

## Research Article

# Awareness of Osteoporosis-Related Symptoms, Risk Factors, Preventive Measures, and Treatment Availability among Female Adults Attending Primary Healthcare Centers in Muscat Governorate, Oman

Anwaar Al Lawati \*, Manar AlZeedi, Basma Al Zadjali, Habiba Meah, Said Al Hasani, Khadija Al Ghammari and Asma Al Muqemmi

Directorate General of Health Services, Primary Health Care, Muscat Governorate, Ministry of Health, Muscat, Oman

## Abstract

### Background and Objective

Osteoporosis-related knowledge and beliefs are important contributors to improving preventive behaviors. This study aimed to assess knowledge of osteoporosis symptoms, risk factors, and treatment availability in Muscat Governorate.

### Methods

This cross-sectional study targeted 400 adult Omani women attending nine randomly selected primary healthcare centers in 2021. A validated 20-item Osteoporosis Knowledge Assessment Tool (OKAT) was used.

### Results

While most women had good knowledge of symptoms/fracture risk (53.9%) and preventive measures (39.8%), only 23.3% and 7.8% were well aware of risk factors and treatment availability, re-

spectively. Based on their OKAT scores, 51.6% demonstrated a moderate level of osteoporosis-related knowledge and overall knowledge (43.8% vs. 20.2–23.3%;  $P = 0.002$ ).

### Discussion

To the best of the authors' knowledge, this is the first study to assess knowledge of osteoporosis in Oman. There were distinct gaps in knowledge, especially in terms of risk factors and treatment availability among the study group.

**Keywords:** Hormonal replacement therapy; Menopause; Osteoporosis; Risk factors

## Introduction

Osteoporosis is a general skeletal disorder marked by a loss of bone mass, deterioration of bone structure, and an increase in bone fragility and fracture risk [1]. According to the World Health Organization (WHO), osteoporosis is diagnosed by dual-energy X-ray absorptiometry (DEXA) in which bone mineral density is 2.5 standard deviations or more below mean peak bone mass [2]. Osteoporosis affects approximately 50% of women and 20% of men over the course of their lifetime [1,3]. Globally, osteoporotic fractures occur every three seconds, resulting in over 8.9 million fractures per year [3]. According to estimates from the International Osteoporosis Foundation, osteoporosis affects approximately 200 million women worldwide, of which 75 million reside in Europe, Japan, or the United States [4].

Osteoporosis is a multifactorial disease involving various risk factors, including non-modifiable factors like gender, ethnicity, advancing age, and genetic heredity, as well as modifiable factors such as alcohol and caffeine consumption, smoking status, and calcium and vitamin D intake [1]. According to the United States Preventive Services Task Force, osteoporosis screening is indicated for all women aged  $\geq 65$  years and for women aged  $< 65$  with an increased fracture risk [5]. In the Middle East, multiple studies have been conducted to determine the prevalence of osteoporosis as well as its economic and clinical effects at the community level. For instance, in Saudi Arabia, and review of previous research showed that 36.6% of healthy women between the ages of 50–79 years were osteoporotic; in addition, the findings supported the implementation of a lower screening age compared to Western population-based recommendations (55 vs.  $\geq 65$  years) [6].

Health beliefs and increased knowledge may contribute to osteoporosis prevention and management as a result of the early detection of risk factors and adoption of risk-reducing practices [7,8]. Unfortunately, studies from the Middle East and North Africa have indicated a general lack of awareness related to this condition among women [9-12]. One study from Iran found that awareness of osteoporosis amongst adolescent girls was low, although this dramatically improved following an educational intervention [13]. However, another study revealed that, despite uninformed perceptions of their susceptibility to osteoporosis, women attending primary health centers in Qatar demonstrated a strong desire to preserve their health and believed in the advantages of a calcium-rich diet and regular exercise [11].

\*Corresponding author: Anwaar Al Lawati, senior consultant family physician, directorate general of health services, primary health care, muscat governorate, ministry of health, oman. Email: anwaaraj@gmail.com

**Citation:** Lawati AA, AlZeedi M, Al Zadjali B, Meah H, Al Hasani S, et al. (2023) Awareness of Osteoporosis-Related Symptoms, Risk Factors, Preventive Measures, and Treatment Availability among Female Adults Attending Primary Healthcare Centers in Muscat Governorate, Oman. J Community Med Public Health Care 10: 137.

**Received:** September 26, 2023; **Accepted:** October 11, 2023; **Published:** October 18, 2023

**Copyright:** © 2023 Lawati AA, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

To the best of the authors' knowledge, there is a scarcity of information concerning osteoporosis-related health beliefs and awareness among the general female population in Oman. Moreover, no research has yet been published from primary care settings, which constitutes the first point of contact between the public and healthcare services. Thus, there is an urgent need for focused research on this topic to inform future interventions designed to increase awareness of the condition and contribute to disease prevention efforts. This research therefore aimed to assess knowledge of osteoporosis-related symptoms, risk factors, preventive measures, and treatment availability among Omani adult women attending primary healthcare centers in Muscat Governorate, Oman.

