HEALTH PROMOTION

Nurses' knowledge, attitude, and practice regarding osteoporosis prevention and its correlation with their nutritional behaviors

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Keywords

Awareness • Belief • Eating habits • Nutritional behaviors • Osteoporosis • Preventive measures

Summary

Background. *Nurses have good opportunities to communicate with osteoporotic patients and the public as well as convey osteoporosis prevention education to them. Therefore, nurses require specific knowledge, attitude, practice (KAP), and desirable nutritional behaviors for osteoporosis prevention and treatment strategies. Little is known about the KAP for osteoporosis prevention and nutritional behaviors among nurses in Iran.*

Purpose. *The present study was conducted to evaluate nurses' KAP and nutritional behaviors for osteoporosis prevention.*

Methods. *This cross-sectional study included 195 nurses working in three hospitals in southeastern Iran. Nurses were selected using a stratified random sampling method between April and June 2020. The data collection tools included questionnaires of KAP and nutritional behaviors to prevent osteoporosis.*

Findings. *According to the findings, nurses' knowledge regarding osteoporosis prevention was high level (20.23 ± 3.79) and their attitude (72.71 ± 6.97), practice (48.25 ± 6.38), and nutritional behavior scores (110.12 ± 13.68) were desirable. In addition, nurses' KAP regarding osteoporosis prevention was correlated with their nutritional behaviors (p = 0.001).*

Conclusions. *Given the high levels of knowledge, desirable practices, and in Iranian nurses regarding the prevention of osteoporosis, they can play a significant role in changing KAP and nutritional behaviors of people to prevent this disease. To this end, educational and support programs should be implemented in clinical and community settings to develop a healthy lifestyle in the community.*

Introduction

Osteoporosis is a metabolic disease characterized by loss of bone density, loss of quality bone structure, and increased risk of fracture [1]. Globally, more than 200 million people have osteoporosis [2] One in three women and one in five men, over the age of 50, experience osteoporotic fractures in their lifetime [3]. In Iran, according to statistics, 22.2% of women and 11% of men over 50 years of age suffer from osteoporosis [4]. Osteoporosis and related fractures can lead to physical disability, decreased self-sufficiency, and increased hospitalization and mortality rates [5]. The number of osteoporotic fractures might rise up to 4.66 million at costs of 5.91 million dollars by 2035 and in total with medical costs of 25.43 billion dollars by 2050 [6].

Although osteoporotic is not curable, it can be largely prevented by optimizing bone density during growth, maintaining bone density in adulthood, and minimizing bone loss in old age [7]. To introduce effective prevention of osteoporosis, the knowledge, attitude, and practice (KAP) theory could be useful. In the KAP theory, the process of changing human behavior is divided into three stages: obtaining knowledge, creating attitudes, and forming behaviors/practices, during which human health-related behaviors can also be changed effectively. The KAP theory enables people to participate in health behaviors and maintain their health actively; therefore, it plays a significant role in the prevention of disease, its control, and rehabilitation [8].

Researchers have emphasized the changes needed regarding the policy on osteoporosis prevention and the need for nurses to completely develop their roles (*e.g.,* clinical specialists, educators, consultants, researchers, collaborators, managers, and innovators). Prevention of osteoporosis is an important priority for all scope and practice nurses. Nurses can identify patients who require participation in continuous therapeutic interventions or rehabilitation programs and develop patient-specific follow-up protocols [9]. Furthermore, it is important for nurses to pinpoint and follow up on lifestyle and risk factors that increase osteoporosis, for example, inadequate nutritional behaviors (*e.g.*, dietary intake that is low in calcium, smoking, and drinking alcohol), low body weight, and lack of regular physical activity and exercise too much [10].

