Archives of Osteoporosis (2021) 16: 1
https://doi.org/10.1007/s11657-020-00865-7

ORIGINAL ARTICLE

Osteoporosis knowledge, attitudes, and practices among female Princess Nourah University students in Riyadh, Saudi Arabia

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Received: 17 May 2020 / Accepted: 4 December 2020 / Published online: 2 January 2021

Abstract

Background and objective Osteoporosis is characterized by decreased normal bone density. More than 8.9 million fractures worldwide annually are caused by osteoporosis; these fractures are a significant cause of morbidity and mortality. Evidence suggests that the modification of several lifestyle habits could assist in lowering the incidence of osteoporosis. However, limited studies have been conducted in Saudi Arabia to assess the knowledge, attitudes, and lifestyles associated with osteoporosis among college-age females. This study aimed to provide evidence to assist in the development of effective strategies against osteoporosis.

Materials and methods This cross-sectional study was conducted at Princess Nourah Bint Abdul Rahman University (PNU), in February 2018; a self-administered questionnaire was used. The different components of the questionnaire assessed knowledge, attitudes, and lifestyles with regard to osteoporosis. The participants were divided into groups on the basis of their age as follows: juniors, 17–20 years of age; seniors, 21–25 years of age.

Results Of the 250 included participants, 122 (49%) and 128 (51%) were seniors and juniors respectively. Only 16% of all participants achieved a good score on the knowledge questionnaire; in particular, knowledge regarding osteoporosis risk factors was inadequate. Media was the only source of information of the included participants. Only 49% of participants believed that osteoporosis is a serious disease. Overall, only 32% and 27% of juniors and seniors are consumed sufficient dairy products, and 13% and 11% of juniors and seniors engaged in physical exercise, respectively.

Conclusion Osteoporosis misconceptions were extremely prevalent among PNU students, as was poor knowledge and lifestyle habits regarding osteoporosis. Information regarding osteoporosis presented through the media needs to be revised and simplified. Concerned institutions should combine their efforts eventually practice. Information about osteoporosis presented through media need to be revised, simplified, and implement a national program to improve osteoporosis awareness and prevention.

Keywords Osteoporosis · Knowledge · Attitude · Female · Student

This article was not presented in any conference.

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Introduction

Osteoporosis is a disorder characterized by declining bone mass and deteriorating bone structure, leading to bone fragility with a risk for fractures [1]. Since it is an asymptomatic disease, its progression is often unnoticed until a person breaks a bone and it becomes evident therafter [2]. It is considered a silent killer that affects patients' quality of life [3]. More than 8.9 million fractures worldwide are caused by osteoporosis, accounting for 2.8 million disability-adjusted life years (DALY) [4].

Females are more prone to have osteoporosis than males (4:1 ratio) [5]. Menopause can increase one's risk due to the low oestrogen levels. In Saudi Arabia, the osteoporosis prevalence in postmenopausal women is approximately 31–40% [6]. However, by the age of 18 years of age, most young healthy women attain 92% of their body mineral content, and by 26 years of age, they attain 99% of their body mineral content [7, 8]. Therefore, early corrective approaches should be implemented to prevent osteoporosis.

The modification of lifestyle habits can assist in lowering the incidence of osteoporosis. Diet can assist in preventing osteoporosis; adequate calcium and vitamin D intake can improve bone density. Smoking and the high consumption of caffeinated and soft drinks can increase the risks of osteoporosis. Physical activity, such as weight-bearing exercises, jogging, and aerobics exercise increase muscle mass, which eventually increases bone strength [9]. Subjective knowledge and individuals' perspectives on health issues have a great impact on lifestyle and health [10]. Raising awareness and modifying attitudes at an early age will impact the prevention of osteoporosis [8]. This is specifically important among college-age individuals, who are more capable of adopting lifestyle changes [11].

Several studies have been conducted to assess the knowledge regarding osteoporosis and its risk factors in Saudi Arabia; they reported poor levels for the assessed parameters [10, 12–16]. However, the majority of these studies have focused on postmenopausal women; very few studies have targeted female university students [17]. The lack of studies targeting such high impact group in Saudi Arabia is forming an obstacle for developing effective intervention programs that address specific concerns for this group [10, 17]. Additionally, knowledge regarding osteoporosis and attitudes have not been evaluated among female university students in Saudi Arabia. Thus, to our knowledge, this is the first study that assesses the knowledge and attitudes concerning osteoporosis among female university students in Riyadh, Saudi Arabia. The aim of this study is to provide evidence to assist in the development of effective strategies against osteoporosis.

