Electronic Journal of General Medicine
2023, 20(3), em475
e-ISSN: 2516-3507
https://www.ejgm.co.uk/

MODESTUM

Original Article

OPEN ACCESS

Perception and awareness of osteoporosis and its related risk factors among women: A cross-sectional study

Manal Ayyash [1*], Kamel Jaber [2], Rajaa Daghash [3], Rana Abu-Farha [3], Eman Alefishat [4,5,6]

[1] Department of Pharmaceutics and Pharmaceutical Science, Faculty of Pharmacy, Applied Science Private University, Amman, JORDAN
[2] School of Medicine, The University of Jordan, Amman, JORDAN
[3] Department of Clinical Pharmacy, Faculty of Pharmacy, Applied Science Private University, Amman, JORDAN
[4] Department of Pharmacology, College of Medicine and Health Science, Khalifa University of Science and Technology, Abu Dhabi, UAE
[5] Department Biopharmaceutics and Clinical Pharmacy, Faculty of Pharmacy, The University of Jordan, Amman, JORDAN
[6] Center for Biotechnology, Khalifa University of Science and Technology, Abu Dhabi, UAE
***Corresponding Author:** m_ayyash@asu.edu.jo

Citation: Ayyash M, Jaber K, Daghash R, Abu-Farha R, Alefishat E. Perception and awareness of osteoporosis and its related risk factors among women: A cross-sectional study. Electron J Gen Med. 2023;20(3):em475. https://doi.org/10.29333/ejgm/13010

ARTICLE INFO

Received: 08 Nov. 2022

Accepted: 08 Feb. 2023

ABSTRACT

Objectives: This study was designed to assess the awareness of women of the risk factors and preventive measures of osteoporosis.

Methods: This is a cross-sectional study that was conducted in Jordan. During the study period, a convenience sample of women were invited to participate via a survey link communicated through social media. Linear regression was used to screen independent variables affecting participants' awareness of osteoporosis, its risk factors, and preventive measures.

Results: 426 women agreed to participate in this study, with a median age of 38.5 years (IQR=16.0). Results showed that women have a median awareness score of 5.0 out of 9.0 (IQR=4.0) about osteoporosis risk factors, whereas women with higher educational levels (diploma or higher) and those with medical-related degrees have a higher awareness about osteoporosis risk factors compared to others ($p \leq 0.05$).

Medical websites were the primary source used to obtain information about osteoporosis by the participating women (n=236, 55.4%). Also, results showed that more than 90% of the women believed that osteoporosis is a chronic silent disease that makes your bones less dense and more fragile (n=418, 98.1%), and that bone strength may increase by taking vitamin D and calcium (n=405, 95.0%).

Conclusion: This study showed that women had an intermediate level of awareness of osteoporosis and prevention measures. The importance of medical websites and social media as sources of information was also demonstrated. More public targeted campaigns are needed to promote awareness of osteoporosis, its risk factors, prevention, and treatment.

Keywords: osteoporosis, awareness, perception, women, Jordan

INTRODUCTION

Osteoporosis is a silent, asymptomatic skeletal system disorder that distinctively leads to less dense and more fragile bones [1]. Age increases the extent of this condition; women over 50 are more likely to develop osteoporosis [2, 3]. Osteoporosis is clinically manifested after an accidental minor fall and bone fracture [4]. Such fractures will increase the disability among the elderly, lower the individuals' quality of life [5], and increase the economic burdens inflected by the illness [6].

Several studies highlighted the risk factors of osteoporosis, which were categorized into factors that cannot be changed, such as age, gender, family history, previous fracture, menopause, and other diseases [7-13] and changeable factors that can be modified by changing patient's lifestyle, including alcohol intake, smoking, low body mass index, malnutrition especially in calcium, lack of exercise, and vitamin D deficiency which is a prominent issue among Jordanian women [13, 14].