The term "nutritional behaviors" refers to the eating habits that can help prevent osteoporosis [11]. These

behaviors encompass all the planned, spontaneous, or habitual measures taken by individuals or social groups to obtain, prepare, and consume food. While a diet rich in dietary protein, calcium, vitamin D, fruits, and vegetables can significantly promote bone health, higher rates of fracture have been linked to high calorie and alcohol intake [12]. Unfortunately, many people are unaware of the connection between osteoporosis, lifestyle, and nutrition behaviors [7]. Since preventing this disease is a cost-effective achievement, it is important to implement osteoporosis prevention programs. Given the crucial role of healthcare providers in maintaining and promoting community health, the healthcare system should assess and promote the knowledge, attitudes, and practices (KAP) of healthcare providers and their nutritional behaviors before conducting any educational programs on osteoporosis prevention in the community [6].

When nurses are knowledgeable and well-prepared, they are a significant source of health information for their clients [6]. Nurses need sufficient KAP for osteoporosis prevention, risk factors, and nutritional behaviors to perform their teaching role. Lack of proper KAP concerning osteoporosis among nurses may negatively influence their participation in preventative behaviors negatively [6, 13] and ultimately affect the progression and prognosis of osteoporosis in their patients. In this regard, nurses could warmly welcome the opportunity to communicate with osteoporotic patients and provide them with the necessary instructions [14], and present the general public with the primary and secondary prevention trainigns regarding osteoporosis [15].

According to the literature review, some studies in different countries merely investigated nurses' knowledge and awareness of osteoporosis [6, 13-17]. To the best of our knowledge, only one study has evaluated nurses' KAP regarding osteoporosis in India [10]. One study evaluated levels of mastery and use of musculoskeletal assessment skills among Iranian nurses [18] and another evaluated knowledge and attitude regarding national clinical osteoporosis guideline among the nurses in orthopedic wards in Iran [19]. However, we could not find any study on Iranian nurses' knowledge and nutritional behaviors for osteoporosis prevention and its extent to correlation among these variables. Furthermore, as community health nurses and nurse educators in universities, we believe that, given the significant role of nurses in maintaining and promoting health in the community, it is necessary to evaluate nurses' KAP regarding osteoporosis prevention in different societies to obtain comprehensive information. Therefore, the present study aimed to evaluate nurses' KAP and nutritional behaviors for osteoporosis prevention.

METHODS

Study design & settings

This cross-sectional study was conducted in three hospitals (Dr. Gharazi, Imam Reza, and Velayat) affiliated with Sirjan University of Medical Sciences in southeastern Iran in 2020.

Population And Sampling

The study population included all nurses working in the aforementioned hospitals (N = 375). Based on Cochran's formula ($\alpha = 0.05$, $p = 0.5$, $q = 0.5$, $d = 0.06$, $Z = 1.96$), the sample size was 170. Considering about 15% dropout probability, 195 nurses were selected from the hospitals using a stratified random sampling method proportionate to the number of nurses per hospital. Therefore, 85 nurses from Dr. Gharazi Hospital (N = 165), 100 nurses from Imam Reza Hospital (N = 195), and 10 nurses from Velayat Hospital (N = 15) were selected (Fig. 1). The inclusion criteria were nurses with a bachelor's or higher degree, work experience of at least one year, and their consent to participate in this study. Nurses who did not fully answer the questionnaire were excluded from the study [18].

Instruments

Data collection was done using five questionnaires:

1. Demographic Information Questionnaire

This questionnaire included items about the participants' gender, age, marital status, shift work, education level, work experience, position, hospital ward, corticosteroid use, and source of information on osteoporosis prevention.