## Methods

This cross-sectional study was conducted at nine primary healthcare centers in Muscat Governorate in 2021. These centers were randomly selected from a total of 31 primary healthcare centers located in the six *wilayats* (districts) of Muscat Governorate based on the percentage of women aged 20–45 years in each *wilayat*. The selected health centers included the Al-Koud, Al-Seeb, and Al-Mabela health centers from Seeb *wilayat*, the Al-Khuwair and Al-Ghubra health centers from Bawsher *wilayat*, the Wadi Al-Kabir health center from Mutrah *wilayat*, the Al-Amerat health center from Al-Amara *wilayat*, the Muscat health center from Muscat *wilayat*, and the Al-Sahel health center from Qurayat *wilayat*.

The target population consisted of adult Omani women between 20–45 years old attending the selected primary healthcare centers. Women who had already been clinically diagnosed with osteoporosis were excluded from the study, as were those with intellectual disabilities. The necessary sample size was calculated to be 400 eligible Omani women. Recruitment for the study continued until the target sample size had been reached.

Data were collected from the participants using an Arabic-language questionnaire divided into two main sections. The first section assessed the sociodemographic characteristics of the participants, while the second section consisted of a previously validated, Arabic-language version of the 20-item Osteoporosis Knowledge Assessment Tool (OKAT) [14,15]. The OKAT questionnaire covers four main domains of osteoporosis-related knowledge, including: (1) symptoms and fracture risk (five items); (2) risk factors (seven items); (3) preventive measures (six items); and (4) availability of treatment (two items). Participants are asked to choose one out of three possible responses for each item ('true', 'false', or 'I don't know').

As per the original OKAT questionnaire, correct responses received a score of 1 per item, while incorrect responses or responses of 'I don't know' were assigned scores of 0 per item, resulting in a total score range of 0–20 [14]. For the purposes of the present study, total scores of  $\geq 12$ , 8–11.9, and  $< 8$  were considered to indicate good, moderate, and poor levels of overall osteoporosis-related knowledge, respectively. In turn, good, moderate, and poor levels of knowledge were also considered for each individual domain of knowledge, including symptoms and fracture risk (scores of  $> 3$ , 3–2, and  $< 2$ , respectively), risk factors (scores of  $> 4$ , 4–3, and  $< 3$ , respectively), preventive measures (scores of  $> 3$ , 3–2, and  $< 2$ , respectively), and availability of treatment (scores of  $> 1$ , 1, and  $< 1$ , respectively). Data was collected by the researchers during visits to each of the selected health centers. After a brief explanation of the main objectives of the study, verbal informed consent was obtained from each

participant. All potential participants were assured that participation in the study was entirely voluntary in nature and that all data would be kept confidential. Digital consent was also confirmed prior to the electronic administration of the questionnaire via a web-based mobile application. The researcher remained available during the completion of the questionnaire to assist with any inquiries.

Results were presented as percentages and numbers and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20 (IBM Corp., Armonk, NY, USA). A Chi-squared test was used to test associations between categorical variables. A *P* value of  $< 0.05$  was considered statistically significant. This study was approved by the Regional Research and Ethical Committee of the Ministry of Health in Muscat Governorate, Oman.

## Results

A total of 400 Omani women participated in the study. The participants ranged in age from 20–45 years, with 50.5% being aged 30–39 years. The majority (82.5%) were married, had been educated to the school level (52.8%), and had a monthly income of  $< 1,500$  OMR (93.3%). Most participants (73.8%) had no family history of osteoporosis; among those with a positive history, 55 (61.1%) had first-degree relatives who were osteoporotic. Most participants (78.5%) had no prior chronic diseases and did not currently smoke (99.7%). Over half of the cohort were above normal weight, with 120 (30.6%) and 112 (28.6%) overweight and obese, respectively [Table 1].