As in Jordan, the prevalence of osteoporosis worldwide makes it one of the most outstanding public health issues in most countries [15, 16]. In 2003, a study conducted in Jordan reported that the prevalence of osteoporosis among Jordanian women is 30%, regardless of the menopausal status [15], while another study reported a prevalence of 43.3% among postmenopausal women [17]. In 2017, another study reported that the overall prevalence of osteoporosis among postmenopausal women attending the National Center for Diabetes, Endocrinology, and Genetics in Jordan was 37.5% [18]. Regarding the latest gender distribution released by the Department of Statistics in Jordan, women represent 47.1% of the Jordanian population, with most women (60.6%) belonging to the age group between 15 and 64 years, and 3.9% being above 65 years [14]. Notably, women are at higher risk of osteoporosis, where it affect around 200 million women worldwide [19]. Assessing the level of awareness may serve as

an important initial step to inform authorities and policymakers to take effective and sustained actions to promote awareness of osteoporosis, its risk factors, and enhance public health as a whole, which in turn, can help in reducing the economic burden of the disease.

Thus, the current study was designed to assess the awareness of women of the risk factors and preventive measures of osteoporosis.

METHODS

Study Design, Settings, and Participants

This descriptive cross-sectional study that was conducted from August to September 2021 to assess women's perception about osteoporosis, knowledge of risk factors, and the preventive measures. An appropriate sample of women participated in this study via a survey link that was communicated over two social media platforms: Facebook and WhatsApp. The inclusion criteria were adult women (≥18 years) living in Jordan. The objectives of the study were explained to the participation before filling out the survey. They were informed about the anticipated time it will take them to complete the survey (approximately 10 minutes). It was also made clear to the participants that their participation is appreciated but is entirely voluntary.

Sample Size Calculation

The number of subjects per predictor needed to conduct linear regression analysis was used for sample calculation as per Tabachnick and Fidell's recommendations (5-20 subjects per predictor) [20]. Seven predictors were included in this study, which meant that a minimum sample size of 35-140 participants is considered representative. In this study, 426 participants were agreed to participate and filled-out the study questionnaire.

Survey Instrument Development and Validation

The survey was developed after an extensive literature search of similar studies that have evaluated public knowledge and perceptions towards osteoporosis [21, 22]. A group of three experts conducted face and content validity on the prefinal draft of the survey. Experts' feedback was used to amend and introduce some minor modifications to the survey.

The final version of the survey was used, which had three sections: the first section was assigned for demographic data, which covered age, material status, and educational level. The second section covered participant`s lifestyle and diet. The third section consisted of questions that assessed the participants' awareness of the risk factors and sources of information, if any. A five-point Likert scale was used to record the participants' perception of osteoporosis in the last section (5: strongly agree, 4: agree, 3: neutral, 2: disagree, 1: strongly disagree). Arabic language is the official language in Jordan, thus, the survey was translated and distributed in Arabic. Translation was performed using translation and back translation approach.

Participant awareness score was calculated out of nine. Participants received one point for each correctly identified risk factor, while receiving zero points for each incorrect response. Participants were classified as having high awareness if their score was higher than the median value, otherwise, they were classified as having poor awareness if they scored below the median value.

Patient Consent for Publication

Before being granted access to the questionnaire, potential participants were required to give their electronic consent by selecting "agree to participate". Otherwise, if they selected "disagree to participate", they were not granted access to the study questionnaire, and the response was automatically submitted and was counted as a non-response item. All study participants were informed about the aim of the study and the anonymity of their responses before taking part in it. the study.

Statistical Analysis

Study data were extracted from an excel sheet obtained from the Google Form platform, then entered into IBM statistical package for social sciences (SPSS) (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp) for data analysis. Descriptive analyses were presented as median ± interquartile range (IQR) and frequency for continuous variables and categorical variables, respectively.

Independent variables that may affect participants' awareness of osteoporosis risk factors were screened using simple linear regression. A univariate linear regression analysis was performed and all variables with $p< 0.25$ were entered into a multiple linear regression analysis. Variables that independently affected participants' awareness of osteoporosis risk factors were identified in the multiple linear regression analysis. Variables independence was checked using person correlation where $r<0.9$ indicates the absence of multicollinearity between the independent variables in regression analysis. A $p\leq0.05$ was considered statistically significant.

RESULTS

426 women agreed to participate during the study period and signed out the electronic consent form, while only three refused to sign the consent form (response rate 99.3%). The median age of the participants was 38.5 years (IQR=16.0, ranged from 18-76 years), and the majority were married (n=291, 68.3%). Most of the study sample (n=304, 71.4%) had an educational level of diploma or bachelor and 41% of them had a medical-related degree (n=175). Most participants had a monthly income ≤500 JD (n=220, 51.6%), and reside in the central area of Jordan mostly Amman (n=398, 93.4%). More details about the sociodemographic characteristics are presented in **Table 1**.