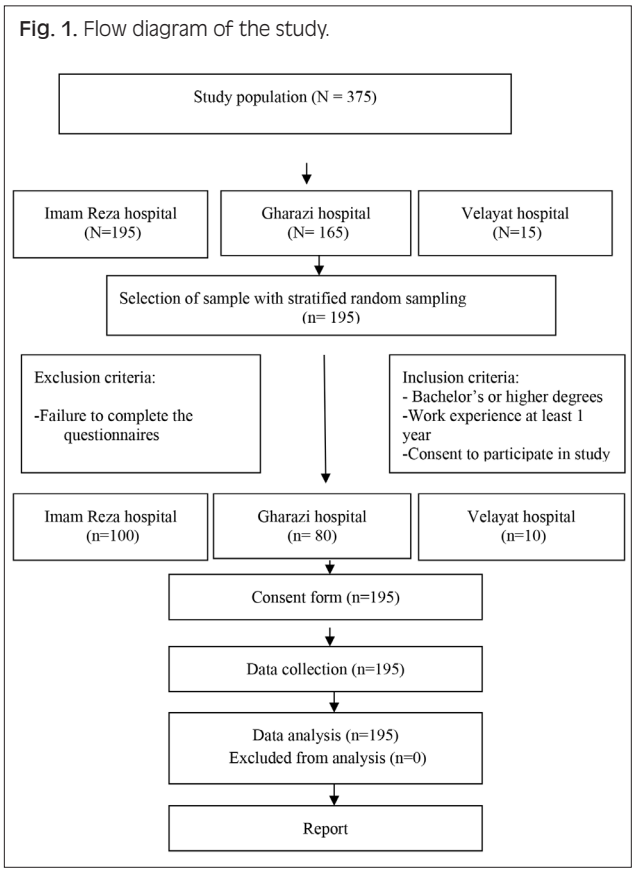

Fig. 1. Flow diagram of the study.

2. Osteoporosis Prevention Knowledge Questionnaire

This questionnaire designed and validated in Iran by Forouzi et al. [20] with 30 items. Each item has a response option of "True", "False", and "Do not know". Correct answers received one score, while incorrect answers and I don't know received zero scores. The minimum score was zero and maximum score was 30. According to the designers of the questionnaire, scores of 20-30 showed high levels of knowledge, scores within the range of 10-20 indicated moderate levels of knowledge, and scores of less than 10 represented low levels of knowledge. The content validity of the questionnaire was confirmed by a panel of experts consisting of 10 nursing professionals. The calculated content validity index (CVI) was 0.88. Test-retest ($r = 0.85$) and internal consistency ($\alpha = 0.74$) were also conducted by its designers to determine the reliability of the questionnaire [21].

3. Attitude Toward Prevention of Osteoporosis Questionnaire

This questionnaire was designed by Forouzi et al. [20] and has 18 items on a five-point Likert scale. Positive items (1, 4, 6, 7, 10, 12, 13, 15, 16, and 17) were scored as follows: strongly agree (5), agree (4), no idea (3), disagree (2), and strongly disagree (1). However, negative items were scored in reverse. The minimum score on this questionnaire was 18, and the maximum score was 90. According to the designers of this questionnaire, scores higher than 66 indicate a desirable level of attitude, scores within the range of 42-66 indicate somewhat desirable attitudes, and scores lower than 42 indicate undesirable attitudes. The content validity method and a panel of experts (10 nursing faculty members) were used to determine the validity of the questionnaire. The calculated content validity index (CVI) was 0.86. Test-retest ($r = 0.56$) and internal consistency ($\alpha = 0.66$) were also conducted by its designers to determine the reliability of the questionnaire [21].

4. Practice for Prevention of Osteoporosis Questionnaire

This questionnaire was developed in Iran by Forouzi et al. [21], and contains 23 items. Items with correct practices (1, 2, 4, 6, 7, 8, 11, 13, 15, 16, 18) were scored in the following way: always/often (score 3), sometimes (score 2), rarely/ never (score 1), while items with incorrect practices were scored in reverse. The minimum score on this questionnaire was 23, and the maximum score was 69. According to these designers, scores within the range of 46-69, 23-46, and lower than 23 indicate desirable, somewhat, and undesirable levels of practice, respectively. The questionnaire's validity was confirmed using the content validity method and opinions of 10 nursing faculty members, and its CVI was 0.86. Its reliability was corroborated by the internal consistency method ($\alpha = 0.74$) [21].