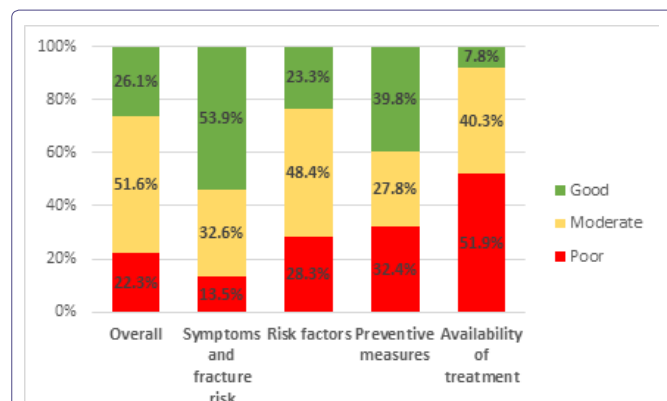
Characteristic	n (%)
<b>Age in years*</b>	
20–29	124 (31)
30–39	202 (50.5)
$\geq 40$	73 (18.3)
<b>Marital status</b>	
Single	54 (13.5)
Married	330 (82.5)
Divorced	14 (3.5)
Widowed	2 (0.5)
<b>Education level*</b>	
Illiterate	1 (0.3)
School	211 (52.8)
University	187 (46.8)
<b>Employment status*</b>	
Unemployed	238 (59.5)
Employed	161 (40.3)
Retired	8 (2)
<b>Monthly income in OMR†</b>	
$< 500$	127 (31.8)
500–1,500	246 (61.5)
1,501–2,500	11 (2.8)
$> 2,500$	6 (1.5)
<b>Family history of osteoporosis</b>	
Yes	90 (22.5)
No	295 (73.8)
I don't know	14 (3.5)
<b>Degree of relative with osteoporosis‡</b>	

First	55 (61.1)
Second	26 (28.9)
Third	1 (1.1)
In-law	6 (6.7)
<b>History of chronic disease*</b>	
Yes	85 (21.3)
No	314 (78.5)
<b>Current smoker<sup>¶</sup></b>	
Yes	396 (99.7)
No	1 (0.3)
<b>BMI in kg/m<sup>2</sup></b>	
<18.5	22 (5.6)
18.5–24.9	138 (35.2)
25.0–29.9	120 (30.6)
≥30	112 (28.6)

**Table 1:** Sociodemographic and clinical characteristics of the participants (N = 400).

OMR = Omani riyals; BMI = body mass index.\*Percentages calculated out of 399 due to missing data for one respondent. †Percentages calculated out of 390 due to missing data for 10 respondents. ‡Percentages calculated out of those who indicated a family history of osteoporosis (n = 90). Percentages calculated out of 397 due to missing data for three respondents.

Based on their total OKAT scores, most participants (51.6%) demonstrated a moderate level of osteoporosis-related knowledge. In terms of specific knowledge domains, 53.9% and 39.8% demonstrated good knowledge of osteoporosis-related symptoms/fracture risk and preventive measures, respectively, while only 23.3% and 7.8% demonstrated good knowledge of osteoporosis-related risk factors and treatment availability, respectively [Figure 1]. The frequency of correct responses for each OKAT item is shown in [Table 2].



**Figure 1:** Level of osteoporosis-related knowledge\* among the participants (N = 400).

\*Assessed using the Osteoporosis Knowledge Assessment Tool [14,15]

The maximum score for this tool was 20. scores of  $\geq 12$ , 8–11.9, and  $< 8$  were considered to indicate good, moderate, and poor levels of overall osteoporosis-related knowledge, respectively. In turn, good, moderate, and poor levels of knowledge were also considered for each individual domain of knowledge, including symptoms and fracture risk (scores of  $> 3$ , 3–2, and  $< 2$ , respectively), risk factors (scores of  $> 4$ , 4–3, and  $< 3$ , respectively), preventive measures

(scores of  $> 3$ , 3–2, and  $< 2$ , respectively), and availability of treatment (scores of  $> 1$ , 1, and  $< 1$ , respectively).

Item		Correct responses, n (%)
Symptoms and fracture risk	Osteoporosis leads to an increased risk of bone fractures <sup>†</sup>	363 (91.4)
	Osteoporosis usually causes symptoms (e.g., pain) before fractures <sup>‡</sup>	33 (8.3)
	By age 80, the majority of women have osteoporosis <sup>‡</sup>	291 (72.9)
	From age 50, most women can expect at least one fracture before they die <sup>†</sup>	207 (52.1)
	It is easy to tell whether someone is at risk of osteoporosis by their clinical risk factors <sup>‡</sup>	129 (32.3)
Risk factors	Having a higher peak bone mass at the end of childhood gives no protection against the development of osteoporosis in later life <sup>¶</sup>	255 (64.1)
	Osteoporosis is more common in men <sup>¶</sup>	266 (66.8)
	Cigarette smoking can contribute to osteoporosis <sup>¶</sup>	205 (51.5)
	White women are at highest risk of fracture as compared to other races <sup>¶</sup>	80 (20.1)
	A fall is just as important as low bone strength in causing fractures <sup>¶</sup>	195 (49)
	There is a small amount of bone loss in the 10 years following the onset of menopause <sup>‡</sup>	112 (28.1)
	Family history of osteoporosis strongly predisposes a person to osteoporosis <sup>‡</sup>	246 (61.7)
Preventive measures	Any type of physical activity is beneficial for osteoporosis <sup>‡</sup>	46 (11.5)
	An adequate calcium intake can be achieved from two glasses of milk a day <sup>‡</sup>	238 (59.6)
	Sardines and broccoli are good sources of calcium for people who cannot take dairy products <sup>‡</sup>	305 (76.4)
	Calcium supplements alone can prevent bone loss <sup>‡</sup>	268 (67)
	Alcohol in moderation has little effect on osteoporosis <sup>‡</sup>	176 (44.1)
	A high salt intake is a risk factor for osteoporosis <sup>¶</sup>	197 (49.5)
Availability of treatment	Hormone therapy prevents further bone loss at any age after menopause <sup>¶</sup>	72 (18.1)
	There are no effective treatments for osteoporosis available in Oman <sup>¶</sup>	151 (37.9)

**Table 2:** Knowledge of osteoporosis\* among the respondents (N = 400).

\*Assessed using the Osteoporosis Knowledge Assessment Tool [14,15].

