



The Open Nursing Journal

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RESEARCH ARTICLE

Osteoporosis Knowledge, Beliefs and Self-efficacy Among Female University Students: A Descriptive Study

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Abstract:

Aim:

This study aimed to investigate female university students' knowledge, beliefs and self-efficacy regarding osteoporosis.

Methods:

This is a descriptive cross-sectional study conducted amongst 260 female university students in Jordan. This study utilized a package of instruments to measure different variables of the study, including demographic data, Osteoporosis Knowledge Assessment Tool (OKAT), Osteoporosis Health Belief Scale (OHBS) and Osteoporosis Self-Efficacy Scale (OSES).

Results:

Participants had a relatively low level of knowledge regarding osteoporosis (M=8.1/20, 40.5%). In general, they had fairly positive beliefs toward osteoporosis with a percentage of 70% (M=3.5/5, SD=0.3) and moderate self-efficacy in practicing osteoporosis recommended practices. No significant differences were observed in participants' knowledge, beliefs, and self-efficacy of osteoporosis based on their demographic variables except their college specialty.

Conclusion:

The current study confirmed that female university students had inadequate knowledge about osteoporosis. There is a gap between the participants' beliefs, self-efficacy about osteoporosis and their daily lifestyle. In view of such lack of knowledge of osteoporosis, efforts should be made to raise the level of osteoporosis awareness among university students through health education intervention programs for all-female university students regardless of their college, specialty or academic program.

Keywords: Beliefs towards osteoporosis, Efficacy of osteoporosis, Jordan, Osteoporosis Knowledge, Osteoporosis Health Belief Scale (OHBS), Skeletal disease.

Article History

Received: June 12, 2020

Revised: August 23, 2020

Accepted: September 06, 2020

1. INTRODUCTION

Osteoporosis is a skeletal disease represented through decreased bone density that enhances the possibility of bone fracture [1]. It is a silent disease that leads to millions of annual osteoporotic fractures worldwide [2]. Due to its fatal complications, the World Health Organization (WHO) [3, 4] classified it as a global health problem constituting a dangerous disease besides stroke, cancer and heart diseases. This disease is prevalent in females more than males with variable onset according to their age [5], where elderly women are the most affected age group with different osteoporotic fracture sites

such as hip, spine, forearm and proximal humerus [6]. The majority of the affected women suffer from pain, disabilities, reduced social interaction, and depression, which lead to an expensive lengthy hospital stay and premature death [7].

The prevalence of osteoporosis is well-documented in both industrial and developed countries. Approximately, osteoporosis is affecting 200 million women worldwide, and the risk of the disease is increasing with advanced age [2]. Similarly, the National Osteoporosis Foundation [8] reported that approximately nine million adult Americans had osteoporosis and more than 48 millions are affected worldwide. Such numbers are expected to increase by 2030 to 11.9 and 64.3 millions, respectively, if measures to prevent it are not effective, causing a major health problem. In western industrial

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countries, the prevalence of osteoporosis ranged between 9-38% for women and 1-8% for men [9]. Similar rates have been reported in developing countries. For instance, it was reported to be 13.3% in Iran [10], 12.01% in Pakistan [11]. However, osteoporosis is more prevalent in Arabic countries, with rates ranging between 8-40% [12]. Furthermore, Jordan, as a developing country, has a relatively higher prevalence of osteoporosis that ranged from 13.5-44% [13]. Such high rates may be explained by the massive demographic changes, mainly the increase in the elderly age group 50-70 years to 35%, the lack of awareness among healthcare professionals to diagnose and treat the disease, in addition to vitamin-D insufficiency and deficiency [14]. Therefore, the WHO has identified osteoporosis as one of the health priorities in the Middle East region, aiming at increasing awareness and training regarding osteoporosis among women [3, 4].

Osteoporosis is associated with numerous risk factors such as age, gender, menstrual cycle changes, tobacco smoking, alcohol consumption, physical inactivity, and decrease calcium and vitamin-D intake [15]. Such factors disturb bone mass density shaped early in life, doubled by the age of 20 years, and rapidly shrink by the age of 50 years among women [16]. Thus, preserving bone mass early during the first three decades of life for young females through promoting females' knowledge regarding the disease and adopting a healthy lifestyle is an important strategy in reducing the risk of osteoporosis among women [17].

Osteoporosis knowledge was tested in different international studies. Most of these studies found a lack of knowledge and awareness regarding osteoporosis among females with different age groups, accompanied by deprived application and less self-efficacy or confidence toward exercise and calcium intake, which determined as preventative behaviors [18, 19]. On the other hand, few studies were conducted to assess female university students' level of osteoporosis knowledge, beliefs and self-efficacy. Most of these studies focused on knowledge and revealed an inadequate knowledge of osteoporosis among university students [20, 21]. Further studies found that knowledge and perceptions are not demonstrated among university students' behaviors even though they had positive self-efficacy toward exercise and negative self-efficacy toward calcium intake [22]. This age group is important as bone mass density is formed early in life, doubling by the age of 20 years. Many of the university students may not have achieved peak bone mass, and with sufficient knowledge, they may be able to raise the level at which their bone mass may eventually reach. Thus, increasing awareness and knowledge of osteoporosis will be of great worth in improving bone health among this age group.