5. Nutritional Behaviors for Prevention of Osteoporosis Questionnaire

This questionnaire was prepared by Seyedabadi et al. (2016) [22] for the assessment of eating habits to prevent osteoporosis, such as adequate dietary protein, calcium, vitamin D, fruits, and vegetables, intake of appropriate calories, and alcohol consumption. The questionnaire consists of 29 items. Positive items (1, 2, 3, 4, 5, 6, 7, 16, 17, 18, 19, 20, 21, 23, and 24) were scored as strongly agree (score 5), agree (score 4), no idea (score 3), disagree (score 2), and strongly disagree (score 1), whereas negative items were scored in reverse. The minimum score on this questionnaire was 29, and the maximum score was 145. Scores higher than 107 indicated desirable nutritional behavior, scores within the range of 68-107 indicate somewhat desirable, and scores lower than 68 indicated undesirable nutritional behavior. The content validity of the questionnaire was confirmed using the opinions of ten nursing faculty members and its validity index was 0.88, and its reliability were determined using the internal consistency method ($\alpha = 0.91$).

Data collection procedure

Data were collected using an anonymous self-report questionnaire from April to June 2020. To collect data, the first researcher referred to the study settings in different shift works, distributed the questionnaires among eligible participants, and explained the study aims. She also explained how the nurses filled out the questionnaires. To achieve the highest response rate, the researcher spent a lot of time collecting data and arranged a date to deliver the completed questionnaires. She sent reminders via WhatsApp or a phone to collect the completed questionnaires at the arranged time. All the completed questionnaires were anonymous and confidential.

Data Analysis

Data were analyzed using SPSS 21 using descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential (independent-samples *t*-test, analysis of variance, Tukey's test, Pearson's correlation coefficient, and multivariate linear regression) statistics. The Kolmogorov-Smirnov test showed that the data followed a normal distribution. The significance level was set at $p < 0.05$.

Results

All 195 nurses completed the survey (response rate: 100%). The results revealed that the majority of the nurses were female (74.4%), aged 31-40 (47.2%), married (77.4%), permanently hired (68.2%), had less than 10 years of work experience (43.1%), and had a bachelor's degree (82.6%). Furthermore, 68.7% of them obtained information about osteoporosis prevention from the mass media (Tab. I).

The total score of nurses' attitudes was also at a desirable

Tab. I. Nurses' demographic information, and its relationship with knowledge, attitude, practice regarding osteoporosis prevention, and nutritional behaviors.