†Percentages calculated out of 397 due to missing data for three respondents. ‡Percentages calculated out of 399 due to missing data for one respondent. Percentages calculated out of 398 due to missing data for two respondents.

In terms of their knowledge of osteoporosis symptoms and fracture risk, most participants were aware that osteoporosis increases the risk of bone fractures (91.4%), that most women over the age of 80 suffer from osteoporosis (72.9%), and that women over the age of 50 are expected to have at least one fracture before they die (52.1%). However, only 8.3% and 32.3%, respectively, knew that osteoporosis does not cause symptoms prior to fractures and that clinical risk factors can be used to determine if an individual is at risk for osteoporosis. With regards to osteoporosis-related risk factors, 66.8% correctly identified the increased risk of osteoporosis in women, although only 20.1% and 28.1%, respectively, identified ethnicity as a risk factor

and were aware of the role of hormonal factors triggered by menopause.

Considering awareness of preventive measures against the development of osteoporosis, few participants (11.5%) correctly indicated that only certain types of physical activity are beneficial for osteoporosis, although most (67%) were aware that calcium supplementation alone cannot prevent bone loss. The majority identified two glasses of milk as an adequate source of calcium (59.6%) and of sardines and broccoli as good, non-dairy sources of calcium (79.4%). On the other hand, less than half realized that high consumption of alcohol (44.1%) and salt (49.5%) could have osteoporotic effects. Finally, in terms of knowledge of treatment availability, only 18.1% were aware that hormonal therapy could prevent further bone loss at any age and only 37.9% were aware of the availability of effective treatment in Oman.

An analysis was conducted to determine associations between selected sociodemographic and clinical characteristics and overall osteoporosis-related knowledge in the cohort [Table 3]. Age was the only factor found to have a significant effect on overall osteoporosis-related knowledge, with women aged  $\geq 40$  years more frequently demonstrating good levels of knowledge compared to those aged 20–29 or 30–39 years (43.8% vs. 20.2% and 23.3%, respectively;  $P = 0.002$ ). When evaluating each specific domain of knowledge, being aged  $\geq 40$  years significantly affected awareness of osteoporosis-related risk factors (45.2% vs. 13.7% and 21.3%, respectively;  $P < 0.001$ ) and preventive measures (58.9% vs. 38.9% and 33.7%, respectively;  $P = 0.003$ ), but not symptoms and fracture risk ( $P = 0.575$ ) or availability of treatment ( $P = 0.598$ ).

History of chronic disease*				0.447
Yes	20 (23.5)	39 (45.9)	26 (30.6)	
No	69 (22)	167 (53.2)	78 (24.8)	
BMI in kg/m <sup>2</sup>				0.818
<18.5	7 (31.8)	11 (50)	4 (18.2)	
18.5–24.9	31 (22.5)	70 (50.7)	37 (26.8)	
25–29.9	28 (23.3)	60 (50)	32 (26.7)	
$\geq 30$	20 (17.9)	62 (55.4)	30 (26.8)	

**Table 3:** Associations between selected characteristics and overall osteoporosis-related knowledge\* (N = 400).

OMR = Omani riyals; BMI = body mass index. \*Assessed using the Osteoporosis Knowledge Assessment Tool [14,15]

Scores of  $\geq 12$ , 8–11.9, and  $< 8$  were considered to indicate good, moderate, and poor levels of knowledge, respectively.

In addition, marital status had a significant effect on awareness of preventive measures, with single participants more frequently demonstrating good levels of knowledge of this domain compared to ever-married participants (55.6% vs. 37.4%;  $P = 0.031$ ). Finally, both marital status and education level affected awareness of treatment availability, with married participants (9% vs. 0%;  $P = 0.007$ ) and women educated to the school level (9.5% vs. 0% and 5.9%, respectively;  $P = 0.028$ ) demonstrating better knowledge of this domain compared to their respective counterparts.