In Jordan, the studies in the field of osteoporosis were very few, and the majority of them had focused on detecting osteoporosis prevalence, and assessing knowledge and awareness of osteoporosis among elderly Jordanian women or adolescents in the schools. Generally, Jordanian women were found to have insufficient knowledge regarding osteoporosis [13, 23]. Furthermore, one old study was conducted among undergraduate university students (both males and females) and confirmed this lack of knowledge of osteoporosis in the

Jordanian population [24]. However, there were not enough Jordanian studies to discuss the knowledge, beliefs and self-efficacy of osteoporosis among the young adult age group [18], which constitutes a critical age group in which the mass of bone tissue reaches the peak of efficiency. Moreover, it constitutes an important determinant for the prevention of osteoporosis, for which evaluating their knowledge, beliefs and practices of osteoporosis can be useful in developing information and educational activities to reduce the risk of disease and disease burden. Therefore, this study aimed to investigate female university students' knowledge, beliefs and self-efficacy regarding osteoporosis. In specific, this study tried to achieve the following research objectives:

1. Evaluate the level of osteoporosis knowledge among Jordanian female university students.
2. Evaluate Jordanian female university students' beliefs toward osteoporosis.
3. Evaluate the female university students' self-efficacy of osteoporosis.
4. Investigate differences in female university students' knowledge, beliefs and self-efficacy regarding osteoporosis based on their demographic data.

2. METHODOLOGY

2.1. Design and Setting

A descriptive cross-sectional design was conducted to achieve the objectives of this study, utilizing self-administered questionnaires. This study was carried out among Jordanian female university students at the largest two universities (one public and one private) in Amman, the capital of Jordan.

2.2. Sampling

The target population of this study includes all-female university students in Jordan. Participants were conveniently recruited from various colleges at the participating universities. The sample size estimated using G power (version 3.1.5, Heinrich-Heine-Universität, Düsseldorf, Germany) that met the criteria (90% power, medium effect size, alpha 0.05), adding 10% attrition rate, showed the need for 243, but we distributed 400 questionnaires leaving a total number of 260 participants. To be included, a participant had to be a Jordanian female student enrolled in any bachelor program, at any year except for students in health colleges (first and second years only).

2.3. Instrument

This study utilized a package of instruments to measure different variables of the study. The first section asked participants to report their demographic data, including age, height, weight, college, and academic year. In addition, they were asked to answer 10 Yes/No questions regarding osteoporosis risk factors developed from the literature review [16, 25]. These factors include a family history of osteoporosis and fractures, sedentary lifestyle, abnormal body mass index (less than 20 or more than 30), smoking, caffeine intake, low intake of dairy products, low intake of meat and eggs, low intake of vitamin supplements, and low exposure to the sun.

The second section evaluated participants' osteoporosis knowledge using the Osteoporosis Knowledge Assessment Tool (OKAT) [26], which consisted of 20 True/False/Don't Know items. One mark was awarded for each correct answer, while the incorrect and don't know answers were awarded zero with a total probable score of 20 and higher scores indicate more knowledge of osteoporosis. The OKAT was used for measuring osteoporosis knowledge levels regarding disease process, risk factors, prevention and treatment. The third section assessed participants' beliefs regarding osteoporosis using the Osteoporosis Health Belief Scale (OHBS) [27] that was developed based on the health belief model. The OHBS is a 42-item questionnaire that was specifically designed to assess beliefs related to calcium intake and exercise behaviors, and consisted of seven subscales (perceived susceptibility to osteoporosis, seriousness of osteoporosis, benefits of exercise, benefits of calcium intake, barriers to exercise, barriers to calcium intake, and health motivation). The OHBS used a 5-point Likert scale to rate the items from strong disagreement (1) to strong agreement (5), with a probable score range of 6 to 30 for each subscale and 42 to 210 for the total scale. The higher scores indicate more positive healthy beliefs except for the two barriers subscales, which were reverse-coded.

The final section measured participants' self-efficacy, or confidence, for behaviors related to physical activity and calcium intake using Osteoporosis Self-Efficacy Scale (OSES) [28]. This 12-items scale measures confidence for adopting behavior change regarding calcium intake (6 items) and exercise (6 items). Participants were asked to respond to the following: "If it were recommended that you do any of the following this week, how confident or certain would you be that you could". Examples include "Do exercises even if they are difficult" and "Obtain foods that give an adequate amount of calcium even when they are not readily available." Participants were asked to rate their response on a 10-point Likert-type scale of 0 to 10 (0=not confident at all, 10=very confident). For both subscales, a score was calculated by averaging the responses to the six related items and multiplying by 10 (range: 0–100).

