



Perception of peri-menopausal and postmenopausal Lebanese women on osteoporosis: A cross-sectional study



Hala Ahmadieh^{a,*}, Ahmad Basho^b, Amal Chehade^b, Adeb Al Mallah^b, Ahmad Dakour^b

^a Clinical Sciences Department, Beirut Arab University, Beirut, Lebanon

^b Beirut Arab University, Lebanon

ARTICLE INFO

Keywords:

Osteoporosis prevention
Risk factors
Fractures
Smoking
Falls

ABSTRACT

Introduction: Osteoporosis is a generalized skeletal disorder characterized by decreased bone mineral density and microarchitectural deterioration, resulting in increased susceptibility to fractures. The prevalence of osteoporosis in Lebanon, defined as T-score < -2.5 at the total hip using NHANES gender-specific database was estimated to be 31% among postmenopausal women.

Purpose: To assess the general perception of osteoporosis among women in Lebanon as well as their general knowledge of its lifestyle, risk factors, diagnostic, preventive and therapeutic measures.

Methods: A cross-sectional study was conducted in Lebanon between January and December 2017. Women above the age of 50 were invited to participate. A standardized questionnaire regarding the perception of personal risk of osteoporosis and fractures was used. Risk factors for osteoporosis, previous fractures or falls, family history of fracture, smoking, alcohol consumption, and secondary causes of osteoporosis were evaluated. Data were recorded on excel and analyzed on SPSS using variety of descriptive analysis, ANOVA tests, and others. P value < 0.05 was considered to be statistically significant.

Results: From 396 interviewed women, 85% were in menopause and were more likely to be diagnosed with osteoporosis. 45% knew the true definition of osteoporosis and their most frequent source of information was doctors. Around 60% had heard of BMD screening but only 54.5% of those women actually did it.

Conclusion: This study reveals that osteoporosis knowledge and perception is low among the Lebanese woman aged 50 years and older.

Introduction

Osteoporosis is a major public health concern associated with deterioration in bone microarchitecture, leading to high risk of fragility fractures. Fractures, especially hip fractures, are considered to be the most dreadful and fearful consequences of osteoporosis leading to high morbidity, such as chronic pain and immobility, and mortality [1]. In addition, fragility fractures lead to significant social and economic burden due to prolonged need for hospitalization and surgeries, medical treatment and overall worsening the quality of life [2].

Osteoporosis has been classified by World Health Organization to be the 10th most common worldwide disease. Studies over the world shed light on osteoporosis and its prevalence. The United States estimated that by the year 2020, one in two Americans over the age of 50, is expected to have or to be at risk of developing osteoporosis [3]. Furthermore, the epidemiology and burden of osteoporosis were assessed in 27 countries of the European Union and it was shown that there is a

very high prevalence of osteoporosis with a substantial gap in treatment and an increased economic burden suggesting that a change in healthcare policy is warranted [4]. As for the prevalence of osteoporosis among Middle Eastern Region, it was found to be high, reaching in Saudi Arabia women up to 44.5% [5]. In Lebanon, the Lebanese Osteoporosis Prevention Society (LOPS) conducted a population-based study, where a random sample of 432 elderly women from the greater Beirut area, aged 65–84 years was evaluated, and the study showed that osteoporosis prevalence using DEXA at total hip was found to be 33.0% [27.5–38.8] in women and 22.7% [16.2–30.2] in men [6]. Another study using the national registry data provided by the Ministry of Health showed that crude incidence for hip fracture rates for those over age of fifty varied across the years (2006–2008) between 164 and 188/100,000 per year for females and between 88 and 107 per 100,000 per year for male subjects [7]. And, in another prospective study conducted in 1996, where orthopedic surgeons completed a structured questionnaire, the estimated annual incidence rate of hip fracture in

* Corresponding author at: Assistant Professor, Department of Internal Medicine, Clinical Sciences Department, Beirut Arab University, Beirut, Lebanon.