Among the women who participated, 11.7% (n=50) reported being current smokers. The majority reported that they do not exercise regularly (n=359, 84.3%, and only one-third (n=138, 32.4%) reported being exposed to sunlight regularly. Of the surveyed women, around one-quarter reported having chronic diseases (n=100, 23.5%), with 22 women (5.2%) reported having osteoporosis. Moreover, more than half of the participants (n=239, 56.1%) reported taking vitamin D supplements, and around 16.0% of them (n=68) reported taking calcium supplements. More details about the about the lifestyle and medical information of the study participants are presented in **Table 2**.

Table 1. Socio-demographic characteristics of study sample (n=426)

Parameter	M (IQR), [Range]	n (%)
Age (years)	38.5 (16.0), [18-76]	
Educational level		
School level or below		57 (14.4)
Diploma or bachelor's degree		304 (71.4)
Graduate degree (masters & PhD)		65 (15.3)
Marital status		
Married		291 (68.3)
Non-married (single, widowed, divorced)		135 (26.1)
Place of residence		
Center of Jordan		398 (93.4)
North of Jordan		18 (4.2)
South of Jordan		10 (2.3)
Monthly income		
≤500 JD		220 (51.6)
≥500 JD		206 (48.4)
Do you have a medical degree?		
No		251 (58.9)
Yes		175 (41.1)

Note. M: Median; IQR: Interquartile range; & JD: Jordanian Dinar (1 JD=0.71 US dollars

Table 2. Participants lifestyle & medical information (n=426)

Parameter	n (%)
Smoking status	
Current smoker	50 (11.7)
Ex-smoker	15 (3.5)
Non-smoker	361 (84.7)
Do you exercise regularly?	
No	359 (84.3)
Yes	67 (15.7)
Do you get exposed to sunlight regularly?	
No	288 (67.6)
Yes	138 (32.4)
IF yes, for how long per a day? (percentage calculated out of 138)	
≤15 minutes	45 (32.6)
15-29 minutes	59 (42.8)
30-44 minutes	17 (12.3)
≥45 minutes	17 (12.3)
Do you have any chronic disease?	
No	326 (76.5)
Yes	100 (23.5)
Have you been diagnosed with osteoporosis?	
No	404 (94.8)
Yes	22 (5.2)
Do you take vitamin D supplement?	
No	187 (43.9)
Yes	239 (56.1)
If yes, is the vitamin D recommended by your health care provider? (percentage calculated out of 239)	
No	31 (13.0)
Yes	208 (87.0)
Do you take calcium pills?	
No	358 (84.0)
Yes	68 (16.0)
If yes, is the calcium recommended by your health care provider? (percentage calculated out of 68)	
No	19 (27.9)
Yes	49 (72.1)

Regarding participants' awareness of osteoporosis risk factors (**Table 3**), results showed that women have a median awareness score of 5.0 out of 9.0 (IQR=4.0).

Table 3. Evaluation of the study participants' awareness about osteoporosis risk factors (n=426)

Statement	CID (n [%])
Family history (close family member with osteoporosis)	222 (52.1)
Smoking	246 (57.7)
Alcohol in a large amount	213 (50.0)
Malnutrition (diet deficient in vitamin D & calcium)	319 (74.9)
Postmenopausal	311 (73.0)
Petite & thin women	151 (35.4)
Medical conditions (hyperthyroidism, hyperparathyroidism, cancer & rheumatoid arthritis)	281 (66.0)
Certain medicines (corticosteroids including inhaler for asthma)	197 (46.2)
Certain hormones (thyroid replacement therapy)	145 (34.0)
Knowedge score (median [IQR])	5.0 (4.0)

Note. IQR: Interquartile range& CID: Correctly identified

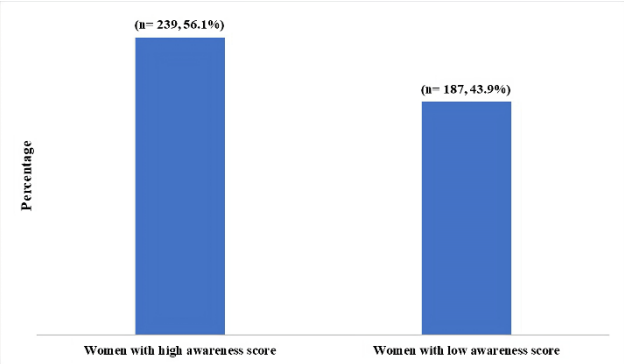

Figure 1. Participants' classification on their awareness scores regarding osteoporosis (n=426) (Source: Authors' own elaboration)