Translation and back translation of the questionnaires were performed by three experts in the field in relation to terminology simplicity and comprehension of the questionnaire in the Arabic language. The majority agreed that the statements were simple and readable except for item number (4) (*There is a good chance that you will get osteoporosis*), a modification was done by merging it with the item number (3) (*It is extremely likely that you will get*) from OHBS after translation and back translation as they had nearly the same meaning in Arabic. In addition, cultural adaptation of the questionnaire was made by giving the questionnaire to three experts in the field of osteoporosis (one physician, one nurse, one nurse academician). A modification was done after translation and back translation for item number 16 (Alcohol in moderation has little effect on osteoporosis) in the OKAT as it is culturally inappropriate.

Finally, the instrument package was pilot-tested for feasibility, clarity and readability among a sample of 15 students not included in the sample. The majority agreed that

the statements were understandable and readable.

2.4. Ethical Considerations

Ethical approval for this study was obtained from the Scientific Research Committee at the School of Nursing-The University of Jordan, and from the administration of the participating universities.

2.5. Data Collection

After obtaining ethical approval, the universities' administrations were contacted to seek permission to conduct this study. Students were interviewed in their lecture rooms by trained research assistants. Eligible students were invited to participate in this study after being informed about its aims and nature. Those who accepted the invitation were given the questionnaire package with a cover letter explaining the purpose of the study. Participants were asked to complete the entire questionnaires and return them back to the research assistants who were available to answer their questions. Returning the completed questionnaires was considered as implied consent for participation.

3. RESULTS

3.1. Description of Sample Characteristics

A total of 400 questionnaires were distributed, out of which 289 complete questionnaires were returned (response rate= 72.3%). However, a total of 29 incomplete questionnaires were excluded leaving a total number of 260 participants who were mainly singles (84.2%, n=219), from the public university (78%, n=203), registered in the humanitarian schools (45.8%, n=119), at their second year (52.7%, n=137). Their mean age was 19.7 years (SD=1.4), and their mean of BMI was 22.6 (SD=3.3). When asked about osteoporosis risk factors (Table 1), they had a mean of 3.2 risk factors (SD=1.2), where the most frequent risk factor was "caffeine intake" (75.4%, n=196) followed by "low intake of vitamin supplements" (65.8%, n=171). On the other hand, the least reported risk factors were "low intake of meat & eggs" (11.5%, n=30) and "low intake of dairy products" and "family history of osteoporosis" (12.3%, n=32).

3.2. Description of Study Variables

3.2.1. Knowledge of Osteoporosis

As shown in Table 2, participants had a relatively low level of knowledge regarding osteoporosis (M=8.1/20, 40.5%). Table 3 shows detailed scores of different knowledge items, where item 1 "Osteoporosis leads to an increased risk of bone fractures" had the highest score (94.6%, n=246), followed by item 10 "Any type of physical activity is beneficial for osteoporosis" (74.2%, n=193). Conversely, items with the lowest scores were item

2 "Osteoporosis usually causes symptoms before fracture occur" (7.7%, n=20) and item 18 "There is a small amount of bone loss in the ten years following the onset of menopause" (11.5%, n=30).

Table 1. Participants' characteristics (N=260).

-	% (n)
Age, Mean (SD)	19.7(1.4)
BMI, Mean (SD)	22.6(3.3)
College	78.1(203)
Public	21.9(57)
Private	
College	
Health	13.5(35)
Scientific	40.8(106)
Humanitarian	45.8(119)
Academic Year	
First	18.1(47)
Second	52.7(137)
Third	18.5(48)
Fourth	10.8(28)
Osteoporosis Risk factors, M(SD)	3.2(1.4)
1. Family history of osteoporosis	12.3(32)
2. Family history of fracture	25.4(66)
3. Abnormal BMI	34.6(90)
4. Smoking	16.2(42)
5. Caffeine intake	75.4(196)
6. Sedentary Lifestyle	48.5(126)
7. Low intake of dairy products	12.3(32)
8. Low intake of meat & eggs	11.5(30)
9. Low intake of vitamin supplements	65.8(171)
10. Low exposure to sun	19.6(51)

Table 2. Participants' means of the main study variables.

Variable	No. of Items	Min	Max	Mean	SD
Knowledge of Osteoporosis	20	0	15	8.1	2.6
Attitudes toward Osteoporosis	9	2.3	4.2	3.5	0.3
Susceptibility of Osteoporosis	5	0	1.0	0.5	0.2
Seriousness of Osteoporosis	6	1.0	4.7	2.9	0.8
Benefits of Exercise	6	1.0	5.0	4.1	0.7
Benefits of Calcium	6	2.0	5.0	3.9	0.6
Barriers to Exercise	6	2.0	5.0	3.8	0.7
Barriers to Calcium Intake	6	1.5	5.0	3.7	0.7
Health Motivation	6	1.0	5.0	3.4	0.7
Osteoporosis Self-Efficacy	12	.9	10.0	6.7	1.9
Efficacy of Exercise	6	.8	10.0	6.7	2.3
Efficacy of Calcium Intake	6	0	10.0	6.7	2.4

