RHEUMATOLOGY RESEARCH JOURNAL

Vol. 8, No. 2, April 2023
Webpage: http://rheumres.org
Email: rheumres@gmail.com
ISSN:2476-5856
doi: 10.32592/RR.2023.8.2.71

Original Article **Open Access**

Osteoporosis knowledge, attitude and practice among nurses in Rafsanjan, 2020

Mitra Abbasi Fard[1], Amir Mohammad Torabzadeh[2], Zahra Kamiab[3*]

[1]Assisstant professor, Dept of Internal Medicine, School of Medicine; Clinical Research Development Unit, Ali-Ibn Abi-Talib Hospital, Rafsanjan University of Medical Sciences, Rafsanjan, Iran[2]General physician, Clinical Research Development Unit, Ali-Ibn Abi-Talib Hospital, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. [3]Assistant professor, Dept of community Medicine, School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran.

Because osteoporosis is largely preventable and an essential principle in preventing this condition is the way of thinking, lifestyle, and daily habits of people, the current study aimed to determine the knowledge, attitude, and practice of nurses at Rafsanjan University of Medical Sciences regarding osteoporosis. The population of this descriptive study comprised 418 nurses at Ali-Ibn Abi-Talib Hospital in Rafsanjan by census in 2021. The data collection tool was a valid questionnaire that was completed through self-reporting. Data were entered into SPSS software version 24 and analyzed using the chi-square, independent t-test, and one-way analysis of variance tests. The mean age of participants was 34.15 ± 7.28 years, and the mean work experience was 9.36 ± 7.46 years. Of the 418 subjects, 214 (51.2%) were female, and 204 (48.8%) were male. The mean score in the field of knowledge was 20.84 (out of 28 points), in the field of attitude was 18.70 (out of 22 points), and in the field of practice was 9.32 (out of 18 points). The mean scores of knowledge (P = 0.001), attitude (P = 0.015), and practice ($p < 0.001$) of nurses were significant according to different age groups. Women obtained higher mean scores for knowledge than men ($p < 0.001$), but men achieved higher mean score for practice than women ($p < 0.001$). The current finding indicate that nurses' knowledge and attitude towards osteoporosis in Rafsanjan are optimal. Nonetheless, their practice of preventing this disease is weak and requires influential factors.

Keywords: Osteoporosis; Knowledge; Attitude; Practice; Nurse

Introduction

Osteoporosis is a metabolic disease characterized by diminished density and loss of microstructure quality in bone [1]. An estimated 75 million people in Europe, Japan, and the United States suffer from this disease [2]. In 2014, more than 10 million Americans had osteoporosis, and 34 million suffered from bone loss [3]. Osteoporosis in Iran has been estimated at 17% in women, 12% in men, and 19% in postmenopausal women. In addition, around 2 million people in Iran are at risk of fractures resulting from osteoporosis [4]. According to previous studies, about 80 factors causing osteoporosis have been found, 50% of which significantly affect the disease [5]. Gender, skeleton size, alcohol consumption, caffeine, and tobacco consumption, reduced estrogen, premature menopause (before the age of 45), reduced calcium intake, and a lack of physical activity are the main factors

*Corresponding Author: Zahra Kamiab, Assistant professor, Dept of community Medicine, School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran. E-mail: dr.kamiab89@gmail.com

Received: 14 February 2023; **Accepted:** 17 March 2023

contributing to this disease. In addition, familial history of fracture, history of glucocorticoid use for more than six months, hereditary diseases, Cushing syndrome, hyperthyroidism, and malabsorption syndrome are secondary causes of osteoporosis [6–8].

As prevention is of higher priority than treatment, the necessity of preventing osteoporosis is obvious. Preventive strategies against osteoporosis include maximizing bone mass and minimizing bone density reduction through healthcare education and health promotion programs [9, 10]. It has been estimated that 20% to 50% of changes in bone density are adjustable, as they are related to lifestyle [11].