As presented in **Figure 1**, 43.9% of the participating women (n=187) were classified to have poor awareness score (awareness score below the median value of five), while the remaining women (n=239, 56.1%) were classified as having high awareness score (awareness score of five or above). Around half of the participating women knew that smoking (n=246, 57.7%), family history (n=222, 52.1%), and alcohol (n=213, 50.0%) were factors that are associated with increasing the risk of osteoporosis. Also, only 35.4% of the women (n=151) recognized that thin women are at higher risk of having osteoporosis. In comparison, 73.0% of participants knew that postmenopausal women were at higher risk of disease (n=311).

Moreover, as **Table 3** depicts, only 46.2% of the participants (n=197) knew that some medications such as corticosteroids are associated with an increased risk of osteoporosis, and a lower percentage of them (n=145, 34.0) answered correctly that thyroid replacement therapy was associated with increasing the risk of this disease.

The surveyed participants were asked about their sources of information about osteoporosis (**Figure 2**). As seen in **Figure 2**, medical websites were the primary used source to obtain information about osteoporosis by the participating women (n=236, 55.4%), followed by social media and healthcare providers (n=182, 42.7% for both). Academic societies were the least source of information used by the participating women (n=46, 10.8%).

Women were asked to express their perceptions towards osteoporosis (**Table 4**), results showed that more than 90% of the women believed that osteoporosis is a chronic silent disease which makes your bones less dense and more fragile

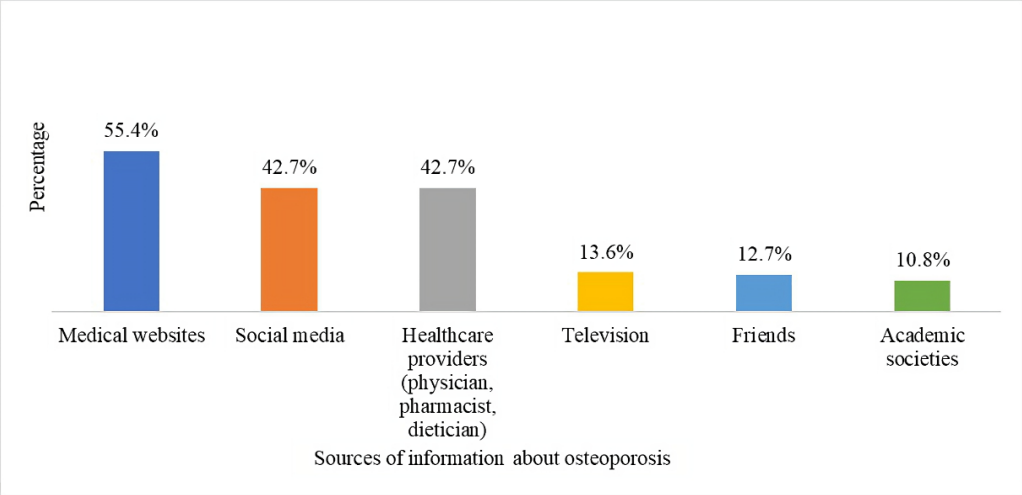

Figure 2. Participants' reported sources of information about osteoporosis (n=426) (Source: Authors' own elaboration)

Table 4. Participants' perception towards osteoporosis (n=426)

Statements	Participant' responses *n* (%)		
	SA/A	N	SDA/D
Osteoporosis is a chronic silent disease which makes your bones less dense and more fragile.	418 (98.1)	7 (1.6)	1 (0.2)
Most women over 50 years are susceptible to developed osteoporosis	332 (77.9)	67 (29.9)	27 (6.5)
There is a high prevalence of osteoporosis worldwide	325 (76.3)	93 (21.8)	8 (1.9)
Most people engage in risky behaviors that lead to osteoporosis	346 (81.2)	66 (15.5)	14 (3.3)
The bone strength may increase by intake of Vitamin D and calcium	405 (95.0)	19 (4.5)	2 (0.5)
Osteoporosis symptoms can be managed by regular physical exercise	395 (92.9)	23 (5.4)	8 (1.9)
Osteoporosis symptoms can be modified by daily sunlight exposure	395 (92.9)	26 (6.1)	5 (1.1)
There is a low awareness about osteoporosis in Jordan	375 (88.1)	34 (8.0)	17 (4.0)
Probiotics may increase the strengthen of the bone	175 (41.1)	208 (48.8)	43 (10.1)