It is suggested that university female students in Saudi Arabia would possess limited knowledge about osteoporosis disease and it is risk factors. This would result in poor preventive practice; however, these parameters were expected between seniors and juniors.

Methodology

Design and patients

A cross-sectional study was conducted in February 2018 among 250 female non-health curriculum students enrolled at Princess Nourah University, College of Education; College of Arts, Languages, Arts and Design; and College of Social Work, which was conducted at February 2018. The study excluded non-Saudi medical and health students and participants with missing data. The participants were divided into two groups, juniors, 17–20 years of age; seniors, 21–25 years of age. A convenience sampling method was used to collect data. The sample was convenient as it was in the same campus and administrative approval was easy to be taken.

Sample size

The sample size was calculated using epiinfo-7 at a 90% confidence interval and 30% expected frequency and 5% accepted margin error. The sample size included in the study was 227 participants to be included in the study. We increased 10% of the calculated sample size to overcome problems in data collection so the targeted number of students for collect data from them was 250 participants.

Questionnaire

The participants completed a pre-coded Arabic self-administered questionnaire. The components of the questionnaire included information on demographic characteristics, knowledge, attitudes, and practices regarding osteoporosis. Additionally, a question evaluating the participants' source of information regarding osteoporosis was added. Items included in the questionnaire were adopted from validated questionnaires (the Osteoporosis Knowledge Assessment Tool (OKAT)). The OKAT was adopted to evaluate knowledge. The questionnaire was translated from English to Arabic, and backward translation was performed to maintain precision. The Osteoporosis Health Belief Scale (OHBS) was validated by the following: (1) face validity was carried out by reviewing the Questionnaire with two orthopaedic consultants. (2) Pilot study was conducted among 20 students prior to initiation of this study. The results of that pilot study are not included in this study's results.

Knowledge questions include the following: Does osteoporosis have any symptoms before a fracture occurs? Is

osteoporosis a treatable disease, and amount of bone loss after 10 year after menopause? Does an increase in bone mass gives bone protection at end of childhood? Would most women get osteoporosis by age of eighty? Would most women by the age of fifty expect at least one fracture? Does family history of osteoporosis predisposes a person to osteoporosis? Can adequate calcium intake be achieved from two glasses of milk? Does calcium supplements alone prevent bone loss? Are sardines and broccoli sources of calcium? Are women more likely to have osteoporosis than men? Does hormonal replacement therapy prevent bone loss after menopause? Can smoking contribute to osteoporosis? Is a fall important in causing fractures? Is high salt intake a risk factor for osteoporosis? Does osteoporosis lead a risk factor of bone fractures? Can risk of osteoporosis be determined by clinical risk factors?

Attitudes' questions include: Is osteoporosis a life threatening disease? Does bone loss increase after menopause? Is the chance of getting osteoporosis higher in postmenopausa?, Can some medications cause osteoporosis? Does increased number of giving birth a risk factor for osteoporosis? Does physical activity increase the risk of osteoporosis? Does calcium-rich food intake prevent osteoporosis?

Responses to questions regarding knowledge were as follows: true, false, and unknown. Correct answers were allocated a score of 1, and incorrect and unknown answers were allocated a score of 0. The total knowledge score ranged from 0 to 17, from zero to eight is poor knowledge, and from nine to seventeen is good knowledge scores.

Likert scale items (agree [score = 3], uncertain [score = 2], disagree [score = 1]) were used to assess the attitudes toward osteoporosis; the maximum total attitude score was 24. The range for the following scores was the following: perceived seriousness score was 1–3 (one item); perceived severity 2–6 (two items); perceived susceptibility 1–3 (one item); perceived risk factors 2–6 (two items); risk factors 2–6 (two items). Behaviours considered preventive against osteoporosis included the frequency of the intake of calcium-rich foods and physical activity. A five-point scale was used to the rate frequencies for each of the aforementioned behaviours. The practice assessment questions had the following scores: 1 point for never, 2 points for seldom, 3 points for 1–3 times/week, 4 points for often, and 5 points for daily. The maximum total score was 13 and a higher score indicated better preventive behaviours.