## Discussion

This study aimed to assess levels of osteoporosis awareness among a cohort of adult Omani women attending nine selected primary healthcare centers in Muscat Governorate. Knowledge was assessed over four dimensions: (1) osteoporosis symptoms and risk of fracture; (2) osteoporosis-related risk factors, (3) preventive measures against the development of osteoporosis; and (4) availability of treatment. Women were chosen as the target population for the study because of their high risk of osteoporosis and related complications compared to men. A better understanding of baseline levels of knowledge concerning osteoporosis may help inform future interventions dedicated to disease prevention. According to their total OKAT scores, the majority of the Omani women in our study (51.6%) demonstrated a moderate level of overall osteoporosis-related knowledge. Previous studies have indicated similar findings among Qatari, Turkish, and Swedish women [16-18].

Most women in the present study (53.9%) demonstrated a good level of knowledge of osteoporosis symptoms and risk of fracture, with only 13.5% showing poor knowledge for this domain. In particular, the vast majority (91.4%) had a basic understanding of osteoporosis and how this condition leads to an increased risk of bone fractures. Similar results were observed in studies of women attending health centers in Qatar, Saudi Arabia, and southern India [19-21]. In contrast, 87.1% and  $>65\%$  of Qatari women in another study and Turkish women, respectively, were unaware of the relation between osteoporosis and hip fractures [16,17]. Moreover, 72.9% of our participants recognized that the majority of women will develop osteoporosis by the age of 80. However, the greatest knowledge gap concerned the asymptomatic nature of osteoporosis, as 91.7% incorrectly believed that symptoms such as pain would occur prior to a fracture. This finding is of major concern as it may prohibit early help-seeking behaviors due

Characteristic	Knowledge level, n (%)			p value
	Poor	Moderate	Good	
<b>Age in years*</b>				0.002
20–29	31 (25)	68 (54.8)	25 (20.2)	
30–39	50 (24.8)	105 (52)	47 (23.3)	
$\geq 40$	8 (11)	33 (45.2)	32 (43.8)	
<b>Marital status</b>				0.637
Single	10 (18.5)	31 (57.4)	13 (24.1)	
Married/divorced/widowed	79 (22.9)	175 (50.7)	91 (26.4)	
<b>Education level*</b>				0.585
Illiterate	0 (0)	0 (0)	1 (100)	
School	48 (22.7)	110 (52.1)	53 (25.1)	
University	41 (21.6)	96 (51.3)	50 (26.7)	
<b>Monthly income in OMR†</b>				0.949
<500	29 (22.8)	65 (51.2)	33 (26)	
500–1,500	54 (22)	127 (51.6)	65 (26.4)	
1,501–2,500	3 (27.3)	4 (36.4)	4 (36.4)	
>2,500	1 (16.7)	4 (66.7)	1 (16.7)	
<b>Family history of osteoporosis</b>				0.515
Yes	24 (26.7)	40 (44.4)	26 (28.9)	
No	61 (20.7)	160 (54.2)	74 (25.1)	
I don't know	4 (28.6)	6 (42.9)	4 (28.6)	

to an absence of symptoms. Previous research from Saudi Arabia and Malaysia has similarly indicated a lack of awareness in the general community of the 'silent' nature of osteoporosis [22,23].

Surprisingly, only 23.3% of women in our study demonstrated a good level of knowledge about osteoporosis-related risk factors. A considerable proportion of Turkish women (>40%) similarly could not identify important osteoporosis-related risk factors [16]. However, the majority of women in our study (61.7%) were aware of how a positive family history could predispose an individual to osteoporosis. In contrast, only 36% of women attending primary healthcare centers in Qatar were aware that osteoporosis risk was related to family history [17]. Similarly, a survey conducted among women in New Zealand revealed that only 22% identified family history as a risk factor for osteoporosis [24]. Just over half of the participants in our study (51.5%) agreed that cigarette smoking contributed to osteoporosis. Another study found that only 36% of postmenopausal women in Lebanon were aware of the role of smoking as a risk factor for osteoporosis [25]. Few of the participants in our study realized the role played by other risk factors such as ethnicity (20.1%) or menopause (28.1%).

A baseline understanding of knowledge of osteoporosis symptoms and risk factors in the general female community is essential, because this can direct healthcare providers to implement important public education and preventive health programs [26]. As revealed earlier, half of our participants were aware of the symptoms of osteoporosis, and the majority knew that osteoporosis can lead to an increased risk of bone fracture. Knowledge about symptoms and fracture risk in osteoporotic patients is vital to prevent further complications and poor health outcomes [27]. However, it is worth noting that approximately one in 10 of our participants still ignored or were not aware of the fact that osteoporosis leads to the risk of fractures. This could be improved through additional public health education efforts.

With regards to preventive measures against the development of osteoporosis, 39.8% of our participants demonstrated good levels of knowledge for this domain, while 28.3% had poor knowledge. Specifically, most participants were aware of the importance of calcium intake through milk (59.6%) and the insufficiency of calcium supplementation alone (67%) to prevent bone loss, as well as non-dairy sources of calcium such as broccoli and sardines (76.4%), although very few were aware of the benefits of certain types of physical activity (11.5%). Hernandez-Rauda *et al.* reported that very few women in El Salvador had adequate knowledge of preventive health practices which could potentially reduce the risk of osteoporosis, including adequate calcium intake or engaging in weight-bearing physical exercise known to increase bone mass [28]. On the other hand, Al Muraikhi *et al.* indicated that most Qatari women were aware of the importance of certain exercises in preventing osteoporosis, while von Hurst and Wham found that over half of women surveyed in New Zealand correctly identified broccoli and canned sardines as good sources of dietary calcium [17,24].