Note. SA/A: Strongly agree/agree; N: Neutral; & SDA/D: Strongly disagree/disagree

(n=418, 98.1%), and that bone strength may increase by taking vitamin D and calcium (n=405, 95.0%). Also, participants believed that osteoporosis symptoms can be managed by regular physical exercise (n=395, 92.9%), and daily sunlight exposure (n=395, 92.9%). Moreover, 88.1% of the women (n=375) agreed/strongly agreed that there is low awareness about osteoporosis in Jordan, and only 41.1% of the women (n=175) believed that probiotics could strengthen the bones.

Lastly, factors affecting women awareness about osteoporosis risk factors were investigated using univariate and multivariate linear regression analysis (**Table 5**). Results showed that participants with higher educational level (diploma or higher) have higher awareness about osteoporosis risk factors compared to those with lower educational level (school level or below), (beta=0.102, p= 0.038). Also, women with medical related degrees showed higher awareness compared to participants with no medical degrees (beta=0.237, p<0.001).

DISCUSSION

Osteoporosis is a major public health concern in Jordan particularly among older adults. Focusing on female osteoporosis awareness is a key step in preventing and treating osteoporosis and is valuable to osteoporosis prevention and treatment programs. Women's awareness and perceptions were investigated in this study.

The current study found that women had adequate knowledge of the risk factors for osteoporosis, such as family history, smoking, and alcohol consumption, as well as the fact that postmenopausal women are more likely to have the condition. This finding is comparable to the Singapore study and superior to the Turkish study [7, 8], but lower than the Vietnamese, Malaysian, Philippine, and Taiwanese and Jordanian studies [9-13]. The aforementioned Jordanian study which targeted patients visiting community pharmacies showed a better level of knowledge concerning osteoporosis, and this may be indicative that community pharmacists as healthcare providers contribute to enhances awareness and patient education, which was not the case in our study targeting women of the general public.

More than 95% of the women in the current study correctly defined osteoporosis as a chronic silent disease which makes the bones less dense and more fragile, which is close to the percentage documented among Turkish women, where almost 90% of the women believed that they are familiar with osteoporosis when they were asked if they had heard about it before and were requested to answer what is the definition of osteoporosis [23]. However, this percent is considered high when compared to other countries as the accurate definition of osteoporosis was found to be reported only by 62.2% in a study from South Australia [24], and 67% in a study from Canada [25]. Such result may have stemmed from the high educational level among the participants.

Different studies found that osteoporosis was the 'most concerning' adverse effect of corticosteroid use [26-28]. Contrary to the current study's findings, just around half of the participants were aware that corticosteroids could cause such a problem. When it comes to managing thyroid disorders using

Table 5. Assessment of factors affecting participants' awareness about osteoporosis risk factors (n=426)

Parameter	Awareness score			
	Beta	p-value#	Beta	p-value$
Age (years)	-0.023	0.644	-	-
Educational level				
School level or below	Reference: 0.177	<0.001^	0.102	0.038*
Diploma or higher				
Marital status				
Married	Reference: 0.035	0.475	-	-
Non-married (single, widowed, divorced)				
Place of residence				
Center of Jordan	Reference: 0.057	0.240	-	-
Others (north and south of Jordan)				
Monthly income				
<500 JD	Reference: 0.024	0.616	-	-
≥500 JD				
Do you have a medical degree?				
No	Reference: 0.269	<0.001^	0.237	<0.001*
Yes				
Do you have any chronic disease?				
No	Reference: 0.030	0.531	-	-
Yes				

Note. ^Eligible for entry in multiple linear regression; #Using simple linear regression; $Using multiple linear regression; *Significant at 0.05 significance level; & JD: Jordanian Dinar (1 JD=0.71 US dollars)

replacement therapy and its impact on osteoporosis, only around one-third of our participants were aware of osteoporosis as a deleterious health effect of thyroid replacement therapy as reported by the American Thyroid Association Task Force on Thyroid Hormone Replacement [29]. This, in part, reflects a lack of complementary education and instruction by healthcare providers responsible for managing thyroid disorders, as they should provide the patients with a complete picture of the consequences of their medications and act to manage such effects.