Statistical analysis

SPSS, version 21 (IBM; Armonk, New York), was used for all statistical analyses.

The collected data were categorized into the following themes: knowledge, attitudes, and practices. For comparisons of the various characteristics between senior and junior students, descriptive statistics, the chi-squared tests, and *t* tests were used as appropriate. Quantity variables like the age were divided into seniors and juniors, according to the age of full legal rights. All qualitative data that assess knowledges, attitudes, and practices are presented in quantity manners, to illustrate the practice scores according to the source of knowledge, divided into good and poor score percentages. A score of $\geq 60\%$ was considered good, whereas $< 60\%$ was considered poor; the chi-squared tests were used to make comparisons between these percentages. A *t* test was used to compare the means of the scores between seniors and juniors. *P* values of less than 0.05 were considered statistically significant.

Ethics

Ethical approval from the Princess Nourah University Institutional Review Board was obtained prior to conducting the study. Participants were orally consented prior to data collection. Moreover, they were provided enough information about the aim and the benefits of the study. Participants were informed that their participation is anonymous and voluntary. They could withdraw from the study at any point and that provided data will remain confidential.

Results

All of the 250 students participating in the study were from Riyadh region and came from different social classes. They were healthy without comorbid disease. Some members refused to participate; they were not willing to answer the Questionnaire. The participants were divided into juniors (17–20 years) and seniors (21–25 years) according to the age of full legal rights, 128(51%) and 122(49%) were juniors and seniors, respectively. A total of 128 and 122 juniors and seniors had previously heard about osteoporosis. The participants with missing data were excluded from study analysis.

Table 1 depicts the responses obtained regarding the knowledge about osteoporosis; the majority of the factors investigating knowledge did not significantly differ between juniors and seniors ($P > 0.05$). However, 50% of seniors reported that they believed that smoking increased one's risk of osteoporosis, compared to 37% of juniors ($P = 0.03$).

The cut-off point for the proper knowledge is true and for the improper knowledge was false and does who does not know.

Table 2 illustrates the attitudes of the participants regarding osteoporosis based on school grouping. The majority of the factors investigated to determine the participants attitudes did not significantly differ between the juniors and seniors ($P > 0.05$). However, significantly fewer seniors reported that osteoporosis was a life-threatening disease when compared to juniors (42% vs. 59%, $P = 0.02$). Additionally, 15% of seniors

Table 1 Proper knowledge of osteoporosis among the participants based on school grouping

Proper knowledge	Total $N = 250$ (100%)	Seniors $N = 122$ (100%)	Juniors $N = 128$ (100%)	P value
1. Osteoporosis causes symptoms before fractures occur.	88 (35.2%)	37 (30%)	51 (39%)	0.11
2. Osteoporosis is not treatable.	141 (56.4%)	72 (60%)	69 (53%)	0.41
3. There is a small amount of bone loss after 10 years after menopause.	29 (11.6%)	14 (11%)	15 (12%)	0.9
4. Higher peak bone mass gives no protection at the end of childhood.	78 (32.2%)	40 (32%)	38 (30%)	0.6
5. By the age of 80, most women have osteoporosis.	154 (61.6%)	74 (60%)	80 (63%)	0.7
6. By the age of 50, most women can expect at least one fracture before they die.	80 (32%)	38 (31%)	42 (32%)	0.7
7. A Family history of osteoporosis predisposes a person to osteoporosis.	100 (40%)	43 (35%)	57 (44%)	0.13
8. An adequate calcium intake can be achieved from two glasses of milk.	185 (74%)	86 (70%)	99 (77%)	0.2
9. Calcium supplements alone can prevent bone loss.	135 (54%)	73 (60%)	62 (48%)	0.07
10. Sardines and broccoli are sources of calcium for people who cannot consume dairy products.	139 (55.6%)	64 (52%)	75 (59%)	0.3
11. Women are more likely to have osteoporosis than men.	159 (63.6%)	76 (62%)	83 (64%)	0.6
12. Hormonal replacement therapy prevents bone loss after menopause.	43 (17.2%)	23 (19%)	20 (16%)	0.4
13. Smoking can contribute to osteoporosis.	108 (43.2%)	61 (50%)	47 (37%)	*0.03
14. A fall is important in causing fractures.	186 (74.4%)	91 (75%)	95 (74%)	0.9
15. High salt intake is a risk factor for osteoporosis.	60 (24%)	62 (21%)	34 (13.6%)	0.3
16. Osteoporosis leads to a risk of bone fractures.	217 (86.8%)	106 (86%)	111 (87%)	0.9
17. The risk of osteoporosis can be determined by clinical risk factors.	106 (42.4%)	53 (43%)	53 (41%)	0.7