Variables	N (%)	Knowledge		Attitude		Practice		Nutritional behaviors	
		Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)
Gender									
Female	145 (74.4)	20.45 (3.69)	t = 1.36 (0.07)	72.81 (7.25)	t = 0.34 (0.73)	49.14 (6.36)	**t = 3.41 (0.001)***	111.42 (13.98)	**t = 2.27 (0.02)***
Male	50 (25.6)	19.60 (4.05)		72.40 (6.14)		45.66 (5.76)		106.36 (12.13)	
Work experience									
< 10 years	84 (43.1)	19.42 (4.04)	**F = 4.32 (0.02)***	72.51 (6.62)	F = 0.66 (0.51)	47.65 (6.32)	F = 1.22 (0.29)	107.45 (14.05)	F = 2.89 (0.058)
10-20 years	74 (37.9)	20.50 (3.33)		72.35 (6.66)		48.24 (6.41)		119.91 (12.90)	
20-30 years	37 (19)	21.51 (3.77)		73.89 (8.57)		49.62 (6.40)		112.59 (13.64)	
Age groups									
20-30 years	38 (19.5)	20.02 (3.88)	F = 2.75 (0.66)	72.73 (6.58)	F = 0.29 (0.74)	47.78 (5.86)	F = 0.78 (0.45)	108.50 (11.72)	F = 0.43 (0.64)
31-40 years	92 (47.2)	19.69 (4.04)		72.34 (7.13)		47.86 (6.47)		110.08 (14.39)	
41-50 years	65 (33.3)	21.10 (3.24)		73.21 (7.02)		49.06 (6.57)		111.12 (13.82)	
Type of employment									
Hired (permanent)	133 (68.2)	20.53 (3.83)	F = 1.21 (0.30)	73.36 (7.34)	F = 3.76 (0.38)	48.21 (6.32)	F = 1.31 (0.33)	111.49 (14.43)	F = 1.10 (0.35)
Hired (experimental)[a]	15 (7.7)	19.66 (4.54)		70.33 (7.28)		49.33 (6.48)		107.53 (9.94)	
Contract recruiters[b]	16 (8.2)	18.68 (3.60)		71.43 (5.66)		48.18 (7.79)		108.93 (13.91)	
Contract recruiters[c]	15 (7.7)	20.40 (2.64)		71 (5.74)		50.13 (7.08)		105.06 (11)	
Committed[d]	16 (8.2)	19.50 (3.70)		72.37 (5.20)		45.87 (4.08)		107.06 (11.39)	
Education degree									
Bachelor's	161 (82.6)	20.24 (3.65)	t = 0.009 (0.92)	72.30 (7.07)	t = 3.20 (0.07)	48.58 (6.27)	t = 2.52 (0.11)	110.09 (13.48)	t = 0.003 (0.95)
Master's	34 (17.4)	20.17 (4.45)		74.64 (6.20)		46.67 (6.77)		110.23 (14.80)	
Shift work									
Fixed	27 (13.8)	21.70 (3.78)	**t = 2.18 (0.03)***	73.25 (6.02)	t = 0.43 (0.66)	49.59 (5.79)	t = 1.15 (0.25)	111.85 (13.50)	t = 67 (0.50)
Rotational	168 (86.1)	19.99 (3.76)		72.62 (7.14)		48.06 (6.47)		109.94 (13.71)	
Position									
Head nurse	17 (8.7)	22.05 (3.28)	**F = 2.67 (0.03)***	73.70 (5.34)	**F = 2.68 (0.03)***	50.11 (6.81)	F = 1.89 (0.11)	113.82 (13.64)	**F = 4.25 (0.03)***
Nurse	165 (84.7)	19.94 (3.76)		72.18 (6.81)		47.85 (6.36)		108.88 (13.18)	
Nurse manager	13 (6.6)	22 (3.88)		79 (7.45)		52.50 (5.93)		120.30 (16.39)	
Marital status									
Single	44 (22.6)	19.75 (3.95)	t = -0.95 (0.34)	72.90 (6.28)	t = 0.21 (0.83)	46.88 (6.05)	t = -1.61 (0.10)	105.88 (12.08)	t = -2.36 (0.02)*
Married	151 (77.4)	20.37 (3.75)		72.65 (7.17)		48.64 (6.44)		111.35 (13.91)	

▶

Tab. I (*follows*). Nurses' demographic information, and its relationship with knowledge, attitude, practice regarding osteoporosis prevention, and nutritional behaviors.

Variables	N (%)	Knowledge		Attitude		Practice		Nutritional behaviors	
		Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)	Mean (SD)	Statistic test (*p*-value)
Workplace section									
Medical and surgical	108 (55.5)	19.76 (4.08)	F = 0.946 (0.46)	71.80 (5.86)	F = 1.37 (0.21)	46.88 (6.10)	F = 1.02 (0.41)	111.2 (13.90)	F = 1.97 (0.06)
Emergency and operating room	58 (29.8)	20.08 (3.75)		72.40 (8.03)		47.81 (6.16)		106.83 (13.76)	
Critical care	29 (14.9)	21.66 (3.17)		73.81 (5.75)		50.69 (6.89)		110.87 (9.54)	
Corticosteroids use									
Yes	28 (14.4)	20.75 (4.23)	t = -0.77 (0.43)	72.89 (6.26)	t = 0.14 (0.83)	46.14 (5.30)	t = -1.90 (0.059)	109.87 (15.81)	t = -0.14 (0.88)
No	167 (85.6)	20.14 (3.72)		72.68 (7.09)		48.60 (6.49)		110.17 (13.34)	
Information source									
Mass media	134 (68.7)	20.26 (3.83)	F = 0.160 (0.87)	72.96 (7.45)	F = 0.74 (0.460)	47.68 (5.99)	F = 1.53 (0.12)	109.75 (14.06)	F = 1.60 (0.17)
Books	99 (50.8)	20.32 (4.01)		73.23 (7.07)		48.16 (6.89)		110.90 (14.35)	
Official and ducational programs	107 (54.9)	19.50 (3.69)		73.59 (6.99)		45.60 (5.76)		108.49 (13.47)	
Magazines/newspapers	25 (12.8)	21 (2.84)		74.08 (8.54)		50.36 (7.51)		113.76 (14.75)	
Friends/ relatives	59 (30.3)	20.18 (3.87)		72.45 (7.57)		48.23 (4.99)		111.01 (14.43)	
Medical staff	121 (62.1)	20.12 (3.67)		73.12 (7.21)		47.59 (5.64)		111.11 (13.30)	
Others	6 (3.1)	21 (4.38)		71.66 (5.50)		52.16 (3.86)		116.33 (19.86)	