E-mail address: hala.ahmadieh@bau.edu.lb (H. Ahmadieh).

<https://doi.org/10.1016/j.jcte.2018.10.001>

Received 28 June 2018; Received in revised form 24 September 2018; Accepted 1 October 2018

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Lebanese women aged 30 years or above was 129/100,000 person-years (for women: 153/100,000 person-years and for men 100/100,000 person-years) [8].

Lebanese guidelines were developed in order to build sound clinical decision-making in the diagnoses and management of the patients with osteoporosis. Certain indications were set on those guidelines to screen patients with osteoporosis and to decide on when to treat based on BMD and Fracture Risk Assessment Tool (FRAX).

Given the high prevalence and morbidity associated with fractures, it's important that people have good awareness and knowledge about osteoporosis, especially its risk factors, methods of diagnoses, its associated complications, ways of prevention and treatment. In addition, a better understanding of osteoporosis and an adequate appreciation of its associated fracture risk are of paramount importance, as they could potentially improve adherence rates to screening programs and adherence to osteoporosis treatment. Cline et al. have previously shown that there was a better adherence to anti-resorptive treatment among female patients who had a self-perception of increased risk of osteoporosis [9]. On the other hand, a lack of awareness about osteoporosis and its risks may lead to a delay in its diagnosis and treatment and thus leading to high burden socially and economically [10]. Perception of women about osteoporosis, its risk factor and seriousness was assessed in different studies [11–14]. However, in Lebanon, no such study was conducted.

By conducting our research, we are aiming to identify the level of knowledge, awareness and attitude among postmenopausal women in Lebanon to osteoporosis, its risk factors, complications, methods of diagnosis and treatment.

Methodology

Study design and population

This cross-sectional study was carried out on Lebanese postmenopausal women, aged 50 years or older between January 2017 and December 2017. A total of 396 women participated in the study, out of the 420 approached. Patients, who attended outpatient clinics in different regions in Lebanon were recruited by convenience sampling over 8 months period between January 2017 and August 2017. Ethical clearance for the study was obtained from the Ethics Institutional Review Board at Beirut Arab University before the commencement of study procedures (2017H-0050-M-R-0200). A waiver of signed informed consent was presented to patients by medical students before their participation in a face-to-face interview, which lasted for 10–15 min. Participants were told about their rights to withdraw, at any time, if they felt the need to. Women with cognitive impairment were excluded. The estimated sample size was calculated based on the women's population size in Lebanon, 95% confidence level and 99% confidence interval and it was found to be 384 patients, but in the end 396 participants were included.

Data collection instrument

Data collection process starting from January 2017 for a total duration of 8 months period starting from January 2017. The questionnaire used was developed with the help of a survey instrument expert. The questionnaire was translated to Arabic by a certified translator and back translated to English prior to its use. Information was obtained, through face-to-face interview, by previously trained interviewers, on socio-demographic variables (age, sex, weight, height, education level, and health insurance), menstrual, obstetrics and past medical history, personal history of osteoporosis and fragility fractures, lifestyle history (smoking, alcohol, and physical activity) and use of medications, such as steroids, calcium supplements, vitamin D preparations, bisphosphonates, denosumab, teriparatide, and hormone therapy. In addition, information was obtained about previous bone

densitometry screening, personal history of chronic diseases, and parental history of major fractures. The questionnaire, which included questions similar to those used in other studies, but modified for its applicability to Lebanese culture (11–16) and it aimed to assess participants' knowledge, beliefs, attitude and practices towards osteoporosis, including their positive behaviors, such as dietary calcium intake, physical activity and exposure to sun, and negative behaviors, such as smoking and alcohol intake. Questions were asked with regards to their perception on the definition of osteoporosis, normally defined as a skeletal disorder characterized by compromised bone strength (weak and brittle bones) predisposing to an increased risk of fracture. In addition, knowledge was obtained about risk factors for osteoporosis, its methods of diagnosis and perception about its treatment. Moreover, questions assessed whether women were concerned about risk of having fractures in the future, whether they had received any recent information about osteoporosis in the year prior to their participation in the study. The answers obtained to the question on knowledge on osteoporosis risk factors, diagnosis and management were "strongly agree", "agree", "neutral", "disagree", "strongly disagree". A pilot test of the data collection instrument used was done on a small number of participants, along with consequent changes, prior to the use of the instrument to interview participants.

