis.<sup>26,27</sup> It is also noted that the inclusion of osteoporotic (namely, minimal trauma) fracture only, and exclusion of the traumatic fractures may underestimate the prevalence of fragility fractures.<sup>28</sup> To avoid these confusions, we had included hip fractures due to causes other than 'Road Traffic Accident' (RTA) in our study. The age adjusted annual incidence rate of hip fracture in >40 population of South Sharqiya was 0.14%. This rate compares well with the rates found in other countries of the region like Saudi Arabia, Iran, predominantly Arab race, have rapidly developing economies, and the life expectancies are on the rise, the magnitude of hip fracture is likely to be same. The incidence of hip fractures in the South Sharqiya is within the range reported by the Mediterranean Osteoporosis Study (MEDOS) survey (0.1% among men and 0.21% among women).<sup>16</sup>

Our study population has a shorter life expectancy than that of industrialized countries. Hence, the lifetime

risk of femoral fractures is also low in our population. The comparison of incidence of hip fracture of our study with other studies both in the Middle East Asia and countries of European and American continent clearly suggest that the studies had wide variation in the target population, the incidence rate, and the year of the study. The developing countries of South East Asia had a higher incidence of hip fracture compared to our study. The magnitude of hip fracture in our study was not different in male and female populations. This is contrary to the conventional understanding of higher incidence in females compared to males in older ages. The risk of osteoporosis in females after menopause increases and that is the main reason for higher incidence in females.<sup>7</sup> In addition, females live longer than males. Perhaps better nutritional status of females, high fertility rates among Omani females and minimum use of oral contraceptives due to religious restrictions could attribute to a lower risk of osteoporosis compared to females of similar age groups of other countries. Free and easy access to health services to females in the last 3 decades in the study area also might have attributed to better bone health of females. High prevalence of osteoporosis has also been found in a study in Saudi men.<sup>29</sup> Further studies with a larger sample are recommended to understand gender not being associated to incidence of hip fracture.

In our study, 12.2% of patients with hip fractures had a past history of other types of hip or osteoporotic fractures. The risk of subsequent fracture among those with a prior fracture at any site is 2.2 times more compared to that in people without a prior fragility fracture. Hence, such patients should be investigated and targeted for the treatment of osteoporosis if further fragility fractures are to be prevented.<sup>30,31</sup> A previous history of fractures in older Mexican Americans was the strongest predictor of recurrent fractures at hip and non-hip sites, independent of other health measures.<sup>32</sup> Our findings of recurrent fractures suggest that proactive steps to detect the osteoporosis, fall-related factors in this population and adequate measures to treat osteoporosis should be undertaken. More than half of our patients with hip fractures were suffering from co-morbidities, mainly diabetes (19.7%) and hypertension. This matched with the results of other studies that showed association of diabetes to hip fractures.<sup>33-36</sup> Longitudinal studies are recommended to confirm higher risk of hip fracture among patients with diabetes. This is more relevant in Oman as the prevalence of diabetes in 30-60 years old population was as high as 16.1%.<sup>37</sup>

The high incidence of hip fracture in our population shows that preventive strategies for hip fracture, and osteoporosis should be considered in males as well as females. A multi-center study to investigate the incidence of hip fractures in Oman should be

undertaken to determine magnitude and risk factors of osteoporosis. This will assist the decision makers for formulating and implementing a National Health Policy on osteoporosis.

**Acknowledgment.** We thank the administrators of the Sur Hospital and the Directorate of Health Affairs of South Sharqiya region for permitting us to undertake this study. We thank all the colleagues of Orthopedic Department who rendered services to the patients. We also thank our patients who cooperated with us in different stages of their care.

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