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## SYSTEMATIC REVIEW

### Economic Impact of Osteoporosis Related Hip Fractures in Bahrain. A Systematic Review

Mir Sadat-Ali<sup>1,2,\*</sup>

<sup>1</sup>Department of Orthopaedic Surgery, King Fahd Hospital of the University Imam AbdulRahman Bin Faisal University, Dammam, Saudi Arabia

<sup>2</sup>Affiliate Consultant Orthopaedic Surgeon, Awali Hospital, Awali, Kingdom of Bahrain

#### Abstract:

#### Background:

Fragility fractures are common due to osteoporosis and there is very limited data on hip fractures from the Middle East in general and Kingdom of Bahrain in particular. The aim of this paper is to review the published data of femoral fractures in the Middle East and extrapolate the financial burden of osteoporosis related hip fractures in Bahrain and suggest some course of action for the region in controlling the fragility fractures.

#### Methods:

An extensive search was performed on published studies on hip fracture from 1990 to 2020 by a Medline, EMBASE the Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews and the Science Citation Index, Bahrain Medical Bulletin, Qatar Medical J, Oman with the key words: Osteoporosis, osteopenia, fragility hip fractures. The inclusion criterion was studies published during 1990-2020 describing the prevalence of osteoporosis and proximal hip fractures in patients with  $\geq 50$  years, from the Kingdom of Bahrain, Saudi Arabia, State of Kuwait, Sultanate of Oman, United Arab Emirates, State of Kuwait, Iraq, Iran, Turkey and the State Hashemite Kingdom of Jordan. Based on the fractures per 1000, an average was taken and extrapolated for the Kingdom of Bahrain and direct and indirect costs were assessed.

#### Results:

A total of 19 studies were selected for analysis from 10 countries. The average prevalence of postmenopausal osteoporosis was  $29.37 \pm 6.97\%$  (Range 20.2 to 38.5). In these 10 countries, 252.411 million people live, with an average of 28.56% suffering from osteoporosis. A total of 72.088 million are at risk of having a fragility fracture. The prevalence of fragility fractures of the proximal femur in six countries means prevalence is 4.41/1000. With this average, it is extrapolated that femoral fractures due to osteoporosis costs Bahrain yearly a total of BD 5.31 million.

#### Conclusion:

The prevalence of Osteoporosis is going to increase in Bahrain as the population is aging. This will further increase the economic impact of taking care of elderly patients with osteoporosis and related fractures. Early intervention to diagnose and treat this aging population will reduce the cost and save lives.

**KeyWords:** Osteoporosis, Bahrain, Fragility fractures, Prevalence, Proximal femur, Mortality.

#### Article History

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## 1. INTRODUCTION

Osteoporosis is a major issue in the developing world, which is causing concerns on the financial as well as social aspects. The reported incidence of post menopausal osteoporosis among Saudi Arabian women was reported to be 33% and men 39% [1, 2]. A recent published report from the Kingdom of Bahrain suggested that the prevalence of osteoporosis is 38% [3, 4]. Osteoporosis has always been under

diagnosed hence under treated. Even though the health care authorities and societies have promoted awareness of osteoporosis and its complications but still wide gaps remain in the ideal treatment [4, 5]. These figures did not change much as a recent study showed that only 27.7% women were treated with osteoporosis medications post fragility fractures within 12 months of the index fracture and 72.2% were left untreated [6]. A fragility fracture involving proximal femur is the most devastating injury leading to serious consequences and 28% mortality within the first year. In those surviving the fracture episode, the morbidity is high with loss of independent mobility and 10-12% being assigned to post acute care facility

\* Address correspondence to this author at Orthopaedic Surgery, King Fahd Hospital of the University Imam AbdulRahman Bin Faisal University, Saudi Arabia; Tel: +966505848281; Fax: +966138820887; E-mail: drsadat@hotmail.com

were readmitted within the first 6 weeks [7].