Statistical analysis

Processing of data included data entry into Statistical Package for Social Sciences (SPSS) program version 21 and Excel computer software. Qualitative and quantitative data were expressed as frequencies, with percentage and mean \pm SD. Demographic data and other characteristics of the participants were analyzed using descriptive statistics. Descriptive analysis was carried out by calculating the mean and standard deviation for continuous variables. Continuous variables were analyzed using a *t*-test. A *p* value of < 0.05 was considered as significant. Associations between categorical variables were evaluated using a Chi-square test. Only for significant *p*-value, multiple regression analysis was used to assess the relationship and examine the effect of different factors such as age, gender, education, duration of osteoporosis, history of fracture and family history of osteoporosis on osteoporosis knowledge score.

Results

420 individuals were invited to participate, but 396 accepted and were qualified for their participation. Participants' mean age was 59.5 ± 7.8 years. 85% (337 women) were found to have menopause, which was determined by women reporting having 12 months period of amenorrhea. Mean years since menopause was 3 years. The majority of the participants were unemployed and married. 44% were either university graduate or undergone postgraduate studies. Caffeine intake was reported in 92.5%. 33% were smokers and 61% were overweight or obese. 40.7% of women who had menopause reported that they were previously told that they had osteoporosis, and this was higher when compared to women who did not have menopause yet (40.7% versus 23.7% respectively; $p = 0.013$). 25% of included women had hypertension and 8.8% had diabetes. Around 80% had no parental history of hip fracture. Check [Table 1](#) for detailed socio-demographic information of our participants. As for the years since menopause, 65% had history of menopause for a duration of 5 years or more.

With regards to their perception about osteoporosis definition, there was low perception overall, where 46% only had the correct definition (soft and brittle bones). The most frequent source of getting information about osteoporosis were doctors and TV programs. 62% claimed that they previously received education about osteoporosis. Check [Table 2](#) for details. Around 60% had actually heard of BMD screening and only 54.5% of them did it. 80.8% thought that drug treatment can help build strong bones.

Table 1
Demographic characteristics of the participants.

Demographic Characteristics N (%)	Postmenopausal	Premenopausal	Total
<i>Age</i>			
50–55 yrs	88	57	145 (37%)
56–60 yrs	95	1	96 (24%)
61–65 yrs	75	1	76 (19%)
> 65 yrs	79	0	79 (20%)
<i>Body mass index (BMI)</i>			
< 18	4	1	5 (1.2%)
19–25	127	22	149 (37.6%)
26–30	165	29	194 (49%)
> 30	41	7	48 (12.2%)
<i>Place of Residence</i>			
North	25	5	30 (8%)
South	122	29	151 (38%)
Beirut	71	7	78 (20%)
Mount Lebanon	56	12	68 (17%)
Bekaa	63	7	70 (17%)
<i>Marital Status</i>			
Single	23	5	28 (7%)
Married	257	52	309 (78%)
Divorced	42	3	45 (11%)
Widowed	15	4	19 (4%)
<i>Chronic Diseases</i>			
Hypertension	88	11	99 (25%)
Diabetes	32	3	25 (8.8%)
Cardiovascular diseases	25	3	28 (7%)
<i>Education Level</i>			
Primary school	71	8	79 (20%)
Upper/secondary school	98	6	104 (27%)
University graduate	72	14	86 (21%)
Postgraduate studies	60	31	91 (23%)
Others	36	0	36 (9%)
<i>Employment Status</i>			
Yes	75	32	107 (27%)
No	262	27	289 (73%)
<i>Prior Pregnancies</i>			
Yes	296	53	349 (88%)
No	41	6	47 (12%)
<i>Diagnosed with Osteoporosis</i>			
Yes	136	14	150 (38%)
No	198	45	243 (62%)
<i>Risk Factors for Osteoporosis</i>			
<i>Caffeine Intake</i>			
Yes	312	55	367 (93%)
No	25	4	29 (7%)
<i>Smoking</i>			
Yes	107	23	130 (33%)
No	229	36	265 (67%)
<i>Alcohol Intake</i>			
Yes	8	0	8 (2%)
No	328	59	387 (98%)
<i>Exercise</i>			
Yes	122	23	145 (36%)
No	215	36	251 (64%)
<i>Family History of Hip Fracture</i>			
Yes	72	12	17 (4.3%)
No	265	47	312 (78.7%)
<i>Recent weight loss of 5 Kg during prior years</i>			
Yes	136	21	157 (39.6%)
No	201	38	239 (60.4%)
<i>Use of Calcium Supplements</i>			
Currently Using	100	6	106 (27%)
Previously used	98	20	118 (30%)
Not used	139	33	172 (43%)