To prevent diseases, people's attitudes, level of knowledge, lifestyle, and daily habits should be identified and studied to enhance their quality and efficiency [3]. Health care personnel and the general public have reported a need for knowledge of osteoporosis, its risk factors and preventive measures [12]. While osteoporosis is known as a preventable disease with modifiable risk factors, the results of a review study indicated that in five major European countries and Sweden, 2.6 million disability adjusted life years are attributed to bone fractures, and the cost related to fractures has increased from 29.6 euros in 2010 to 37.5 euros in 2017 [13]. Thus, healthcare specialists, especially nurses, are in a suitable position to increase the knowledge of patients and the public, thereby reducing the cost burden of osteoporosis [14, 15]. Previous research has shown that healthcare specialists need more knowledge about osteoporosis [16, 17]. Furthermore, a study in Taiwan showed that the level of knowledge about osteoporosis, especially the symptoms, risk factors, diagnosis, treatment, was low, and only 13% of nurses had participated in educational classes about this disease [18]. Research has shown that over the past few decades, the trend of preventive behaviors for osteoporosis, such as performing physical activity, consuming dairy products, etc., has had a downward trend [19]. Considering the debilitating complications of osteoporosis and the critical role nurses play as the central link of a multidisciplinary approach chain in preventing and treating osteoporosis as well as enhancing the lifestyle of patients with this preventable disease, this study was designed and implemented to investigate the level of knowledge, attitude, and practice of nurses at Ali-Ibn Abi-Talib hospital in Rafsanjan about osteoporosis.

Materials and Method

In this descriptive study, all nursing personnel of Ali-Ibn Abi-Talib Hospital in Rafsanjan, a total of 418 individuals, were included in the census sampling. Data about knowledge, attitude, and practice was collected through a questionnaire designed by Monshadi et al. The questionnaire has 34 items. The first section includes 14 items related to knowledge about osteoporosis, each with ‘yes, no, don’t know’ answer options, whereby the correct answer is scored two points, ‘don’t know’ 1 point, and the wrong answer 0 points (range: 0-28). The second section of the questionnaire includes 11 items related to attitudes about osteoporosis, again with ‘yes, no, and don’t know’ answer options. The scoring of the responses is similar to that of part one (range: 0–22). The third and final section of the questionnaire includes nine items with yes and no answers for measuring the practice of the examined population. Correct practice is scored two points, and wrong answers are scored zero points (range: 0–18). A higher score in each section indicates excellent knowledge, attitude, and practice. The reliability and validity of this questionnaire have been confirmed in the study by Monshadi et al. (Cronbach's α for knowledge, attitude and performance are equal to 83, 76 and 84%, respectively.) [20]. The study was approved by the local ethics committee with the code IR.RUMS.REC.1399.060. After referring to the nursing office and receiving permission, the researcher visited different wards of Ali-Ibn Abi-Talib Hospital and explained the research objectives to all nurses on different shifts. Written informed consent was obtained from all participants. Then, information regarding each participant’s age, gender, place of residence, marital status, education, economic status, history of osteoporosis, ward of service (internal medicine, surgery, pediatrics, emergency, obstetrics and gynecology, subspecialty wards and Intensive Care Unit), year of graduation, and work history was collected using a questionnair and a researcher-made checklist.

Data were entered into SPSS 20 and analyzed through chisquare, independent t-test, and one-way analysis of variance tests. The significance level was considered to be 0.05.

Results

The results indicated that participants had a mean age of 34.15 ± 7.28 years and a mean work history of 9.36 ± 7.46 years. Most participants in this study were female, city residents, and had a Bachelor of Science degree. Participants reported a higher frequency of work in internal medicine and emergency wards, and most of them had an average economic status (Table1).

Table 1. Demographic characteristics of the participants in this study (n = 418)

Variable	Group	No.	Percentage
Gender	Male	204	48.8
	Female	214	51.2
Place of residence	Urban	369	88.3
	Rural	49	11.7
Marital status	Single	137	32.8
	Married	263	62.9
	Divorced	18	4.3
Level of education	Diploma	18	4.3
	BSc. (Bachelor of Science)	306	73.2
	MSc.(Master of Science)	64	15.3
	PhD (Doctor of philosophy)	30	7.2
Economic status	Poor	45	10.8
	Average	338	80.9
	Good	35	8.4
History of osteoporosis	Yes	63	15.1
	No	355	84.9
Ward	Internal medicine	95	22.7
	Pediatrics	50	12.0
	Surgery	56	13.4
	Emergency	80	19.2
	Other	137	32.7
Year of graduation	1991-1996	41	9.8
	1997-2001	61	14.6
	2002-2006	48	11.5
	2007-2011	92	22.0
	2012-2016	27	6.5
	2017-2020	149	35.6

The mean scores for knowledge, attitude, and practice regarding osteoporosis were 20.84 ± 3.46, 18.3 ± 2.46, and 20.84 ± 3.46, respectively (Table 2).