3.2.2. Beliefs Towards Osteoporosis

Participants' attitudes towards osteoporosis were assessed in terms of seven areas (Table 2), for which their means and standard deviations were calculated. In general, participants had fairly positive attitudes, with a percentage of 70% (M=3.5/5, SD=0.3). They had the highest positive attitudes in the area of "Benefits of exercise" (M=4.1/5, SD=0.7) followed by "Benefits of calcium" (M=3.9/5, SD=0.6). Conversely, "Susceptibility of osteoporosis" had the lowest negative attitudes (M=0.5/5, SD=0.2), preceded by "Seriousness of

osteoporosis" (M=2.9/5, SD=0.8).

3.2.3. Efficacy of Osteoporosis

As shown in Table 2, participants were found to have a moderate self-efficacy in practicing osteoporosis (M=6.7/10, SD=0.70), which was equal in the areas of "Efficacy of exercise" (M=6.7, SD=2.3) and "Efficacy of calcium Intake" (M=6.7, SD=2.4). Examining individual items of self-efficacy (Table 4) revealed that "Do the type of exercises that you are supposed to do" had the highest score (M=7.02, SD=2.7)

followed by “Increase your calcium intake” (M=6.98, SD=2.7). In contrast, “Change your exercise habits” had the lowest score (M=6.58, SD=2.6), preceded by “Stick to a diet which gives an adequate amount of calcium” (M=6.59, SD=2.8).

3.2.4. Comparison of Study Variables based on Participants' Demographics

The analysis revealed no significant differences in participants' knowledge, attitudes, and self-efficacy of osteoporosis based on their demographic variables except their college specialty (Table 5), where participants from humanitarian colleges scored significantly less than their counterparts in the knowledge of osteoporosis ($F=5.012$, $df=257$, $P=.007$).

4. DISCUSSION

In this study, the researchers aimed to investigate female university students' knowledge, beliefs and self-efficacy regarding osteoporosis. Such a study is essential to add to both national and international efforts, which seek to fight against osteoporosis through increasing knowledge and awareness among one of the most important age groups of the population;

female university students. In this study, participants confirmed the generally low levels of knowledge regarding osteoporosis, where they scored a mean of 40.5%. This result was against the expectation to find better knowledge and awareness level regarding osteoporosis, while this study targeted university students than other lay population. A similar lack of knowledge was reported among university students in Saudi Arabia (62%) [20], Malaysia (79.4%) [21], among students in health colleges (49.0%) [29]. The only study that reported a high level of knowledge among females was reported among Saudi females [30], which was explained by the presence of an osteoporosis awareness and prevention campaign through the Center of Excellence for Osteoporosis in King Abdulaziz University. This indicates the importance of educating females regarding such an important topic.

The reason for the lack of knowledge of osteoporosis may be due to the fact that female students are between the ages of 18-21 years and therefore, their information about such diseases is limited to the information they acquired during the secondary stages in school, or because the disease is known to affect older age groups. Another reason is that the majority of female students were from humanitarian and scientific colleges, who usually do not register for health courses.

Table 3. Participants' knowledge of osteoporosis (N=260).

Sr. No.	Knowledge Item	% (n)
1.	Osteoporosis leads to an increased risk of bone fractures.	94.6 (246)
2.	Osteoporosis usually causes symptoms before a fracture occurs.	7.7(20)
3.	Having a higher peak bone mass at the end of childhood gives no protection against the development of osteoporosis in later life.	23.5(61)
4.	Osteoporosis is more common in men.	53.5(139)
5.	Cigarette smoking can contribute to osteoporosis.	58.1(151)
6.	White women are at the highest risk of fracture as compared to other races.	10(26)
7.	A fall is just as important as low bone strength in causing fractures.	44.6(116)
8.	By age 80, the majority of women have osteoporosis.	64.6(168)
9.	From age 50, most women can expect at least one fracture before they die.	47.3(123)
10.	Any type of physical activity is beneficial for osteoporosis.	74.2(193)
11.	It is easy to tell whether I am at risk of osteoporosis by my clinical risk factors.	51.5(134)
12.	Family history of osteoporosis strongly predisposes a person to osteoporosis.	47.3(123)
13.	Adequate calcium intake can be achieved from two glasses of milk a day.	13.5(35)
14.	Sardines and broccoli are good sources of calcium for people who cannot take dairy products.	55(143)
15.	Calcium supplements alone can prevent bone loss.	42.7(111)
16.	Alcohol in moderation has little effect on osteoporosis.	35.4(92)
17.	High salt intake is a risk factor for osteoporosis.	21.5(56)
18.	There is a small amount of bone loss in the ten years following the onset of menopause.	11.5(30)
19.	Hormone therapy prevents further bone loss at any age after menopause.	21.9(57)
20.	There are no effective treatments for osteoporosis available in Australia.	31.2(81)

Table 4. Participants' individual responses to osteoporosis self-efficacy (out of 10).