* Bold p-values are significant at level of ≤ 0.05. [a] They are hired as pilot or testable nurses for two years and then hired permanently. [b] Annually contracted with payment similar to hired nurses. [c] Annually contracted with payment less than hired nurses. [d] It is obligatory to work for government for two years at a lower rate of pay.

level (72.71 ± 6.97; range, 18-90), so that 81% of the nurses had desirable attitudes. Nurses' highest attitude scores were related to item of "osteoporosis prevention is easier than cure," while their lowest attitude scores were related to item of "financial problems are a major obstacle to osteoporosis prevention".

The total score of nurses' practice was at a desirable level (48.25 ± 6.38; range, 23-69) and 57.4% of them had high practice scores. The highest and lowest practice scores of nurses were related to "intense and heavy physical activity" and weight gain, respectively. In addition, the total score of nurses' nutritional behaviors was at a desirable level (110.12 ± 13.68; range, 29-145) and 57.4% of them obtained desirable scores in nutritional behaviors for the prevention of osteoporosis. Nurses' highest nutritional behavior score was attributed to items of "I do my best to include calcium-rich food such as milk, yogurt, vegetables, fish, *etc.* in my diet," while their lowest nutritional behavior score was for item of "a calcium-rich diet to prevent osteoporosis is expensive" (Tab. II).

Moreover, table I shows a significant difference in

Tab. II. Description of nurses' knowledge, attitude, practice and nutritional behaviors regarding osteoporosis prevention.

Variables	Category	N	%	Mean ± SD
Knowledge	Low	2	1	20.33 ± 3.79
	Moderate	86	44.1	
	High	107	54.9	
Attitude	Somewhat desirable	37	19	72.71 ± 6.97
	Desirable	158	81	
Practice	Somewhat desirable	83	42.6	48.25 ± 6.38
	Desirable	112	57.4	
Nutritional behaviors	Somewhat desirable	83	42.6	110.12 ± 13.68
	Desirable	112	57.4	

Tab. III. Correlation between nurses' knowledge, attitude, practice, and nutritional behaviors.

Variables	Nutritional behaviors	
	Pearson coefficient	p-value
Knowledge	0.40	0.001*
Attitude	0.40	0.001*
Practice	0.44	0.001*

*Bold p-values are significant at level of ≤ 0.05

nurses' knowledge scores based on their job position (F = 2.67, p = 0.03), shift work (t = 2.18, p = 0.03), and work experience (F = 4.32, p = 0.02). Nurses with fixed shifts and job positions had higher knowledge scores. Tukey's test indicated a significant difference in work experience between nurses who had 10-20 and 21-30 years of work experience.