Table 2. Investigating the status of awareness, attitude, and performance of the participants about osteoporosis (n = 418)

Variable	Mean ± SD	Min-Max	Median (first quartile – third quartile)
Knowledge	20.84 ± 3.46	10-26	(19-23) 21
Attitude	18.70 ± 2.62	11-22	(16-20) 20
practice	9.32 ± 2.71	4-18	(8-12) 10

Independent t-test results indicated that the mean scores of knowledge, attitude, and practice of nurses were significant in terms of gender, place of residence, and history of osteoporosis. Female participants had a higher mean knowledge score than males, but males had a significantly higher

mean score for practice. Furthermore, the mean practice score was significantly higher in urban areas than in rural areas and significantly higher in participants with a positive history of osteoporosis.

Based on the one-way ANOVA and Scheffe post hoc test results, the mean knowledge score was higher in the subgroup of obstetrics and gynecology wards and significantly lower in the surgical and internal medicine wards than in other wards. The mean attitude score was significantly higher in the obstetrics/gynecology and pediatrics wards than in other wards. The mean practice score was significantly higher in internal medicine and surgery than in other wards. The subgroups of graduates before 1996 and after 2017 had significantly higher mean practice scores than the other groups. The mean practice score was significantly lower in the subgroups of 6–10, 11–15, and 16–20 years of work experience compared to other groups. Nevertheless, knowledge, attitude, and practice had significantly higher mean scores in the bachelor's, Ph.D., and diploma groups, respectively, compared to other groups. Moreover, the mean scores of knowledge, attitude, and practice were significantly higher among single nurses compared to other groups and in those with a good economic status compared to those with a weak or average economic status. Correlation analysis revealed a positive and significant correlation between knowledge and attitude ($r = 0.504$; $P = 0.001$) and practice ($r = -0.346$; $P = 0.001$) as well as between attitude and practice ($r = 0.277$; $P = 0.001$)

Table 3. Comparing the knowledge, attitude, and practice in terms of the examined variables (n = 418)

Variable		knowledge	Attitude	Practice
Age groups (year)		Mean ± SD	Mean ± SD	Mean ± SD
	< 25 (n = 38)	22.0 ± 3.88	19.17 ± 2.10	9.05 ± 3 .31
	25-30 (n = 132)	21.23 ± 3.63	18.52 ± 2.33	10.18 ± 2.82
	31-35 (n = 61)	*18.66 ± 4.10	18.20 ± 2.62	9.18 ± 2.20
	36-40 (n = 102)	21.05 ± 3.17	18.42 ± 3.18	8.78 ± 2.11
	41-45 (n = 61)	21.10 ± 3.21	19.16 ± 2.50	8.23 ± 2 .90
	> 45 (n = 24)	20.92 ± 3.53	19.96 ± 2.83	10.33 ± 2.48
P-value*		< 0.001	0.015	< 0.001
Ward of service	Internal medicine (n = 95)	19.55 ± 2.73	18.48 ± 2.65	10.29 ± 2.4
	Pediatrics (n = 50)	21.34 ± 2.98	19.10 ± 1.92	10.24 ± 2.64
	Surgery (n = 56)	19.42 ± 3.06	17.45 ± 2.80	8.99 ± 2.23
	Emergency (n = 80)	21.65 ± 2.12	18.45 ± 2.15	9.96 ± 1.94
	Obstetrics/gynecology wards (n=67)	22.64 ± 2.54	19.75 ± 2.06	8.77 ± 2.45
	Subspecialty wards and Intensive Care Unit (n=70)	21.38 ± 2.11	18.84 ± 2.78	8.36 ± 2.02
P-value*		<0.001	< 0.001	< 0.001
Working background (year)	1- 5 (n = 172)	20.94 ± 3.39	18.63 ± 2.33	10.15 ± 2.96
	6-10 (n = 72)	20.96 ± 3.36	18.81± 2.47	8.86 ± 2.17
	11-15 (n = 91)	20.38 ± 2.93	17.03 ± 3.02	8.75 ± 2.12
	16-20 (n = 43)	21.33 ± 3.17	19.74 ± 2.90	7.21 ± 2.40
	> 20	20.78 ± 3.38	19.23 ± 2.43	10.10 ± 2.31
P-value		0.619	0.005	< 0.001
Level of education	Diploma (n = 18))	19.72 ± 3.75	18.11 ± 1.84	11.78 ± 2.65
	BSc (n = 306)	21.16 ± 3.09	18.55 ± 2.52	9.18 ± 2.82
	MSc (n = 64)	19.78 ± 3.87	18.84 ± 2.31	9.06 ± 2.05
	PhD (n = 30)	21.53 ± 2.90	20.33 ± 1.73	9.73 ± 2.86
P-value*		0.012	0.003	0.001
Economic status	Good (n = 35)	21.49 ± 2.98	20.69 ± 1.18	8.93 ± 2.24
	Average (n = 338)	20.89 ± 3.37	18.53 ± 2.70	9.32 ± 2.79
	Poor (n = 45)	19.57 ± 4.56	17.77 ± 1.93	9.77 ± 2.51
P-value*		0.041	< 0.001	0.391