Sr. No.	Efficacy Item	Mean	SD
1.	Begin a new or different exercise program	6.69	2.7
2.	Change your exercise habits	6.58	2.6
3.	Put forth the effort required to exercise	6.65	2.6
4.	Do exercises even if they are difficult	6.31	2.9
5.	Exercise for the appropriate length of time	6.72	2.7

(Table 4) contd....

Sr. No.	Efficacy Item	Mean	SD
6.	Do the type of exercises that you are supposed to do	7.02	2.7
7.	Increase your calcium intake	6.98	2.7
8.	Change your diet to include more calcium rich food	6.77	2.7
9.	Eat calcium rich foods as often as you are supposed to do	6.79	2.8
10.	Select appropriate foods to increase your calcium intake	6.87	2.8
11.	Stick to a diet which gives an adequate amount of calcium	6.59	2.8
12.	Obtain foods that give an adequate amount of calcium even when they are not readily available	5.98	2.9

Table 5. Comparison of the study variables based on their categorical demographics (N=236).

Variable	Knowledge of Osteoporosis M(SD)	Attitudes toward Osteoporosis M(SD)	Osteoporosis Self-Efficacy M(SD)
College			
Health	8.69(2.5)	3.47(0.3)	7.12(2.1)
Scientific	8.51(2.4)	3.56(0.3)	6.38(2.3)
Humanitarian	7.55(2.7)*	3.43(0.3)	6.76(2.3)
College			
Public	7.99(2.4)	3.51(0.3)	6.72(1.9)
Private	8.49(3.2)	3.43(0.4)	6.45(2.2)
Academic Year			
First	8.62(2.9)	3.45(0.3)	6.60(2.2)
Second	7.93(2.7)	3.48(0.3)	6.45(2.3)
Third	7.63(1.9)	3.50(0.4)	7.06(2.5)
Fourth	8.82(2.7)	3.54(0.2)	7.10(2.0)
Family History of Osteoporosis			
No	8.08(2.5)	3.51(0.3)	1.98(0.2)
Yes	8.81(2.9)	3.52(0.3)	1.80(0.3)

*Significant at $P < 0.05$, ** Significant at $p < 0.01$. Note: The category with * was used as a reference for comparison

Knowledge of risk factors and preventive practices is essential in preventing or delaying the inception of osteoporosis as well as in reducing morbidity due to osteoporosis. Such knowledge can be used by healthcare policymakers and nurses in healthcare centers as a tool to carry out prevention programs for the disease. Nevertheless, knowledge of both modifiable and non-modifiable risk factors among the participants was low to average. For example, they were unable to recognize race, salty diet and alcohol intake as risk factors of osteoporosis. However, they successfully determined age, gender, cigarette smoking and family history as the greatest risk factors for the disease. These findings were consistent with previous studies founding poor knowledge in general to risk factors [29].

Interestingly, information regarding such risk factors has not been translated in the participants' lifestyles, where most of them consumed caffeine, had abnormal body mass index, lived a sedentary lifestyle and had a low intake of calcium and vitamin D supplements. It seems that there are regional similarities in relation to lifestyle practices among Iranian [31], Jordanian [32] and Saudi Arabian participants [33], and this was different from those adopted by Chinese participants [25]. This should alarm all osteoporosis national and international initiatives, including primary care providers in healthcare centers, to give higher priority to risk factors, especially the modifiable risk factors, which would help in minimizing the risk of developing osteoporosis. Since knowledge plays a key role in changing behavior, habits and beliefs, there is an urgent need for raising awareness through an effective health

education intervention programs on osteoporosis that focuses on the disease risk factors and aims to adopt a healthy lifestyle through exercises and nutrition for all Jordanian universities students regardless their college, specialty or academic program. Nursing schools are encouraged to take the lead for such an initiative.

It was noteworthy that participants' knowledge score was the least on symptoms of osteoporosis, where only 7.7% of them correctly answered the question about (Osteoporosis usually causes symptoms before fracture occur), despite that 94.6% of the participants knew that osteoporosis leads to an increased risk of bone fractures. This finding is analogous with a study conducted by Haq *et al.* [34], in which the respondents did not know much about the apparent symptoms of osteoporosis. Regarding the prevention and treatment of the disease, the participants highly recognized physical activity, calcium and vitamin D intake as preventative and treatment measures as the following percentages, 74.2%, 55%, 42.7%, respectively. On the other hand, only 13.5% of the participants could correctly determine the daily requirement of calcium and vitamin D. These findings match with a study conducted among female adolescents in Egypt by Hossien, Tork and El-Sabeely [35], in which most of the participants correctly identified preventive measures for osteoporosis. Conversely, Amin and Mukti [21], reported that most of the participants failed to identify osteoporosis preventive measures. Comprehensive education programs are needed to emphasize more on the type of exercises and the daily requirements of vitamin D and calcium needed for osteoporosis prevention.