*P values < 0.05 were statistically significant as determined by the chi-squared test. N.B. Among the targeted population, only 16.2% achieved a good score on the knowledge questionnaire, and the mean (± SD) knowledge score of this study was 8.05 ± 2.4

believed that an increased number of births was a risk factor for osteoporosis, compared to 24% of juniors ($P = 0.05$).

In terms of preventative behaviours against osteoporosis, 30 (12%) and 65 (26%) of included participants exercised daily and consumed dairy products. The frequency of daily exercise and the consumption of dairy did not significantly differ between seniors and juniors (11% vs. 13%, $P = 0.52$ and 27% vs. 25%, $P = 0.7$, respectively).

Table 3 shows the scores of knowledge and participants' knowledge scores that range from zero to eight (considered poor knowledge) and from nine to seventeen (considered as good knowledge scores). The main sources of knowledge on osteoporosis were one's family members (94%), society (95%), the media (85.5%), and health campaigns (34%). Only 21% of the participants identified that health care providers were their main source of knowledge. There was a significant difference in the knowledge scores for those whose main source or knowledge was the media (good 53% vs. poor 32.5%, $P = 0.01$).

Table 4 depicts the percentages of good and poor practice scores related to each knowledge score; the media negatively impacted the knowledge scores ($P = 0.01$).

The mean ± standard deviation of knowledge, attitude, and practice scores for juniors and seniors were 8.05 ± 2.4 vs. 8.01 ± 2.6, 19.05 ± 2.2 vs.19.4 ± 2.1, and 6.6 ± 1.8 vs. 6.8 ± 1.7, respectively. None of these scores significantly differed between juniors and seniors ($P > 0.05$).

Discussion

Osteoporosis is considered a global health problem and is prevalent among postmenopausal women [5]. University students are considered the fundamental block of any community; therefore, knowledge regarding osteoporosis among university students will assist in the adoption of living and nutritional standards that will help to avoid this disease [11, 17]. Most of the studies conducted in Saudi Arabia in the past have focused on postmenopausal women, with only few studies targeting female university students. This study aimed to therefore explore knowledge regarding osteoporosis and to evaluate the attitudes and practices of college students regarding osteoporosis risk management.

Among the targeted population, only 16.2% achieved a good score on the knowledge questionnaire, and the mean (± SD) knowledge score of this study was 8.05 ± 2.4. Our study revealed that the majority of students had good knowledge regarding their requirements for dairy calcium. This is contrary to a study conducted by El-Sayed et al. in 2013 [13] in King Saud University that showed the limited of knowledge regarding osteoporosis among the included students. This difference could be explained by the difference in the ages of the participants between the two studies. Indeed, young age was associated with higher levels of knowledge. In this study, the majority of participants were not able to identify calcium-rich food such as sardines and broccoli. This founding is supported

Table 2 Proper attitude of the participants regarding osteoporosis based on school grouping

Attitudes	Total $N = 250$ (100%)	Seniors $N = 122$ (100%)	Juniors $N = 128$ (100%)	P value
1. Osteoporosis is a life-threatening disease (seriousness)	123 (49.2%)	51 (42%)	72 (59%)	*0.02
2. Osteoporosis limits daily activities (severity)	204 (81.6%)	104 (85%)	100 (78%)	0.14
3. Bone loss increases after menopause (severity)	108 (43.2%)	53 (43%)	55 (43%)	0.9
4. Chance of getting osteoporosis is higher in postmenopausal (susceptibility)	112 (44.8%)	59 (48%)	53 (41%)	0.26
5. Some medications can cause osteoporosis (risk factor)	160 (64%)	80 (66%)	80 (63%)	0.6
6. An increased number of giving births is a risk factor for osteoporosis (risk factor)	49 (19.6%)	18 (15%)	31 (24%)	*0.05
7. Physical activity increases the risk of osteoporosis (preventive)	156 (62.4%)	74 (61%)	82 (64%)	0.6
8. Calcium rich food intake prevents osteoporosis (preventive)	227 (90.8%)	109 (89%)	118 (92%)	0.3