Table 2a
Knowledge about Definition of Osteoporosis.

	Definition of Osteoporosis			
	Soft bones (due to vitamin D deficiency)	Calcium Deficiency	Weak and Brittle Bones	Calcium Deficiency and Weak and Brittle Bones
Total	56 (14.1%)	152 (38.4%)	183 (46.2%)	5 (1.3%)

As for history of falls, 70% reported no previous history. There was statistically significant relation between menopause and previous history of falls as shown in Table 3. Among those who had history of fracture, spine fracture followed by hip fracture were the most common. The most common cause of fracture was fall from standing height.

Table 4 includes data on women who were postmenopausal. It shows that the majority were married. Significantly higher percentage of women with osteoporosis were on calcium supplements. Around 40% mentioned that they had recent history of weight loss of at least 5 kg and this was significantly more common among those who had osteoporosis. No statistical significant difference in caffeine intake or smoking was present between patients who had osteoporosis as compared to those who didn't. 70% mentioned that they have vitamin D deficiency, more so in women with osteoporosis but these women were tested in different labs and the assays may have not been reliable. Furthermore, women with osteoporosis reported more paternal history of hip fracture.

As shown in Table 5, 75% agreed that osteoporosis is a serious disease and it is possible to prevent it. The majority had fears related to falling and having a fracture. One-third thought that osteoporosis affects women only and 20% were not sure. There was not enough knowledge that most people gain their bone mass before the age of 30 although they did know that the ideal time to make bones strong and increase bone mass is before the age of 25 years. 57% knew that bone loss increases significantly after menopause. In addition, the majority believed that it is possible to prevent and treat osteoporosis. As for risk factors and protective factors, there was insufficient information in the majority of the questions asked. 44% disagreed with the statement that physical activity increases osteoporosis risk. 64% agreed that caffeine increases the osteoporosis risk. Also 81% thought that calcium rich diets help in prevention. Furthermore, 78% agreed that low vitamin D level is a risk factor for developing osteoporosis and that sunlight is an important source of vitamin D. Only 36% agreed that smoking is a risk factor for osteoporosis. Half knew that early menopause, heredity and family history are risk factors. 66% knew that low back pain, fractures, loss of height and loss of teeth are complications of osteoporosis.

Discussion

Our study was the first one in Lebanon to evaluate the general perception of osteoporosis among women in Lebanon aged above 50 years as well as their knowledge of its lifestyle and risk factors. Since there is no cure for osteoporosis, primary preventive measures aiming to increase awareness is important. However, our findings showed that Lebanese women are not well educated about behaviors that would promote and maintain optimal bone mass, resulting in lack of healthy lifestyle and dietary habits sufficient to decrease the risk of osteoporosis.