Moreover, future studies are needed to investigate healthy lifestyle practices and their relation with socio-demographic data.

In general, 68% of the participants in this study had positive health motivation regarding learning about health issues and following recommendations, but they perceived themselves at a lower risk to have osteoporosis. Thus, perceived susceptibility towards osteoporosis in our study was extremely low, with only 10% despite that 58% of the participants believed that osteoporosis is a serious disease which may influence their life. This result was consistent with another study in which the participants had low perceived susceptibility towards osteoporosis and positive health motivation [19]. Although participants had positive beliefs about the role of exercises and calcium in the prevention of osteoporosis, these beliefs had not been translated into behavior patterns in their lifestyles. For instance, only 52.5% of them reported practicing exercise. Therefore, extra efforts are needed to bridge between females' beliefs and actual practices through interventional education programs to fight osteoporosis.

People who have high self-efficacy and believe that they can achieve what they want, are highly effective and healthy [36]. Thus, efficacy can play an important role to assist people in adopting or maintaining healthy behaviors. Our participants reported a moderate osteoporosis self-efficacy 55.8% for both exercise and calcium intake. They reported more self-confidence in doing exercises for the appropriate length of time, even if it was difficult. Moreover, they were ready to change their diet to include calcium rich foods. Interestingly, this result is in agreement with the finding of Endicott [37] in which the participants perceived the barriers to exercise and calcium as low and the benefits of exercise and calcium as high. Conversely, Aree and Petlamul [38] found that participants reported less self-efficacy concerning exercise and calcium intake. Such finding indicates that participants had the motivation and positive thinking to implement such changes, which should be utilized in a health education program to encourage them to change their lifestyle practices towards preventative osteoporosis measures like exercises and calcium intake. Building public health strategies aiming toward improving calcium intake among adult females and promoting healthy lifestyle practices is also recommended. Therefore, future studies must be based on targeting healthcare professionals, especially nurses in healthcare centers and nursing schools, to engage them in education efforts regarding osteoporosis.

To obtain more information of our results, the study variables were examined in terms of participants' demographics. No significant differences were found except for humanitarian college, in terms of knowledge of osteoporosis. Thus, female students from health and scientific colleges had better knowledge than those from humanitarian colleges. The results are in accordance with the result obtained from the study conducted in Pakistan [34]. This indicates a general problem in the community, especially among these young age groups. This study reflects the need for spreading knowledge regarding osteoporosis and promoting preventative

practices for the disease among female university students through educational programs. Offering educational programs via the curriculum to improve the awareness of this disease among university students will be of great value.

4.1. Limitations of the Study

Only two universities were included so that the population studied was limited, which might limit the generalizability of the study findings. Moreover, the osteoporosis Knowledge Assessment Tool (OKAT) was designed in a True/False format, which might have encouraged guessing and might not be a true reflection of the participants' knowledge about osteoporosis. Additionally, extra factors such as socio-economic differences, access to exercise facilities and healthy diet were not investigated in the study. These factors are important because they are related to the lifestyle and daily behavior of participants, which in turn may affect the risk factors that contribute to the occurrence or prevention of osteoporosis, such as healthy nutrition and exercise. Future studies are invited to include such factors in their demographic variables.

CONCLUSION

The findings of this study demonstrate that female university students had inadequate knowledge about osteoporosis, which matches with the international literature. There was poor knowledge in relation to risk factors of osteoporosis. The perceived susceptibility for osteoporosis was low. There is a gap between the participants' beliefs, self-efficacy about osteoporosis and their daily lifestyle, which contains many contributing factors that increase the risk of osteoporosis incidence. Type of college (Health, Scientific, and Humanitarian) was the only significant finding between study variables and participants' demographics.

In view of such a lack of knowledge of osteoporosis, efforts should be made to raise the level of osteoporosis awareness among university students. Offering educational programs via the curriculum to improve the awareness of this disease among university students regardless of their college type or speciality and increasing awareness and knowledge of osteoporosis will be of great worth in improving bone health among this critical age group by which bone mass density achieved its peak. Nursing schools are encouraged to take the lead in this initiative.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval for this study was obtained from the Scientific Research Committee at the School of Nursing-The University of Jordan, Jordan # PF.17.3.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

FUNDING

This study has been funded by Deanship of Academic Research-The University of Jordan, Jordan #2/2017-2018.

CONFLICT OF INTEREST

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

ACKNOWLEDGEMENTS

Declared none.