Year of graduation	1991-1996	20.17 ± 2.78	19.59 ± 2.25	9.89 ± 2.32
	1997-2001	21.07 ± 3.57	18.43±3.42	8.0 ± 2.56
	2002-2006	21.21 ± 2.75	18.33 ± 2.65	8.0 ± 1.89
	2007-2011	20.98 ± 3.93	18.90 ± 2.60	8.98 ± 2.19
	2012-2016	20.33 ± 4.25	19.04 ± 2.65	8.96 ± 2.79
	2017-2020	20.83 ± 3.55	18.50 ± 2.29	10.42 ± 2.92
P-value*		0.692	0.149	< 0.001
Gender	Male (n = 204)	20.13 ± 3.50	18.48 ± 2.75	10.01 ± 2.52
	Female (n = 214)	21.52 ± 2.69	18.91 ± 2.48	8.65±2.73
P-value**		< 0.001	0.093	< 0.001
Place of residence	Urban (n =369)	20.73 ± 3.53	18.73 ± 2.62	9.43 ± 2.74
	Rural (n = 49)	21.73 ± 2.73	18.47 ± 2.65	8.49 ± 2.33
P-value**		0.055	0.511	0.023
Marital status	Single (n = 137)	20.12 ± 4.27	17.77 ± 2.34	10.55 ± 3.02
	Married (n = 263)	21.21 ± 3.02	19.13 ± 2.71	8.67 ± 2.39
	Divorced (n = 18)	21.17 ± 3.49	19.61 ± 2.92	9.13 ± 2.97
P-value*		0.011	< 0.001	< 0.001
History of osteoporosis	Yes (n = 63)	17.05 ± 4.45	16.63 ± 2.95	10.38 ± 2.30
	No (n = 355)	21.52 ± 2.76	19.07 ± 2.38	9.13 ± 2.74
P-value**		< 0.001	< 0.001	< 0.001

*One way ANOVA
**Independent T Test

Discussion

Conducted in 2020, the current study investigated the level of knowledge, attitude, and practice of Rafsanjan University of Medical Sciences nursing personnel regarding osteoporosis. The results showed that the nurses' knowledge and attitude about osteoporosis in Rafsanjan City were desirable. Nonetheless, their practice in preventing this disease could have been better. Berarducci et al. reported the level of knowledge of MSc. nursing students about osteoporosis to be 66% [21]. Perez et al. reported this level to be 63% among primary care interns [22]. In their study, Peng et al. determined a mean knowledge score of 11.4 ± 2.5 (range 2–17). The factors affecting nurses' knowledge included age (36–45 years), marital status, and higher education. Only 18% of nurses had participated in educational classes about osteoporosis. The score of nurses in the orthopedics ward about osteoporosis was average to low [23]. Moghadasi Jahromi et al. concluded that the level of knowledge of nurses about osteoporosis was lower than expected [24]. Solimanha et al. also found that most nurses had a low level of knowledge about osteoporosis [25]. The results of Alghamdi et al. in Saudi Arabia indicated that healthcare specialists had good knowledge about osteoporosis, and there was no significant difference among various professional healthcare groups regarding knowledge of osteoporosis [26]. The results of a qualitative study by Clemson et al. suggested common knowledge among nurses about osteoporosis [27]. Zhang et al. in Singapore concluded that the nurses' knowledge about osteoporosis was inadequate [28]. Min et al. in Korea found that female students' knowledge about the importance of nutrition and regular exercise in enhancing bone health and preventing osteoporosis was insufficient [29]. Yaĝmur studied 182 employed nurses and midwives and reported that 65% of the staff had acquired no knowledge about osteoporosis, either during their education or after graduation [30].