Medical websites were the main source of information about osteoporosis among the participants, followed by social media and healthcare providers. While in Qatar, media sources such as television and radio were the primary sources of information (39 %) were the primary sources of information [30]. Regarding the understanding of the prevalence of osteoporosis, which is estimated to affect 200 million women every year [31], 75% of the participants believed in the high prevalence of osteoporosis worldwide.

The current study results revealed that the majority of the participants (95%) reported that the intake of vitamin D and calcium helps preserve bone integrity and strength, a result that is slightly higher than what was shown by another study conducted in Jordan back in 2014, where 87% of the participant believed that a calcium-rich diet can help prevent osteoporosis [13]. This assures that the participating women understand that osteoporosis is a common problem, which probably led these women to look for measures to either prevent or overcome osteoporosis.

In Pakistan, the importance of vitamin D for health, particularly the necessity for sunlight exposure and adequate vitamin D consumption in the diet, was underestimated [32]. However, in the same study, 60% and 37.8% of the participants reported eating a high amount of vitamin D rich food, and dairy products respectively, but more than 90% of them think daily sunlight exposure can help to alleviate osteoporosis symptoms [31]. Moreover, more than half of the participants recognized that osteoporosis symptoms can be controlled by regular physical exercise [31].

The majority of participants believed that Jordan has a low awareness of osteoporosis, contrasting another study conducted in Jordan, where 68.6% of the participants showed sufficient knowledge of osteoporosis [13]. This study revealed that the awareness about osteoporosis risk factors is higher among educated women having diploma or higher certificate compared to those with school level or below, similar to the findings of study conducted in China, Poland, Vietnamese, and Bangkok [9, 33-35]. This goes in concordance with the perceptible quality of education in Jordan, which is thought to be adequate and satisfactory.

Overall, the level of knowledge concerning osteoporosis among women in Jordan is shown to be similar to that described in the region, and in some distant Asian and European counties. Also, women have shown they are adequately aware of the factors impacting osteoporosis, including but not limited to diet, exercise and sun exposure.

This study is a continuum to previous studies on this topic and was conducted with the aim of assessing the awareness of women of the risk factors and preventive measures of osteoporosis when it comes to such dramatic health concern, which despite being previously described, it was not yet adequately addressed by health authorities, and intensive work should be further put in this domain, as osteoporosis is a threat not only to the general health of the population, but also, the economy of such developing country. It is recommended that osteoporosis prevention and treatment initiatives should be introduced and expanded across the country. This study comes with limitation; as the participants from distant governorates and could not cover all the socioeconomic levels of such diverse population, which will be the aim of future studies.

CONCLUSION

This study showed that the participating women had satisfactory awareness knowledge about osteoporosis symptoms and prevention measurements. Medical websites

were the most used source to obtain information about osteoporosis by the participating women.

Author contributions: All authors have sufficiently contributed to the study and agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Ethical statement: The study was commenced after obtaining the ethical approval by the Institutional Review Board Applied Science Private University (Approval number: 2021-PHA-36). Electronic informed consent was obtained from all subjects.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