The fourth dimension of knowledge assessed in our study concerned the availability of osteoporosis treatment in Oman. Crucially, over half of the participants (51.9%) showed poor levels of knowledge related to this domain, while only 7.8% demonstrated good knowledge. Approximately one-third of women attending a university in Saudi Arabia (30.1%) were similarly unaware of the availability of osteoporosis treatment in Saudi Arabia [12]. Only 18.1% of Omani

women knew that hormone replacement therapy (HRT) could prevent future bone loss at any age after menopause. According to another study, 62% of Turkish women indicated that they would accept HRT if they were to be diagnosed with osteoporosis or had just entered menopause.<sup>16</sup> Future research is recommended to evaluate acceptance of or barriers toward the implementation of HRT among Omani women and to assess attitudes and practices related to osteoporosis-related preventive measures in this population.

We conducted an analysis to determine associations between selected sociodemographic and clinical characteristics and overall osteoporosis-related knowledge. There was a significant relationship between overall knowledge of osteoporosis and age, with women aged  $\geq 40$  years more frequently having good levels of knowledge concerning this disease compared to their younger counterparts. Previous studies conducted in Qatar, Saudi Arabia, and Pakistan have reported similar results in which women over the age of 40 years showed better knowledge of the disease compared to younger women [17,29,30]. In contrast, Alexandraki *et al.* observed that younger women in Greece were more likely to have sufficient knowledge of osteoporosis compared with older women [31].

## Conclusion

To the best of the authors' knowledge, this is the first study to assess knowledge of osteoporosis among an adult Omani female population. Although over half of the cohort demonstrated a moderate level of overall osteoporosis-related knowledge and most had good knowledge of specific domains like symptoms/fracture risk and preventive measures, there were distinct gaps in knowledge, particularly concerning osteoporosis-related risk factors and treatment availability. Additional health education measures in Oman are therefore needed to help bolster public awareness of the disease and its risk factors and to encourage the adoption of preventive measures and health practices.

## References

1. Jeremiah MP, Unwin BK, Greenawald MH, Casiano VE (2015) Diagnosis and management of osteoporosis. *Am Fam Physician* 92: 261-268.
2. World Health Organization (2003) Prevention and management of osteoporosis: report of a WHO scientific group. World Health.
3. Johnell O, Kanis JA (2006) An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporos Int* 17: 1726-1733.
4. International Osteoporosis Foundation. Epidemiology. International Osteoporosis Foundation.
5. US Preventive Services Task Force (2011) Screening for osteoporosis: recommendation statement. *Am Fam Physician*. 83: 1197-200.
6. Sadat-Ali M, Al-Habdan IM, Al-Turki HA, Azam MQ (2012) An epidemiological analysis of the incidence of osteoporosis and osteoporosis-related fractures among the Saudi Arabian population. *Ann Saudi Med* 3: 637-641.
7. Turner LW, Hunt SB, DiBrezzo R, Jones C (2004) Design and implementation of an osteoporosis prevention program using the health belief model. *Am J Health Stud*. 19: 115-121.
8. Jeihooni AK, Hidarnia A, Kaveh MH, Hajizadeh E (2015) The effect of a prevention program based on health belief model on osteoporosis. *J Res Health Sci* 15: 47-53.
9. El-Masry R, Elkhawaga G, El-Gilany AH, Alam R (2015) Knowledge and health beliefs of elderly women toward osteoporosis in Mansoura, Egypt. *Prog Med Sci* 2: 1-7.