In the present study, women had a more significant level of knowledge than men, while men's practice was superior to women's. Otmar et al. determined in their study that women had higher knowledge and attitude levels than men [31]. Moghadasi Jahromi et al. found that the level of knowledge of nurses about osteoporosis had no association with gender [24]. In the study by Alghamdi et al., more than half of the participants (69.3%) correctly noted that women are at greater risk of osteoporosis than men, which seems to have arisen from their excellent knowledge of this disease [26]. The reasons for women's higher susceptibility than men include lower bone density, menopause-associated hormonal changes, and a

longer lifespan for women [32]. Thus, women should receive more education about osteoporosis before menopause.

In the current study, age had an inverse relationship with knowledge. The most remarkable attitudes and best practices were observed in participants over 45 years of age. Age had a significant correlation with the level of knowledge of participants about osteoporosis. This result is in line with those of Soleymanha et al. among nurses employed in orthopedics wards in Rasht [25], Vakili et al. among nursing students [33], and Hannon et al. among midwives and clinical nurses [34]. Ozturk et al. reported that the level of knowledge about osteoporosis was significantly higher in the age group 40–50 years compared to other age groups [35]. Alghamdi et al. observed a significant difference in osteoporosis knowledge across different age groups. The results of these researchers showed that participants younger than 30 years of age had the most outstanding level of knowledge and positive attitude compared to the above-30 age group [26], which is supported by a previous study conducted in the same region [36]. It contrasts, however, with the findings of another study conducted on the general public in Saudi Arabia [37]. Osteoporosis accelerates with aging and hormonal changes during menopause. This may explain the increase in information among people of older ages.

In the present study, the mean scores of knowledge, attitude, and practice of nurses with Ph.D. degrees were higher than those of nurses with other levels of education. Soleymanha et al. found that education has a significant correlation with the level of awareness of the research units about prevention, risk factors, and total awareness [25]. Moghadas Jahromi et al. found a significant direct correlation between the level of education and knowledge [24], which is in line with the results of the present study. According to the cross-sectional study by Alghamdi et al., there was a significant association between the level of education and knowledge. Indeed, the results suggest a higher level of knowledge among academic graduates compared to lower educational groups (up to high school) [26]. This is similar to the findings of other studies, such as one by Amani et al. in the Asir region of Saudi Arabia [38]. Nevertheless, a negative correlation was reported in a similar study performed in the Majmaah region of Saudi Arabia [36]. Osteoporosis is a bone disease that leads to an increased risk of fracture by reducing bone density. Most of the participants in the currents study showed that they had not been affected by osteoporosis. Alghamdi et al. indicated that most of the individuals studied in their research had not been affected by osteoporosis or had not identified fractures associated with low BMD resulting from simple attempts. Although half of the participants reported a strong familial history of osteoporosis, 82.3% of them, surprisingly, had never undergone a BMD test [26]. This can be explained by the fact that most participants were younger, and the incidence of osteoporosis at this stage of life is infrequent. In the present study, the attitude of nurses toward osteoporosis was average. Khan et al. also found similar results [39]. The participants of another study showed a positive and recommended attitude toward osteoporosis for self protection (90.8%) and underwent the necessary tests through consultation with their physician about osteoporosis (83%). Around half (50.3%) of the participants in said study were interested in osteoporosis [26]. These findings concur with those of the study conducted in the Majmaah region [36]. Future analytical studies are suggested.