1. Sozen T, Ozisik L, Basaran NÇ. An overview and management of osteoporosis. Eur J Rheumatol. 2017;4(1):46-56. https://doi.org/10.5152/eurjrheum.2016.048 PMid:28293453 PMCid:PMC5335887
2. Rossini M, Adami S, Bertoldo F, et al. Guidelines for the diagnosis, prevention and management of osteoporosis. Reumatismo. 2016;68(1):1-39. https://doi.org/10.4081/reumatismo.2016.870 PMid:27339372
3. Jordan KM, Cooper C. Epidemiology of osteoporosis. Best Pract Res Clin Rheumatol. 2002;16(5):795-806. https://doi.org/10.1053/berh.2002.0264 PMid:12473274
4. Werner P. Knowledge about osteoporosis: Assessment, correlates and outcomes. Osteoporos Int. 2005;16(2):115-27. https://doi.org/10.1007/s00198-004-1750-y PMid:15517187
5. Kotz K, Deleger S, Cohen R, Kamigaki A, Kurata J. Osteoporosis and health-related quality-of-life outcomes in the Alameda County study population. Prev Chronic Dis. 2004;1(1):A05.
6. McLeod KM, Johnson CS. A systematic review of osteoporosis health beliefs in adult men and women. J Osteoporos. 2011;2011:197454. https://doi.org/10.4061/2011/197454 PMid:21941678 PMCid:PMC3175388
7. Saw SM, Hong CY, Lee J, et al. Awareness and health beliefs of women towards osteoporosis. Osteoporos Int. 2003;14(7):595-601. https://doi.org/10.1007/s00198-003-1403-6 PMid:12830368
8. Gemalmaz A, Oge A. Knowledge and awareness about osteoporosis and its related factors among rural Turkish women. Clin Rheumatol. 2008;27(6):723-8. https://doi.org/10.1007/s10067-007-0777-9 PMid:17965905
9. Nguyen NV, Dinh TA, Ngo QV, Tran VD, Breitkopf CR. Awareness and knowledge of osteoporosis in Vietnamese women. Asia Pac J Public Health. 2015;27(2):NP95-105. https://doi.org/10.1177/1010539511423569 PMid:22087035
10. Yeap SS, Goh EM, Das Gupta E. Knowledge about osteoporosis in a Malaysian population. Asia Pac J Public Health. 2010;22(2):233-41. https://doi.org/10.1177/1010539509343948 PMid:20457652
11. Miura S, Yagi M, Saavedra OL, Yamamoto S. Sociodemographic variation in knowledge of osteoporosis and locally available calcium-rich foods among urban women living on low incomes in Davao, Philippines. Health Care Women Int. 2010;31(5):387-401. https://doi.org/10.1080/07399330903411150 PMid:20390661
12. Chang SF. Explore the effectors of bone mineral density in community women. J Nurs Res. 2004;12(4):327-36. https://doi.org/10.1097/01.JNR.0000387517.67490.2a PMid:15619183
13. Elayeh E, Akour A, Yousef A-M, Farah D, Hamaly M, Basheti I. Osteoporosis amongst Jordanians: Effect of pharmacist-directed brochure education on people's knowledge. Trop J Pharm Res. 2014;13:2101-8. https://doi.org/10.4314/tjpr.v13i12.22
14. Batieha A, Khader Y, Jaddou H, et al. Vitamin D status in Jordan: Dress style and gender discrepancies. Ann Nutr Metab. 2011;58(1):10-8. https://doi.org/10.1159/000323097 PMid:21252499
15. Shilbayeh S. Prevalence of osteoporosis and its reproductive risk factors among Jordanian women: A cross-sectional study. Osteoporos Int. 2003;14(11):929-40. https://doi.org/10.1007/s00198-003-1458-4 PMid:14530908
16. Al-Qutob RJ, Mawajdeh SM, Khalil AA, Schmidt AB, Hannak AO, Masri BK. The magnitude of osteoporosis in middle aged women. Saudi Med J. 2001;22(12):1109-17.
17. Saadeh R, Jumaa D, Elsalem L, et al. Osteoporosis among postmenopausal women in Jordan: A national cross-sectional study. Int J Environ Res Public Health. 2022;19(14):8803. https://doi.org/10.3390/ijerph19148803 PMid:35886655 PMCid:PMC9315755
18. Hyassat D, Alyan T, Jaddou H, Ajlouni KM. Prevalence and risk factors of osteoporosis among Jordanian postmenopausal women attending the National Center for Diabetes, Endocrinology and Genetics in Jordan. Biores Open Access. 2017;6(1):85-93. https://doi.org/10.1089/biores.2016.0045 PMid:28736691 PMCid:PMC5515108
19. Kanis JA. Assessment of osteoporosis at the primary health-care level. Available at. http://wwwshefacuk/FRAX.2008 (Accessed: 7 November 2022).
20. Tabachnick BG, Fidell LS. Using multivariate statistics. Boston, MA: Allyn & Bacon, Inc.; 2006.
21. Pande KC, de Takats D, Kanis JA, Edwards V, Slade P, McCloskey EV. Development of a questionnaire (OPQ) to assess patient's knowledge about osteoporosis. Maturitas. 2000;37(2):75-81. https://doi.org/10.1016/S0378-5122(00)00165-1 PMid:11137326
22. Alefishat E, Hammad H, Shehadeh M, Ramadan S, Mukattash T. Knowledge and awareness about osteoporosis among Jordanian women. Eur J Pers Cent Healthc. 2015;3(1):100-7. https://doi.org/10.5750/ejpch.v3i1.895
23. Ungan M, Tumer M. Turkish women's knowledge of osteoporosis. Fam Pract. 2001;18(2):199-203. https://doi.org/10.1093/fampra/18.2.199 PMid:11264272
24. Phillipov G, Phillips PJ, Leach G, Taylor AW. Public perceptions and self-reported prevalence of osteoporosis in South Australia. Osteoporos Int. 1998;8(6):552-6. https://doi.org/10.1007/s001980050098 PMid:10326060
25. Juby AG, Davis P. A prospective evaluation of the awareness, knowledge, risk factors and current treatment of osteoporosis in a cohort of elderly subjects. Osteoporos Int. 2001;12(8):617-22. https://doi.org/10.1007/s001980170060 PMid:11580074
26. Costello R, Patel R, Humphreys J, McBeth J, Dixon WG. Patient perceptions of glucocorticoid side effects: a cross-sectional survey of users in an online health community. BMJ Open. 2017;7(4):e014603. https://doi.org/10.1136/bmjopen-2016-014603 PMid:28373256 PMCid:PMC5387953