10. Mohammed SK, Swaredahab Z, Elkhidir OAA (2018) Knowledge, attitude and practice of postmenopausal osteoporosis among females aged 17-24 years, Khartoum, Sudan. *Texila Int J Public Health* 6: 177-185.
11. Al-Muraikhi H, Chehab MA, Said H, Selim N (2017) Assessing health beliefs about osteoporosis among women attending primary health care centres in Qatar. *J Taibah Univ Med Sci* 12: 349-355.
12. Alshareef SH, Alwehaibi A, Alzahrani A, Faqihi A, Alkenani A, et al. (2018) Knowledge and awareness about risk factors of osteoporosis among young college women at a university in Riyadh, KSA. *J Bone Res* 6: 1000194.
13. Moghimi J, Safaei Z, Behnam B, Ghorbani R (2016) Knowledge towards prevention of osteoporosis in adolescent girls: Effect of educational program. *Middle East J Rehabil Health Stud* 4: e41622.
14. Winzenberg TM, Oldenburg B, Frendin S, Jones G (2003) The design of a valid and reliable questionnaire to measure osteoporosis knowledge in women: The Osteoporosis Knowledge Assessment Tool (OKAT). *BMC MusculoskeletDisord* 4: 17.
15. Sayed-Hassan RM, Bashour HN (2013) The reliability of the Arabic version of Osteoporosis Knowledge Assessment Tool (OKAT) and the Osteoporosis Health Belief Scale (OHBS). *BMC Res Notes* 6: 138.
16. Urgan M, Tümer M (2001) Turkish women's knowledge of osteoporosis. *Fam Pract* 18: 199-203.
17. AlMuraikhi H, Said H, Selim N, Chehab MAH (2017) The knowledge of osteoporosis risk factors and preventive practices among women of reproductive age in the state of Qatar: A cross-sectional survey. *Int J Community Med Public Health* 4: 522-527.
18. Waller J, Eriksson O, Foldevi M, GrahnKronhed AC, Larsson L, et al. (2002) Knowledge of osteoporosis in a Swedish municipality: A prospective study. *Prev Med* 34: 485-491.
19. Hammoudeh S, Abdelrahman MH, Chandra P, Hammoudeh M (2015) An assessment of patients' knowledge of osteoporosis in Qatar: A pilot study. *Qatar Med J* 2015: 13.
20. Osman AA (2013) Assessment of osteoporosis KAP among women in As-sir region, Saudi Arabia. *J Med Med Sci* 4: 50-55.
21. Senthilraja M, Cherian KE, Jebasingh FK, Kapoor N, Paul TV, et al. (2019) Osteoporosis knowledge and beliefs among postmenopausal women: a cross-sectional study from a teaching hospital in southern India. *J Family Med Prim Care* 8: 1374-1378.
22. Althobiti ES, Al Nagshabandi EA, Mohamed AH (2020) Knowledge, beliefs and preventive behaviours regarding osteoporosis among female health colleges' students at King Abdulaziz University. *Open Access J Biomed Sci* 2: 000207.
23. Leng LS, Ali A, Yusof HM (2017) Knowledge, attitude and practices towards osteoporosis prevention among adults in Kuala Lumpur, Malaysia. *Malays J Nutr* 23: 279-290.
24. von Hurst PR, Wham CA (2007) Attitudes and knowledge about osteoporosis risk prevention: a survey of New Zealand women. *Public Health Nutr* 10: 747-753.
25. Ahmadi H, Basho A, Chehade A, Al Mallah A, Dakour A (2018) Perception of peri-menopausal and postmenopausal Lebanese women on osteoporosis: a cross-sectional study. *J Clin Transl Endocrinol* 14: 19-24.
26. Riaz M, Abid N, Patel J, Tariq M, Khan MS, et al. (2008) Knowledge about osteoporosis among healthy women attending a tertiary care hospital. *J Pak Med Assoc* 58: 190-194.
27. Sujic R, Gignac MA, Cockerill R, Beaton DE (2013) Factors predictive of the perceived osteoporosis-fracture link in fragility fracture patients. *Maturitas* 76: 179-184.
28. Hernandez-Rauda R, Martinez-Garcia S (2004) Osteoporosis-related life habits and knowledge about osteoporosis among women in El Salvador: a cross-sectional study. *BMC Musculoskelet Disord* 51: 29.
29. El Tlt A, Barghash SS, Al-Salamah NI (2016) Knowledge, attitude and practice (KAP) regarding osteoporosis among general population in Saudi Arabia. *J Adv Med Med Res* 13: 1-10.
30. Bilal M, Haseeb A, Merchant AZ, Rehman A, Arshad MH, et al. (2017) Knowledge, beliefs and practices regarding osteoporosis among female medical school entrants in Pakistan. *Asia Pac Fam Med* 16: 6.
31. Alexandraki KI, Syriou V, Ziakas PD, Apostolopoulos NV, Alexandrakis AI, et al. (2008) The knowledge of osteoporosis risk factors in a Greek female population. *Maturitas* 59: 38-45.