Acknowledgments

The authors of this paper express their sincere appreciate to the staff of the Center for Development of Clinical Research of Ali-Ibn Abi Talib Hospital, for their cooperation in this study.

Conflict of interest

The authors of have no conflicts of interest

Funding

No funds.

References

1. Mclendon An, Woodis Cb. A Review of Osteoporosis Management in Younger remenopausal Women. ***Womens Health*** 2014; 10(1): 59 -77.
2. Shobeiri F, Hesami E, Khodakarami B, Soltanian A. Effect of counseling on preventive behaviors of osteoporosis in women referred to health centers in Hamedan, Iran in 2015. ***J Commun Health*** 2015; 2(3):51-7. .
3. Khani Jeihooni A, Hidarnia A, Kaveh MH, Hajizadeh E. The effect of a prevention program based on health belief model on osteoporosis. ***J Res Health Sci*** 2015 ;15(1):47-53.
4. 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.
5. Malekshahi F, Niknami S, Aminshokravi F, Farhadi A. Predictors of osteoporosis prevention behavior

(physical activity) in women aged 30-50 in Khorramabad: A Trans-theoretical Model study. ***Yafte*** 2015;17(2).

6. Lowe NM, et al. Dietary calcium intake, vitamin D status, and bone health in postmenopausal women in rural Pakistan. ***J Health Popul Nutr.*** 2011;29(5):465.
7. Shobeiri F, Nazari M. Age at menopause and its main predictors among Iranian women. ***Int J Ferti Ster*** 2014;8(3):267.
8. Seeman E, Compston J, Adachi J, Brandi ML, Cooper C, Dawson-Hughes B, et al. Non-compliance: the Achilles' heel of anti-fracture efficacy. ***Osteoporos int*** 2007;18(6):711-9.
9. Khorsandi M, Shamsi M, Jahani F. The survey of practice about prevention of osteoporosis based on health belief model in pregnant women in Arak city. J ***Rafsanjan Univ Med Sci*** 2013;12(1):35-46.
10. Robitaille J, Yoon PW, Moore CA, Liu T, Irizarry-Delacruz M, Looker AC, Khoury MJ. Prevalence, family history, and prevention of reported osteoporosis in US women. ***Am J Prevent Med*** 2008;35(1):47-54.
11. Dunne A, Warrington G, McGoldrick A, Pugh J, Harrison M, O'Connor S, et al. Physical and Lifestyle Factors Influencing Bone Density in Jockeys: A Comprehensive Update of the Bone Density Status of Irish Jockeys. ***Int J Exercise Sci*** 2021;14(6):324.
12. Shams J, Spitzer AB, Kennelly AM, Tosi LL. Bone quality: educational tools for patients, physicians, and educators. ***Clin Orthop Relat Res*** 2011;469(8):2248-59.
13. Lorentzon M, Johansson H, Harvey NC, Liu E, Vandenput L, McCloskey EV, Kanis JA. Osteoporosis and fractures in women: the burden of disease. ***Climacteri.*** 2021 Jul 28:1-7.
14. Smith CA. A systematic review of healthcare professionalled education for patients with osteoporosis or those at high risk for the disease. ***Orthop Nurs*** 2010; 29:119-32.
15. Zhang RF, Chandran M. Knowledge of osteoporosis and its related risk factors among nursing professionals. ***Singapore Med J*** 2011; 52:158-62.
16. Mahdaviazad H, Keshtkar V, Emami MJ. Osteoporosis guideline awareness among Iranian family physicians: results of a knowledge, attitudes, and practices survey. ***Prim Health Care Res Dev*** 2018; 19:485-91.
17. Fourie H, Floyd S, Marshall B. Exploring New Zealand orthopaedic nurses' knowledge of osteoporosis. ***Orthop Nurs*** 2015; 34:29-35.
18. Chen IJ, Yu S, Wang TF, Cheng SP, Huang LH. Knowledge about osteoporosis and its related factors among public health nurses in Taiwan. ***Osteoporos Int*** 2005; 16:2142-8.
19. Ebrahimi Fakhar M, Zand S. Nutritional status and associated factors in elderly residents in nursing homes. *Payesh* 2013; 12(2):143-9.