There is limited literature on the fragility femoral fractures from the Middle-East countries. Bubshait and Sadat-Ali (2007) [8] reported a prevalence of 5.7 femoral fractures per 1000 population over the age of 50 years and recently, Sadat-Ali *et al.* (2015) [9] a prevalence of 5.8/1000 population. The US Preventive Services Task Force (USPSTF) after extensive research and reviews found convincing evidence that bone measurement tests are accurate for predicting osteoporotic fractures in both women and men. The objective of this review is to analyze the prevalence of osteoporosis and related fractures and extrapolate the prevalence of femoral fractures due to osteoporosis in Kingdom of Bahrain and assess the cost and find ways to prevent both.

## 2. METHODS

A meticulous search was performed on published studies on a hip fracture from 1990 to 2020 by a Medline, EMBASE the Cochrane Central Register of Controlled Trials and Cochrane Database of Systematic Reviews and the Science Citation Index, Bahrain Medical Bulletin, Qatar Medical J, Oman with the key words: Osteoporosis, osteopenia, fragility hip fractures. The inclusion criteria were studies published during 1990-2020 describing the prevalence of osteoporosis and proximal hip fractures in patients with  $\geq 50$  years, from

Kingdom of Bahrain, Saudi Arabia, State of Kuwait, Sultanate of Oman, United Arab Emirates, State of Kuwait, Iraq, Iran, Turkey and State Hashemite Kingdom of Jordan. Based on the fractures per 1000, an average was taken and extrapolated for the Kingdom of Bahrain and direct and indirect costs were assessed. Data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 23.0 (Chicago, Illinois). Results were expressed as mean  $\pm$  SD for continuous variables unless stated otherwise

## 3. RESULTS

A total of 19 studies were selected for analysis from 10 countries. The average prevalence of postmenopausal osteoporosis was  $29.37 \pm 6.97\%$  (ranging from 20.2 to 38.5). Table (1) gives the prevalence of individual countries. In these 10 countries, 252.411 million people live with an average of 28.56% suffering from osteoporosis. A total of 72.088 million are at risk of having a fragility fracture. Table 2 gives the prevalence of fragility fractures of the proximal femur in six countries. The mean femoral fracture prevalence is 4.41/1000. It is estimated that in 2020, 7,43901 are Bahraini citizens and 5.32% are  $\geq 50$  years of age totaling 39575, and will suffer 177 fractures will have direct costs of BD1.327 million and indirect yearly cost of BD 3.98 for primary first fracture with a total of BD 5.310 million (US\$14.07 million) [24 - 26] (Table 3).

**Table 1. Review of literature of 10 countries in the Middle East showing the prevalence of osteoporosis.**

	Authors	Country	Total Population in millions	Prevalence/Incidence (%)
1.	Sadat-Ali M & Mattar 20203	Kingdom of Bahrain	0.558	38.5
2.	Sadat-Ali <i>et al.</i> 20122	Saudi Arabia	33.7	33.5
3.	Al-Shoumer and Nair(2012) [10]	Kuwait	1.4	20.2
4.	Fawasy <i>et al.</i> (2012) [11]	UAE	1.08	22.3
5.	D'Souza <i>et al.</i> (2013) [12]	Oman	2.3	27.3
6.	Hyassat <i>et al.</i> (2017) [13]	Jordan	10.23	37.5
7.	Bener <i>et al.</i> (2007) [14]	Qatar	0.313	21.3
8.	Hamdi <i>et al.</i> (2007) [15]	Turkey	83.3	30.2
9.	Gorial <i>et al.</i> (2013) [16]	Iraq	38.43	22.8
10.	Hemmati <i>et al.</i> (2018) [17]	Iran	81.1	32
Total/Average			252.411	28.56

**Table 2. Prevalence of osteoporosis related femoral fractures in 8 countries.**

		Per 1000	Country
1	Al-Nuaim <i>et al.</i> (1995) [18]	2.9	Saudi Arabia
2.	Bubshait and Sadat-Ali (2007) [8]	5.9	Saudi Arabia
3.	Sadat-Ali <i>et al.</i> (2015) [9]	5.7	Saudi Arabia
4.	<a href="https://www.iofbonehealth.org/">https://www.iofbonehealth.org/</a> [19]	2.25	UAE
5.	Memon <i>et al.</i> (1998) [20]	2.95	Kuwait
6.	Kanis <i>et al.</i> (2012) [21]	2.7	Oman
7.	Tuzun S <i>et al.</i> (2012) [22]	3.28	Turkey
8.	Maharlouei <i>et al.</i> (2014) [23]	9.6	Iran
-	-	4.41/1000	-