27. van der Goes MC, Jacobs JW, Boers M, Andrews T, et al. Patient and rheumatologist perspectives on glucocorticoids: An exercise to improve the implementation of the European League Against Rheumatism (EULAR) recommendations on the management of systemic glucocorticoid therapy in rheumatic diseases. Ann Rheum Dis. 2010;69(6):1015-21. https://doi.org/10.1136/ard.2009.114579 PMid:19762359
28. Guidry JA, George JN, Vesely SK, Kennison SM, Terrell DR. Corticosteroid side-effects and risk for bleeding in immune thrombocytopenic purpura: Patient and hematologist perspectives. Eur J Haematol. 2009;83(3):175-82. https://doi.org/10.1111/j.1600-0609.2009.01265.x PMid: 19374704
29. Jonklaas J, Bianco AC, Bauer AJ, et al. Guidelines for the treatment of hypothyroidism: Prepared by the american thyroid association task force on thyroid hormone replacement. Thyroid. 2014;24(12):1670-751. https://doi.org/10.1089/thy.2014.0028 PMid:25266247 PMCid:PMC4267409
30. Hammoudeh S, Abdelrahman MH, Chandra P, Hammoudeh M. An assessment of patients' knowledge of osteoporosis in Qatar: A pilot study. Qatar Med J. 2015;2015(2):13. https://doi.org/10.5339/qmj.2015.13 PMid:26835409 PMCid:PMC4719434
31. Clynes MA, Harvey NC, Curtis EM, Fuggle NR, Dennison EM, Cooper C. The epidemiology of osteoporosis. Br Med Bull. 2020;133(1):105-17. https://doi.org/10.1093/bmb/ldaa005 PMid:32282039 PMCid:PMC7115830
32. Tariq A, Khan SR, Basharat A. Assessment of knowledge, attitudes and practice towards Vitamin D among university students in Pakistan. BMC Public Health. 2020;20(1):355. https://doi.org/10.1186/s12889-020-8453-y PMid:32183774 PMCid:PMC7079348
33. Oumer KS, Liu Y, Yu Q, Wu F, Yang S. Awareness of osteoporosis among 368 residents in China: A cross-sectional study. BMC Musculoskelet Disord. 2020;21(1):197. https://doi.org/10.1186/s12891-020-03217-1 PMid: 32228605 PMCid:PMC7106623
34. Drozdzowska B, Pluskiewicz W, Skiba M. Knowledge about osteoporosis in a cohort of Polish females: The influence of age, level of education and personal experiences. Osteoporos Int. 2004;15(8):645-8. https://doi.org/10.1007/s00198-003-1581-2 PMid:14735301
35. Puttapitakpong P, Chaikittisilpa S, Panyakhamlerd K, Nimnuan C, Jaisamrarn U, Taechakraichana N. Inter-correlation of knowledge, attitude, and osteoporosis preventive behaviors in women around the age of peak bone mass. BMC Women Health. 2014;14(1):35. https://doi.org/10.1186/1472-6874-14-35 PMid:24588970 PMCid:PMC3942254