*$P < 0.05$ were statistically significant as determined by the chi-squared test

by the findings from the study conducted by Al-Shahrani et al. (2010) [18], in which only 48% of middle-aged and older Saudi women could correctly recognize these foods.

Evaluation of the level of knowledge regarding risk factors can be used as a tool in tailoring prevention programs against the disease [19]. In this study, osteoporosis knowledge among the participants was inadequate. This was consistent with that from another study conducted in Saudi Arabia [13], in which it was reported that the majority of participants had inadequate knowledge regarding risk factors, such as cigarette smoking, and prevention behaviours.

The media is the only source of knowledge that significantly affected the good and poor knowledge and practice activities. A previous study reported that not all information available via the media was accurate [20]. Thus, there is a need to revise the materials presented through the media as to avoid misconceptions. In this study, only 9% of the participants reported that they received their knowledge from health care providers. This is consistent with the findings reported by El Sayed et al. [13], who found that health care providers were the source of information for very few participants.

Only 49.2% of the participants believed that osteoporosis is a serious disease. These results coincide with those from the study conducted by El Sayed et al. [13], in which 62% of the participants in King Saud University perceived the seriousness of osteoporosis. In this study, a significant difference between seniors and juniors was detected regarding the perception of the seriousness of osteoporosis. However, the total attitude score in this study was 19, indicating good overall attitudes. This finding was consistent with that reported by Barzanji et al. [12], in which the total attitude score was 21. Diet and physical exercise affect the development of osteoporosis. Our findings revealed that 32% and 27% of juniors and seniors consumed sufficient intake of dairy products and only 13% and 11% of juniors and seniors engaged in physical exercise. Other studies conducted in the KSA reported similar findings; Barzanji et al. [12] reported that only 10% of the included females practiced adequate physical exercise.

In conclusion, poor knowledge about osteoporosis was reported among Princess Nourah University students, particularly that regarding risk factors. This translated into low practice scores. Indeed, accurate information about the risks of

Table 3 Knowledge scores according to participants sources of knowledge

Knowledge sources	Knowledge score		
	Good $N = 41$ (%16)	Poor $N = 209$ (%84)	P value
Media	22 (53%)	68 (32.5%)	0.01*
Social	21 (51%)	92 (44%)	0.4
Family	19 (46%)	100 (48%)	0.8
Campaign	7 (17%)	36 (17%)	0.9
Provider	4 (9.7%)	17 (8%)	0.7

*$P < 0.05$ were statistically significant as determined by the chi-squared test

Table 4 Knowledge scores according to participants sources of knowledge

Knowledge sources			
	Good $N = 56$ (22%)	Poor $N = 194$ (78%)	P value
Media	23 (41%)	67 (34%)	0.01*
Social	19 (33%)	94 (48%)	0.7
Family	19 (33%)	100 (51%)	0.5
Campaign	11 (20%)	32 (16%)	0.1
Provider	5 (9%)	16 (8%)	0.4

*P values < 0.05 were statistically significant as determined by chi-squared test

osteoporosis is important, because awareness may improve prevention behaviours, including nutrition and physical activity. Media is the only source that affected knowledge sores negatively; therefore, the information introduced through media should be revised. In addition, the role of other sources of knowledge, such as health care providers, needs to be reinforced. Concerned institutions should combine their efforts and implement a national program to improve osteoporosis awareness and prevention.

Since the results emphasized the importance of health providers' role, as source of knowledge for preventing osteoporosis, it is recommended to reinforce their role to prevent osteoporosis. As health education by mass media improved participants' knowledge about osteoporosis prevention, more campaigns that promote attitude towards preventing osteoporosis are to be launched.

Limitation of the study

This study was subject to several limitations which merit mentioning here.

Compliance with ethical standards

Conflicts of interest None.

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