Women who had menopause were found more likely to be diagnosed with osteoporosis, where 41% were found osteoporotic, as compared to 23.7% of women who had no menopause, and this is expected because estrogen is known to be a protective factor against osteoporosis as it helps in maintaining bone density, and this is lost in menopausal women.

Compared to the previous data reported on the osteoporosis prevalence among Lebanese being 33%, the prevalence of osteoporosis

Table 2b
Source of information on Osteoporosis.

Total	Source of Information on osteoporosis			Doctors 119 (30.1%)	Family 47 (11.9%)	Friends 23 (5.8%)	Others 71 (17.9%)
	Television 95 (24%)	Internet 20 (5.1%)	Magazine 21 (5.3%)				

Table 2c
Education about Osteoporosis.

Total	Ever received education from your physician about osteoporosis	
	Yes 245 (62%)	No 148 (38%)

Table 3
Fracture in association to menopause.

Fracture Occurrence	Postmenopausal	Premenopausal	Total	Chi 2, P value
<i>Had previous Falls</i>				< 0.005
Never	227	50	277 (70%)	
1 Fall	83	5	88 (22%)	
2 Falls	19	1	20 (5.0%)	
> 2 Falls	8	3	11 (3%)	
<i>Location of bone fracture</i>				P = 0.372
Hip Bone	12	0	12 (21.1%)	
Spine	18	0	18 (31.6%)	
Wrist	10	1	11 (19.3%)	
Elbow	5	0	5 (8.8%)	
Others	11	0	11 (19.3%)	
<i>Cause of Fracture</i>				P = 0.336
No fracture	307	58	365 (92.6%)	
Fall from standing height	19	1	20 (5.1%)	
Twisting	5	0	5 (1.3%)	
Slipping on ice	4	0	4 (1%)	
No	228	45	273 (69.1%)	

among 5160 healthy Saudi women aged 50–79 was 34%, but there was found to be more awareness in Saudi Arabia about osteoporosis when compared to our data [15].

As our results showed, doctors were the main source of information and this contrasted with a study done in Qatar, where participants mentioned that media sources such as television and radio accounted for around 40% of the sources. Another study conducted by Attia et al. also identified that television and magazines were the major source of information about osteoporosis [15]. It is important that media sources in Lebanon work on increasing awareness on such an important topic as it was found to be lacking.

44% of our participants defined osteoporosis correctly as having weak and brittle bones, and 75% admitted that osteoporosis is a serious disease. In Turkey, 90% of women were familiar with osteoporosis but more than 65% were not aware that this may lead to fractures [16]. Our results agree with another study conducted in Qatar that showed that 70% agreed about the seriousness of this disease [16,17].

Regarding the risk factors for osteoporosis, results revealed that the studied sample were aware of the risk factors agreed upon by the National osteoporosis foundation (2011) [18] which include family history, advancing age, postmenopausal status, excess in caffeine, BMI, exercise, height changes, vitamin D deficiency, and smoking.

Exercise levels among our participants were low and inadequate to promote and maintain good bone health. This was comparable to other published works that revealed that 41% rarely do exercise [19]. When asked whether they considered lack of exercise as a risk factor, 55.5% did. This was lower than the higher percentage of 70% found among

Table 4
Comparison between Women with Osteoporosis versus Without Osteoporosis.