- Advances In Industrial Biotechnology | ISSN: 2639-5665
- Advances In Microbiology Research | ISSN: 2689-694X
- Archives Of Surgery And Surgical Education | ISSN: 2689-3126
- Archives Of Urology
- Archives Of Zoological Studies | ISSN: 2640-7779
- Current Trends Medical And Biological Engineering
- International Journal Of Case Reports And Therapeutic Studies | ISSN: 2689-310X
- Journal Of Addiction & Addictive Disorders | ISSN: 2578-7276
- Journal Of Agronomy & Agricultural Science | ISSN: 2689-8292
- Journal Of AIDS Clinical Research & STDs | ISSN: 2572-7370
- Journal Of Alcoholism Drug Abuse & Substance Dependence | ISSN: 2572-9594
- Journal Of Allergy Disorders & Therapy | ISSN: 2470-749X
- Journal Of Alternative Complementary & Integrative Medicine | ISSN: 2470-7562
- Journal Of Alzheimers & Neurodegenerative Diseases | ISSN: 2572-9608
- Journal Of Anesthesia & Clinical Care | ISSN: 2378-8879
- Journal Of Angiology & Vascular Surgery | ISSN: 2572-7397
- Journal Of Animal Research & Veterinary Science | ISSN: 2639-3751
- Journal Of Aquaculture & Fisheries | ISSN: 2576-5523
- Journal Of Atmospheric & Earth Sciences | ISSN: 2689-8780
- Journal Of Biotech Research & Biochemistry
- Journal Of Brain & Neuroscience Research
- Journal Of Cancer Biology & Treatment | ISSN: 2470-7546
- Journal Of Cardiology Study & Research | ISSN: 2640-768X
- Journal Of Cell Biology & Cell Metabolism | ISSN: 2381-1943
- Journal Of Clinical Dermatology & Therapy | ISSN: 2378-8771
- Journal Of Clinical Immunology & Immunotherapy | ISSN: 2378-8844
- Journal Of Clinical Studies & Medical Case Reports | ISSN: 2378-8801
- Journal Of Community Medicine & Public Health Care | ISSN: 2381-1978
- Journal Of Cytology & Tissue Biology | ISSN: 2378-9107
- Journal Of Dairy Research & Technology | ISSN: 2688-9315
- Journal Of Dentistry Oral Health & Cosmesis | ISSN: 2473-6783
- Journal Of Diabetes & Metabolic Disorders | ISSN: 2381-201X
- Journal Of Emergency Medicine Trauma & Surgical Care | ISSN: 2378-8798
- Journal Of Environmental Science Current Research | ISSN: 2643-5020
- Journal Of Food Science & Nutrition | ISSN: 2470-1076
- Journal Of Forensic Legal & Investigative Sciences | ISSN: 2473-733X
- Journal Of Gastroenterology & Hepatology Research | ISSN: 2574-2566
- Journal Of Genetics & Genomic Sciences | ISSN: 2574-2485
- Journal Of Gerontology & Geriatric Medicine | ISSN: 2381-8662
- Journal Of Hematology Blood Transfusion & Disorders | ISSN: 2572-2999
- Journal Of Hospice & Palliative Medical Care
- Journal Of Human Endocrinology | ISSN: 2572-9640
- Journal Of Infectious & Non Infectious Diseases | ISSN: 2381-8654
- Journal Of Internal Medicine & Primary Healthcare | ISSN: 2574-2493
- Journal Of Light & Laser Current Trends
- Journal Of Medicine Study & Research | ISSN: 2639-5657
- Journal Of Modern Chemical Sciences
- Journal Of Nanotechnology Nanomedicine & Nanobiotechnology | ISSN: 2381-2044
- Journal Of Neonatology & Clinical Pediatrics | ISSN: 2378-878X
- Journal Of Nephrology & Renal Therapy | ISSN: 2473-7313
- Journal Of Non Invasive Vascular Investigation | ISSN: 2572-7400
- Journal Of Nuclear Medicine Radiology & Radiation Therapy | ISSN: 2572-7419
- Journal Of Obesity & Weight Loss | ISSN: 2473-7372
- Journal Of Ophthalmology & Clinical Research | ISSN: 2378-8887
- Journal Of Orthopedic Research & Physiotherapy | ISSN: 2381-2052
- Journal Of Otolaryngology Head & Neck Surgery | ISSN: 2573-010X
- Journal Of Pathology Clinical & Medical Research
- Journal Of Pharmacology Pharmaceutics & Pharmacovigilance | ISSN: 2639-5649
- Journal Of Physical Medicine Rehabilitation & Disabilities | ISSN: 2381-8670
- Journal Of Plant Science Current Research | ISSN: 2639-3743
- Journal Of Practical & Professional Nursing | ISSN: 2639-5681
- Journal Of Protein Research & Bioinformatics
- Journal Of Psychiatry Depression & Anxiety | ISSN: 2573-0150
- Journal Of Pulmonary Medicine & Respiratory Research | ISSN: 2573-0177
- Journal Of Reproductive Medicine Gynaecology & Obstetrics | ISSN: 2574-2574
- Journal Of Stem Cells Research Development & Therapy | ISSN: 2381-2060
- Journal Of Surgery Current Trends & Innovations | ISSN: 2578-7284
- Journal Of Toxicology Current Research | ISSN: 2639-3735
- Journal Of Translational Science And Research
- Journal Of Vaccines Research & Vaccination | ISSN: 2573-0193
- Journal Of Virology & Antivirals
- Sports Medicine And Injury Care Journal | ISSN: 2689-8829
- Trends In Anatomy & Physiology | ISSN: 2640-7752

Submit Your Manuscript: <https://www.heraldopenaccess.us/submit-manuscript>