20. Menshadi F, Azari A, Kuhpayeh Zadeh J, Ghasemi M. Knowledge, Attitude and Practice of Osteoporosis among a group of Iranian Adolescent Females (2007). ***J Modern Rehabilitation*** 2009; 2(3):47-54. eng.
21. Berarducci A. Senior nursing students' knowledge of osteoporosis. ***Orthopedic nursing*** 2004; 23(2):121-7.
22. Pérez-Edo L, Recasens MC, Castelo-Branco C, López PO, Marqués AG, Pérez C, et al. Management of osteoporosis in general practice: a cross-sectional survey of primary care practitioners in Spain. ***Osteoporosis Int*** 2004; 15(3):252-7.
23. Peng L, Reynolds N, He A, Liu M,Yang J, She P, et al. Osteoporosis knowledge and related factors among orthopedic nurses in Hunan province of China. ***Int J Orthopaedic Trauma Nurs*** 2020; 36:100714.
24. Moghadasi Jahromi M, Salimzadeh A, Yousef Shahi H. Shariati And Sina Hospital Nurses 'Knowledge About Osteoporosis. ***JMCIRI*** 2010; 28(3):257-61.
25. Solimanha M, Asadi K, Shabani S, Mirblock A, et al. Knowledge level of nurses employed in orthopedic units on osteoporosis disease JHNM 2014; 24(2):25-32.
26. Alghamdi MA, Mohammed AGA. Knowledge and Awareness of Osteoporosis among Saudi Physicians and Nurses: A Cross-Sectional Study. ***Open Access Maced J Med Sci*** 2018; 6(5):913-6.
27. Claesson A, Toth-Pal E, Piispanen P, Salminen H. District nurses' perceptions of osteoporosis management: a qualitative study. ***Osteoporosis Int*** 2015; 26(7):1911-8.
28. Zhang RF, Chandran M. Knowledge of osteoporosis and its related risk factors among nursing professionals. ***SINGAP MED J*** 2011; 52(3):158-62.
29. Min H, Oh H. A Study on Osteoporosis Knowledge, Health Beliefs and Health Behaviors among Female College Students. ***Res in Community and Public Health Nurs*** J 2011; 22:111.
30. Yaĝmur Y. The knowledge of primary health care providers about osteoporosis and changeable osteoporosis risk factors. ***Maltepe Univ nurs sci art J*** 2009; 2:41-50.
31. Otmar R, Reventlow SD, Nicholson GC, et al. General medical practitioners' knowledge and beliefs about osteoporosis and its investigation and management. ***Arch Osteoporos*** 2012;7:107-14.
32. Alshammari A. Women Knowledge, Attitude and Practices About Osteoporosis Prevention " Riyadh Saudi Arabia " ***World J. Medical Sci*** 2014;11:422-31.
33. Vakili M, Pirzadeh A, Dehghani M. Female student's knowledge on osteoporosis in Medical Sciences university of Yazd- 2006. ***J Tolloo e behdasht*** 2007; 2:22-31.
34. Hannon C, Murphy K. A survey of nurses' and midwives' knowledge of risks and lifestyle factors associated with osteoporosis. ***J. Orthop. Nurs*** 2007; 11:30-7.
35. Ozturk A, Sendir M. Evaluation of knowledge of osteoporosis and self-efficacy perception of female orthopaedic patients in Turkey. ***J Nurs Healthcare Chronic Illness*** 2011; 3(3):319-28.
36. AlTohami K, Sami W, AlEidan A, AlMubarak M, Alotaibi F. Study of Knowledge, Attitude and Practice of Osteoporosis among Adult Women in Majmaah City, Saudi Arabia. ***IJHRS*** 2015; 4(3):185-93.
37. Tlt A, Barghash S, Al-Salamah N. Knowledge, Attitude and Practice (KAP) Regarding Osteoporosis among General Population in Saudi Arabia. ***Br J Med Med Res*** 2016; 13:1-10.
38. Amani AO. Assessment of Osteoporosis KAP among Women in Assir Region, Saudi Arabia. ***J Med Med Sci*** 2013;4(2):50-5.
39. Khan JA, McGuigan FE, Akesson KE, et al. Osteoporosis knowledge and awareness among university students in Saudi Arabia. ***Arch Osteoporosis*** 2019;14(1):8.