REFERENCES

- [1] Lorentzon M, Cummings SR. Osteoporosis: the evolution of a diagnosis. *J Intern Med* 2015; 277(6): 650-61. [http://dx.doi.org/10.1111/joim.12369] [PMID: 25832448]
- [2] International osteoporosis foundation. Osteoporosis facts and statistics Available from: <http://www.iofbonehealth.org/factsand-statistics#category-2902017> [Accessed 5/2/2017];
- [3] World-health-organization-criteria-diagnosis-osteoporosis Available from: <http://www.4bonehealth.org/education2017>.
- [4] Prevention and management of osteoporosis: report of a WHO scientific group Geneva, World Health Organization 2003. (WHO Technical Report Series 921) Available at: http://whqlibdoc.who.int/trs/WHO_TRS_921.pdf
- [5] D'Amelio P, Isaia GC. Male osteoporosis in the elderly. *Int J Endocrinol* 2015; 2015907689 [http://dx.doi.org/10.1155/2015/907689] [PMID: 26457082]
- [6] Tanriover MD, Oz SG, Tanriover A, *et al.* Hip fractures in a developing country: osteoporosis frequency, predisposing factors and treatment costs. *Arch Gerontol Geriatr* 2010; 50(3): e13-8. [http://dx.doi.org/10.1016/j.archger.2009.04.010] [PMID: 19481270]
- [7] Leboime A, Confavreux CB, Mehsen N, Paccou J, David C, Roux C. Osteoporosis and mortality. *Joint Bone Spine* 2010; 77(Suppl. 2): S107-12. [http://dx.doi.org/10.1016/S1297-319X(10)70004-X] [PMID: 21211746]
- [8] The National Osteoporosis Foundation. 2013. Prevalence of Osteoporosis and Low Bone Mass in the US from National Osteoporosis Foundation
- [9] Wade SW, Strader C, Fitzpatrick LA, Anthony MS, O'Malley CD. Estimating prevalence of osteoporosis: examples from industrialized countries. *Arch Osteoporos* 2014; 9(1): 182. [http://dx.doi.org/10.1007/s11657-014-0182-3] [PMID: 24847682]
- [10] Irani AD, Poorolajal J, Khalilian A, Esmailnasab N, Cheraghi Z. Prevalence of osteoporosis in Iran: A meta-analysis. *J Res Med Sci* 2013; 18(9): 759-66. [PMID: 24381618]
- [11] Ejaz S, Mahmood A, Qureshi MA, Ali M. Prevalence of osteoporosis and osteopenia among Pakistani pre and post-menopausal women. *IOSR J Dent Med Sci* 2012; 2: 12-7. [JDMS]. [http://dx.doi.org/10.9790/0853-0261217]
- [12] Al Saleh J, Sayed M E, Monsef N, Darwish E. 2016; The prevalence and the determinants of musculoskeletal diseases in Emiratis attending primary health care clinics in Dubai. *Oman Medical Journal* 31(2): 117-23.
- [13] El-Heis MA, Al-Kamil EA, Kheirallah KA, Al-Shatnawi TN, Gharaibia M, Al-Mnayyis A. Factors associated with osteoporosis among a sample of Jordanian women referred for investigation for osteoporosis. *East Mediterr Health J* 2013; 19(5): 459-64. [http://dx.doi.org/10.26719/2013.19.5.459] [PMID: 24617125]
- [14] Jordanian Osteoporosis Prevention Society. The First Jordanian National Osteoporosis Record. Amman, Jordan 2005.
- [15] Cavalli L, Guazzini A, Cianferotti L, *et al.* 2016; Prevalence of osteoporosis in the Italian population and main risk factors: results of BoneTour Campaign. *BMC Musculoskeletal Disorders* 17(1): 1-11. [http://dx.doi.org/10.1186/s12891-016-1248-8]
- [16] Clark P, Lavielle P. Risk perception and knowledge about osteoporosis: well informed but not aware? A cross-sectional study. *J Community Health* 2015; 40(2): 245-50. [http://dx.doi.org/10.1007/s10900-014-9923-x] [PMID: 25096762]
- [17] Al-Otaibi HH. Osteoporosis health beliefs, knowledge and life habits among women in Saudi Arabia. *Open J Prev Med* 2015; 5(06): 236-43. [http://dx.doi.org/10.4236/ojpm.2015.56027]
- [18] Gayathripriya N, Sanad H, Awadhalla M. Knowledge on osteoporosis prevention among bahraini women: a cross sectional study. *J Adv Pharm Educ Res* 2017; 7(4): 397-403.
- [19] Leng LS, Ali A, Yusof HM. Knowledge, Attitude and Practices towards Osteoporosis prevention among adults in Kuala Lumpur, Malaysia. *Malays J Nutr* 2017; 23(2): 279-90.
- [20] AlAnazi NK, AlShahrani MS, AlGosi SM, Mirghani HO. Osteoporosis knowledge and attitude assessment among females University students in Tabuk, Saudi Arabia. *Indian J Basic Appl Med Res* 2016; 5(4): 310-5.