**Table 3. Assessment of total costs for the first year due to hip fractures.**

Direct costs :	BD1,327,500.00
Indirect Costs:	BD3,982,500.00
Total Costs:	BD5,310,000.00

#### 4. DISCUSSION

This review finds that even with the conservative figures, the economic impact on Bahrain due to osteoporosis and its complications, most commonly proximal femoral fractures is BD5.31 million (\$14.07 million) with 28% of the patients dying within a year after the femur fracture. This is for a Bahraini population of <700,000. The ideal way to prevent fractures is to diagnose early and treat appropriately. The gold standard test for such prediction has been dual-energy x-ray absorptiometry (DXA) of the hip and lumbar spine. Based on the DXA, drug therapies can be started to prevent osteoporotic fractures [26 - 28].

Multiple studies have shown that early diagnosis and drug therapy can reduce fractures in postmenopausal women and men with osteoporosis [26, 27]. The cost of managing osteoporosis related fractures specifically fragility fractures, which increase morbidity and mortality is increasing tremendously all around the world [29, 30]. In the USA in 2005, there were over two million fractures, costing \$17 billion, and it is estimated that by 2025, annual fractures and costs are projected to increase by 50% to \$25 billion [30 - 31]. In Europe, the trends are not different from those in the USA, and it was reported that direct costs were estimated at €31.7 billion and are expected to increase to €76.7 billion in 2050 based on the expected changes in the demography of Europe [32]. Giverson [37] reported that in Denmark, hip fracture incidence increased by 56% during the period 1987–1997, with an increase of 41% among women and 104% among men aged 50 years or older, whereas in Finland, the total number of hip fractures increased by 70% within a 10-year period (1992–2002) [34]. In Saudi Arabia, the data shows the yearly direct costs of treating only one fracture is SR564.75 and indirect costs are SR 1.69 billion making total cost of SR2.359 billion.

There was a recent report that stated that the incidence of osteoporosis is 38% and no literature is found regarding the incidence of osteoporosis nor fragility fractures from Kingdom of Bahrain. We have undertaken this retrospective study to assess the prevalence of osteopenia and osteoporosis among Bahraini citizens, so that appropriate screening can be recommended for early diagnosis and appropriate treatment to prevent fragility fractures. Hip fractures are the most devastating osteoporosis related injury with high morbidity and mortality. In the US, the rate of hip fracture is about 6/1000 [35], in Saudi Arabia it was 2.8/1000 in 2007, which increased over time to 5.8/1000 in 2015 [4, 8]. It can be extrapolated in 39575 citizens of Bahrain of  $\geq 50$  years there could be 177 fractures annually, costing the country a total of BD 5.310 million (US\$14.07 million) [23 - 25]. If these patients can be screened and treated appropriately will cost BD50 per patient yearly, costing the Kingdom BD5,54050.00 with a saving of

BD4.755 million. Economically, it is viable which will save money under these economic hardships and save the lives of patients and improve the quality of life and save over BD 4.755 million a year [36 - 39].

#### CONCLUSION

In conclusion, this review highlights the risk of osteoporosis related fractures that can be prevented by early screening and treating appropriately. This will not only reduce the economic impact due to osteoporosis but also decrease mortality and improve the quality of life. Secondly, studying all the citizens of Bahrain  $\geq 50$  years, who are  $\leq 40000$ , will be a great option to assess the pattern of osteoporosis and fragility fractures. This will give the region, the right step as ethnic differences in the review countries do not differ from each other much.

#### CONSENT FOR PUBLICATION

Not applicable.

#### STANDARDS FOR REPORTING

PRISMA guidelines and methodology were followed.

#### FUNDING

None.

#### CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

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Declared none.

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