Attitude scores were significantly different based on the job position of nurses (F = 2.68, p = 0.03), such that nurse managers had higher attitude scores. Regarding practice scores, a significant difference was found with regard to nurses' gender (t = 3.41, p = 0.001), with women receiving higher scores in terms of practice. A significant difference was also found in nutritional behaviors based on gender, (t = 2.27, p = 0.02), job position (F = 4.25, p = 0.03), and marital status (t = -2.36, p = 0.02). Therefore, nurse managers and married nurses exhibited higher nutritional behaviors (Tab. I).

The Pearson correlation test showed that nurses' knowledge (r = 0.40, p = 0.001), attitude (r = 0.4, p = 0.001), and practice (r = 0.44, p = 0.001) had a direct and moderate correlation with their nutritional behaviors regarding the prevention of osteoporosis (Tab. III).

In addition, to verify and control the effect of demographic variables on the correlations, the multivariate linear regression was conducted. The results showed that knowledge (β = 0.2, p = 0.002), attitude (β = 0.3, p <0.001), and practice (β=0.37, p <0.001) related to osteoporosis prevention were the significant predictors for nutritional behaviors. Moreover, demographic variables were not significant predictors of nutritional behaviors in nurses (Tab. IV).

Discussion

Based on the findings, nurses' knowledge regarding the prevention of osteoporosis was at a high level, and their attitudes, practices, and nutritional behaviors were at desirable levels. Furthermore, nurses' KAP scores were directly correlated with their nutritional behaviors for the prevention of osteoporosis. In about section results of KAP regarding prevention of osteoporosis, two studies showed high scores of knowledge about prevention of osteoporosis among the nurses [14, 23]. However, some studies have shown that orthopedic nurses have inadequate knowledge (6, 16) and inadequate knowledge and attitudes toward osteoporosis guidelines [19]. One study also showed that nurses' levels of mastery and use of musculoskeletal assessment skills were not satisfactory [18]. Ramli et al. (2018) reported that the allied health sciences students had moderate level of knowledge and attitude but poor practice regarding osteoporosis [24]. One study focused on the KAP of nurses and general medical practitioners regarding osteoporosis. The results showed that KAP towards osteoporosis were not sufficient in participants, and nurses had lower KAP scores compared with general medical practitioners [10]. These studies explained that although the education of healthcare professionals has improved in recent years, more plans are needed to empower nurses. Therefore, the use of motivational/practical training methods, revision, and changes in nursing curricula are necessary.

Our findings show that nurses had desirable nutritional behaviors to prevent osteoporosis. In agreement with our study, a study showed that most of nurses stated they had improved nutritional behaviors, had increased calcium and milk/dairy intake in their diet and had changed their lifestyle and diets to "eat healthily" for the prevention of osteoporosis [13]. On the contrary, a study showed that a large number of nursing students reported unhealthy habits, such as coffee drinking, low milk drinking, and lack of exercise. Most of them have vitamin D and calcium deficiencies and excessive cholesterol and sodium intake [19]. Park et al. (2015) showed that despite their high levels of knowledge regarding the effects

Tab. IV. Multivariate regression model of knowledge, attitude, practice, gender, work experience, position, shift work, marital status and nutritional behaviors.

Variables	β	t	p-value	95% CI	
				lower	upper
Knowledge	0.20	3.07	0.002*	0.25	1.16
Attitude	0.30	4.82	<0.001*	0.35	0.83
Practice	0.37	5.90	<0.001*	0.52	1.05
Gender	-0.04	-0.74	0.46	-5.01	2.28
Work experience	-0.06	-0.73	0.46	-0.41	0.18
Shift work	-0.01	-0.23	0.81	-6.74	5.30
Position	0.05	0.72	0.47	-1.89	4.09
Marital status	0.11	1.61	0.10	-0.84	8.41

*Bold ***p***-values are significant at level of ≤ 0.05

of diet and healthy behaviors on bone health, most nursing students had unhealthy behaviors and poor eating habits [25].