Health and Lifestyle	Postmenopausal Women Previously Diagnosed with Osteoporosis		Total	P value
	Yes	No		
<i>Marital status</i>				
Married	107	156	263 (79%)	P = 0.642
Single	11	14	25 (7.5%)	
Divorced	17	22	39 (11.7%)	
Widowed	1	5	6 (1.8%)	
<i>Usage of calcium supplement</i>				
Currently using	92	63	155 (78.3%)	P < 0.004
Previously used	14	29	43 (21.7%)	
<i>Prior weight loss 5 kg or more</i>				
Yes	71	64	135 (40.4%)	P < 0.001
No	65	134	199 (59.6%)	
<i>Caffeine Intake</i>				
Yes	126	183	309 (92.5%)	P = 0.939
No	10	15	25 (7.5%)	
<i>Smoking status</i>				
Yes	51	56	107 (32.1%)	P = 0.081
No	85	141	226 (67.9%)	
<i>Exercise status</i>				
Yes	44	76	120 (35.9%)	P = 0.259
No	92	122	214 (64.1%)	
<i>Vitamin D Deficiency diagnosed by Lab</i>				
Yes	101	74	175 (70.6%)	P < 0.001
No	18	55	73 (29.4%)	
<i>Family History of Hip Fracture</i>				
Mother	37	21	58 (17.4%)	P < 0.001
Father	4	10	14 (4.2%)	
None	95	167	262 (78.4%)	

Saudi women [20]. This points to the importance of spreading awareness on the protective effect of exercise on osteoporosis prevention.

Considering vitamin D level, 71% mentioned that they had insufficiency. This could be related to the fact that women in Lebanon may lack adequate exposure to sunlight given that many females in Lebanon wear Hijab. In Taiwan, 86.6% mentioned that had vitamin D insufficiency [21]. Among our participants, 85% knew that sunlight is a source of vitamin D, and this level of awareness is less than that obtained in Egypt, where 90% knew that exposure to the sun is good for bones [4].

78% of women who had menopause are currently using calcium supplements which is lower than that in Singapore where 86% were actually taking [22]. Concerning the knowledge towards the important role of calcium in preventing osteoporosis, majority (82%) admitted that calcium plays a preventive role and helps in maintaining bone density, which is higher in comparison to women in Saudi Arabia, where there was found to be a major lack of knowledge about the importance of calcium [23].

In our study, caffeine intake was very high, and this was much higher to the caffeine intake, reported among the menopausal woman in turkey (45.6%) [16,17]. Regarding knowledge about caffeine being a risk factor, 64% thought that it is.

With regards to BMD, 59.7% have heard about it, and only 54.5% did it. This was lower than the percentage of women who knew about BMD in the US, where over 70.6% heard about it. However in the US,

Table 5
Knowledge about Osteoporosis.

Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. Do you have any fears related to falling and having a fracture?	183 (46.2%)	163 (41.2%)	21 (5.3%)	24 (6.1%)	5 (1.2)
2. Do you think osteoporosis is a disease?	113 (28.5%)	186 (47%)	41 (10.4%)	51 (12.9%)	5 (1.2%)
3. Osteoporosis is a serious disease	56 (14.1%)	119 (30.1%)	150 (37.9%)	67 (16.9%)	4 (1%)
4. Osteoporosis affects women only.	33 (8.3%)	89 (22.5%)	91 (23%)	139 (35.1%)	44 (11.1%)
5. Most important time to build bone strength is between the age of 9 & 30.	72 (18.1%)	166 (41.9%)	112 (28.3%)	43 (10.9%)	3 (0.8%)
6. If you suffer from osteoporosis, you are more like to have a spine hip fracture or other fragility fracture.	95 (24%)	217 (54.8%)	64 (16.2%)	20 (5%)	0 (0%)
7. Having a fragility fracture would increase your risk of having another one.	102 (25.8%)	184 (46.5%)	82 (20.7%)	26 (6.6%)	2 (0.4%)
8. The ideal time to make bones strong and increase bone mass is before the age of 25 years.	64 (16.2%)	168 (42.5%)	115 (29.1%)	46 (11.7%)	2 (0.5%)
9. Bone loss increases significantly after menopause.	74 (18.7%)	154 (38.9%)	126 (31.8%)	38 (9.6%)	4 (1%)
10. It is possible to prevent osteoporosis from developing.	77 (19.4%)	197 (49.7%)	92 (23.3%)	29 (7.3%)	1 (0.3%)
11. There are treatments available for osteoporosis.	82 (20.8%)	195 (49.4%)	75 (19%)	40 (10.1%)	3 (0.7%)
12. Without preventive measures, 20% of women older than 50 years will have fracture due to osteoporosis at some point during their lifetime.	74 (18.7%)	198 (50%)	99 (25%)	22 (5.6%)	3 (0.7%)
<i>Questions about protective and risk factors for osteoporosis</i>					
13. A calcium-rich diet has a protective effect on osteoporosis	105 (26.5%)	219 (55.3%)	56 (14.1%)	14 (3.6%)	2 (0.5%)
14. Children 9–17 years of age get enough calcium from one glass of milk each day to prevent osteoporosis.	84 (21.2%)	190 (48%)	59 (14.9%)	50 (12.6%)	13 (3.3%)
15. Physical activity increases osteoporosis risk.	44 (11.1%)	106 (26.8%)	68 (17.2%)	137 (34.6%)	41 (10.3%)
16. Lean women have higher osteoporosis risk compared to overweight or obese.	29 (7.3%)	114 (28.8%)	118 (29.8%)	109 (27.5%)	26 (6.6%)
17. High caffeine intake increases the risk of osteoporosis.	86 (21.7%)	167 (42.2%)	85 (21.5%)	52 (13.1%)	6 (1.5%)
18. Low vitamin D level results from decreased sun exposure time.	135 (34.2%)	200 (50.6%)	44 (11.1%)	16 (4.1%)	0 (0%)
19. Low vitamin D level increases the risk of osteoporosis.	90 (22.8%)	223 (56.5%)	62 (15.7%)	19 (4.8%)	1 (0.2%)
20. Smoking increases the risk of osteoporosis.	23 (5.8%)	134 (33.8%)	101 (25%)	99 (25%)	39 (9.9%)
21. Early menopause is a risk factor for osteoporosis.	68 (17.2%)	171 (43.2%)	92 (23.2%)	57 (14.4%)	8 (2%)
22. Family history of osteoporosis is a risk factor for osteoporosis.	90 (22.7%)	129 (32.6%)	81 (20.5%)	81 (20.5%)	15 (3.7%)
23. Aging is a risk factor for osteoporosis	106 (26.8%)	215 (54.3%)	58 (14.6%)	15 (3.8%)	2 (0.5%)
24. Heredity is a risk factor for osteoporosis.	68 (17.2%)	156 (39.4%)	87 (22%)	74 (18.7%)	11 (2.8%)
25. Low back pain, fractures, loss of height and loss of teeth are complications of osteoporosis.	71 (17.9%)	193 (48.7%)	76 (19.2%)	46 (11.6%)	10 (2.6%)

only 9.2% have received BMD testing [24]. This points to the lack of awareness on the importance of BMD screening among Lebanese physicians. Among those who had fractures, the majority mentioned that it happened spontaneously and 59.1% were caused by falling from standing height. In addition, 43.4% knew that future fractures are more prevalent in people with previous history of fragility fractures, and this was similar to another study where the majority (59.2%) knew that a person who had a spine fracture is more likely to have another fracture than a person who has not had any fracture before [25] indicating that there is good knowledge about history of fracture being a risk factor for future fractures. 80% of our participants knew that there are drugs that would help build the bones and they would feel satisfied if they take them. Also 70% agreed that osteoporosis can be prevented upon following preventive methods.

Limitations of the study include the use of convenience sampling technique which would not allow us to generalize our findings to all females of this age. Moreover, the information obtained including the percentage of vitamin D deficiency was based on the participants' own perception. In addition, height and weight were self reported by patients and not objectively measured by the data collectors. The body mass index was calculated based on the numbers obtained from the patients which could have been not very accurate.

Conclusion

In conclusion, osteoporosis knowledge is considered low among the Lebanese women aged 50 years and older. Health policy makers could make use of the results of our study in order to conduct large educational programs to affect attitude and perception towards this disease, its risk factors and ways of prevention.

Conflict of interest

There was no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational

grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Funding

No funding used for this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jcte.2018.10.001>.

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