- [21] Amin S, Mukti NA. Assessment of knowledge level on osteoporosis among private university students in Malaysia. *Imp J Interdisciplinary Res* 2017; 3(3): 141-54.
- [22] De Silva REE, Haniffa MR, Gunathillaka KDK, Atukorala I, Fernando EDPS, Perera WLS. A descriptive study of knowledge, beliefs and practices regarding osteoporosis among female medical school entrants in Sri Lanka. *Asia Pac Fam Med* 2014; 13(1): 1-6. [PMID: 24397851]
- [23] Abushaikhla L, Omran S, Barrouq L. Osteoporosis knowledge among female school students in Jordan. *East Mediterr Health J* 2009; 15(4): 906-11. [http://dx.doi.org/10.26719/2009.15.4.906] [PMID: 20187542]
- [24] Amre H, Safadi R, Jarrah S, Al-Amer R, Froelicher ES. Jordanian nursing students' knowledge of osteoporosis. *Int J Nurs Pract* 2008; 14(3): 228-36. [http://dx.doi.org/10.1111/j.1440-172X.2008.00691.x] [PMID: 18460064]
- [25] Zhang YP, Li XM, Wang DL, Guo XY, Guo X. Evaluation of educational program on osteoporosis awareness and prevention among nurse students in China. *Nurs Health Sci* 2012; 14(1): 74-80. [http://dx.doi.org/10.1111/j.1442-2018.2011.00665.x] [PMID: 22303915]
- [26] Winzenberg TM, Oldenburg B, Frendin S, Jones G. The design of a valid and reliable questionnaire to measure osteoporosis knowledge in women: the Osteoporosis Knowledge Assessment Tool (OKAT). *BMC Musculoskelet Disord* 2003; 4(1): 17. [http://dx.doi.org/10.1186/1471-2474-4-17] [PMID: 12877751]
- [27] Kim KK, Horan ML, Gendler P, Patel MK. Development and evaluation of the osteoporosis health belief scale. *Res Nurs Health* 1991; 14(2): 155-63. [http://dx.doi.org/10.1002/nur.4770140210] [PMID: 2047537]
- [28] Horan ML, Kim KK, Gendler P, Froman RD, Patel MD. Development and evaluation of the osteoporosis self-efficacy scale. *Res Nurs Health* 1998; 21(5): 395-403. [http://dx.doi.org/10.1002/(SICI)1098-240X(199810)21:5<395::AID-NUR3>3.0.CO;2-I] [PMID: 9761137]
- [29] Bilal M, Haseeb A, Merchant AZ, *et al.* Knowledge, beliefs and practices regarding osteoporosis among female medical school entrants in Pakistan. *Asia Pac Fam Med* 2017; 16(1): 6. [http://dx.doi.org/10.1186/s12930-017-0036-4] [PMID: 28936120]
- [30] Zakai G, Zakai H. Awareness about osteoporosis among university students in Jeddah, Saudi Arabia. *J Adv Lab Res Biol* 2015; 35: 392-7.
- [31] Akhtar A, Shahid A, Jamal Ar NM, *et al.* Knowledge about osteoporosis in women of child bearing age (15-49 Years) attending Fauji Foundation Hospital Rawalpindi. *Pak Armed Forces Med J* 2016; 66(4): 558-63.
- [32] Elayah E, Akour A, Yousef A, Farah DA, Hamaly M, Basheti I. Osteoporosis amongst Jordanians: effect of pharmacist-directed brochure education on people's knowledge. *Trop J Pharm Res* 2014; 13(12): 2101-8. [http://dx.doi.org/10.4314/tjpr.v13i12.22]
- [33] Alshammari KF. Women knowledge, attitude and practices about osteoporosis prevention "Riyadh Saudi Arabia". *World J Med Sci* 2014; 11(3): 422-31.
- [34] Haq N, Tahir M, Iqbal Q, Naseem Q. Exploration of osteoporosis knowledge and perception among young women in quetta. *Pakistan J Osteoporos Physical Activity* 2015; 3(3): 1-6.
- [35] Hossien YES, Tork HM, El-Sabeely AA. Osteoporosis knowledge among female adolescents in Egypt. *Am J Nurs* 2014; 3(2): 13-7. [http://dx.doi.org/10.11648/j.ajns.20140302.11] [PMID: 24481346]
- [36] Bandura A, Wessels S. Self-efficacy. W.H. Freeman & Company

- 1997; pp. 4-6.
- [37] Endicott RD. Knowledge, health beliefs, and self-efficacy regarding osteoporosis in perimenopausal women. *J Osteoporos* 2013; 2013:853531
- [38] Aree-Ue S, Petlamul M. Osteoporosis knowledge, health beliefs, and preventive behavior: a comparison between younger and older women living in a rural area. *Health Care Women Int* 2013; 34(12): 1051-66. [<http://dx.doi.org/10.1155/2013/853531>] [PMID: 24102035]
- [38] Aree-Ue S, Petlamul M. Osteoporosis knowledge, health beliefs, and preventive behavior: a comparison between younger and older women living in a rural area. *Health Care Women Int* 2013; 34(12): 1051-66. [<http://dx.doi.org/10.1080/07399332.2012.736565>] [PMID: 23477608]

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