The results showed that nurses' KAP had a direct and significant correlation with their nutritional behaviors regarding the prevention of osteoporosis. Similar to the present study, several studies on healthcare providers, including nurses and nursing students, have confirmed our results [10, 13, 26-29]. Chan et al. (2021), in a systematic review, revealed the correlation between KAP, lifestyle, and dietary habits among adolescents and young adults. The lack of awareness and misconceptions about osteoporosis led to poor practices, low perceived susceptibility, and seriousness of osteoporosis. Non-compliance with osteoporosis prevention recommendations may be due to the misconception that the younger generation is not prone to osteoporosis. To improve the practice of osteoporosis prevention, people must consider the susceptibility and severity of the disease. Nurses can influence individuals' beliefs to improve their knowledge and practices by planning educational interventions that are suitable for the younger generation [7].

In the present study, the nurses' KAP scores had significant differences based on some demographic variables, including work experience, shift work, job positions, gender, and marital status. However, none of these demographic variables were found to be significant predictors of nutritional behaviors amog nurses. These findings were confirmed by previous studies that have reported differences in KAP regarding osteoporosis prevention based on some academic and demographic information such as age, gender, and university major [6, 24, 27, 30]. We recommend further studies to assess the different determinants (individual, familial, and social) of KAP and nutritional behaviors regarding osteoporosis prevention.

Overall, our results may be fairly similar to or different from those of the aforementioned studies. However, the differences between some of our results and the studies are likely attributable to the differences in design and setting, sampling method, data collection tools, and diversity of the study population in terms of gender, age, socioeconomic status, educational backgrounds, subjective norms, culture of societies, conditions of the healthcare system, and nurses' job status. Our study suggests that nurses are professionally responsible for clients' positive health outcomes (individual, family, community, and population). Due to equipping nurses with high KAP and nutritional behaviors in preventing osteoporosis, they are in a good position to encourage clients in this case. The strategies for the involvement of clients' behaviors in preventing osteoporosis should be based on the conditions of each community.

Limitation and strength

Considering the limitations of this study, data were collected from nurses working in three hospitals in a city in southeastern Iran. Therefore, these participants might not be representative of all Iranian nurses, and the generalization of the findings should be made with caution. The self-report nature of the administered questionnaires can be considered another limitation of the present study, since participants' responses may be subject to memory failures or other personal issues. Moreover, we used questionnaires originally developed for assessing KAP and nutritional behaviors that were not subscales among non-health professional populations and not among nurses. Therefore, we recommend multicenter studies with specific instruments for nurses to obtain more objective results. Given the strength of the present study, this is the first study in Iran to evaluate the kap and nutritional behaviors of nurses regarding the prevention of osteoporosis.

Conclusions

The findings showed that Iranian nurses had high levels of knowledge and desirable attitudes, practices, and nutritional behaviors related to osteoporosis prevention. Moreover, the nurses' KAP scores were directly correlated with their nutritional behaviors. Nurses play a key role in influencing public attitudes, enhancing knowledge, promoting healthy practice and nutritional behaviors, and identifying risk factors in patients to prevent osteoporosis. They can help their clients adopt health-promoting lifestyles, engage in osteoporosis prevention behaviors, and make health decisions. In the future, nursing researchers should conduct more studies on the level of KAP and nutritional behaviors of different groups, especially vulnerable groups who are prone to osteoporosis and provide valuable interventions to promote preventive behaviors.

Ethical Approval

This paper was derived from a thesis on nursing for a master's degree (project code. 96001083) and was approved by the Ethics Committee of Kerman University of Medical Sciences (code of ethics No. IR.Kmu.REC.1396.2479). At the request of the Ethical Committee, the study was conducted in accordance with the Declaration of Helsinki and Ethics Publication on Committee (COPE). No ethical issues were involved in the study or in data collection. The study was conducted after receiving the required permissions from the authorities of the hospitals under study. Informed consent forms were obtained from all participants.

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Conflict of interest statement

The authors declare that they have no competing interests.

Authors' contributions

AEM, GF, MM and JF conceived and designed the study. The data were collected, analyzed, and interpreted by AEM. GF, MM, and JF contributed equally to writing and revising the manuscript and approved the final manuscript.

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