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Knowledge of osteoporosis among women in Alexandria (Egypt): A community based survey



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Abstract *Aim of the work:* The current study was conducted in order to assess knowledge about osteoporosis (OP) among women aged more than 40 years in Alexandria of Egypt as well as identifying its relation with other variables.

Patients and methods: A cross sectional survey included 532 women aged at or more than 40 years who lived in Alexandria governorate in Egypt was conducted using a self-administered questionnaire as well as the Facts on Osteoporosis Quiz (FOOQ).

Results: The mean age of studied women was 49.92 ± 7.75 years. The majority of them (95.1%) reported that they are familiar with OP and 77.1% perceive it as a serious disease and mass media was the main source of information regarding OP (54.2%) among them. The mean total score of the FOOQ was 11.3 ± 3.6 . It was significantly associated with the level of education and employment status ($P = 0.001$ and 0.021 respectively). Regarding the total knowledge percent score, nearly one half of studied females (51.5%) achieved a percent score ranging from 50% to less than 75% and 18.8% of them obtained a score of 75% or higher.

Conclusions: The knowledge of OP among Alexandrian women could be considered moderate as regards its risk factors, preventive measures and consequences. Controlling the quality of health information provided through the mass media as well as motivating health care providers to play a role in providing information regarding OP is recommended.

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1. Introduction

Osteoporosis (OP) is a chronic progressive disease. It is defined as a systemic skeletal disease characterized by low bone density and micro-architectural deterioration of the bone tissue with a consequent increase in bone fragility that greatly increases the risk of fractures [1]. It is a major public health problem; it is

estimated to affect 200 million women worldwide and causes more than 8.9 million fractures annually [2,3]. In 2014, the National Osteoporosis Foundation estimated that a total of 54 million adults aged 50 and older in USA are affected by OP and low bone mass [4]. In Europe, in 2010 approximately 22 million women and 5.5 million men aged between 50 and 84 years are estimated to have OP. Middle East and Africa showed high prevalence of hypo-vitaminosis D as well as high fracture rates [5].

In Egypt, based on different studies, it has been calculated that 53.9% of postmenopausal women have osteopenia and 28.4% have OP [6]. On the other hand, 26% of men have osteopenia and 21.9% have OP [6]. Salem et al. (2000) reported that 16.7% of 1190 Egyptian menopausal females had lumbar OP [7]. OP awareness has increased in the last 20 years with the introduction of several effective pharmaceutical agents for treating those at high risk [8].

Osteoporosis is either primary or secondary of which the primary type is the commonest form [3]. It is observed mainly in postmenopausal women in the form of postmenopausal OP [1,9]. Secondary OP is a complicating feature of its primary cause [1,10,11]. There are several factors associated with higher risk of OP [12,13]. On the other hand, several measures are known to increase bone mineral density and decrease the risk of fractures [14,15]. Osteoporosis is an under-diagnosed disease [16,17]. Yet prevention is better than treatment and OP is a preventable disease; the first step in its prevention is to increase the awareness of the risk factors [18].

Several studies in different populations assessed the knowledge and attitudes toward OP aiming at providing baseline data essential for planning educational interventions in this topic [18–21]. In Egypt, there are scanty studies that investigated this area [22–24]. No recent data are available about OP knowledge among women in Alexandria (Egypt). The current study was conducted in order to assess knowledge about OP among women aged more than 40 years in Alexandria of Egypt, to identify their source of knowledge and to assess the impact of some variables on their level of knowledge.

2. Patients and methods

2.1. Patients

A cross sectional survey including 532 women was conducted. The target population of the study was women at or above 40 years old (peri and postmenopausal) living in Alexandria governorate, Egypt. A convenient sample of those females – consisting mainly of relatives and neighbors of the medical students (who took the questionnaire sheets to their relatives to fill them and return them back to the investigators) in Alexandria Faculty of Medicine – was enrolled in the study. Women were eligible for the study if they could read and write. Women were excluded from the study if they were illiterate and could not read and write. All included women gave an oral informed consent. An approval to conduct the research was obtained from the Physical Medicine, Rheumatology and Rehabilitation department and Community Medicine Department as well as the ethics committee of the Faculty of Medicine, Alexandria University, Egypt.

2.2. Methods

The data collection was done by using a self administered questionnaire composed of two parts. The first part included the socio-demographic characteristics of studied females (as age, marital status, education and occupation), their menstrual history, family history of OP, their information source regarding OP, and their perceived severity of the disease.

The second part included assessment of the level of knowledge of studied females regarding OP risk factors, complications and preventive measures using the Facts on Osteoporosis Quiz (FOOQ) [25,26]. This quiz (FOOQ) was generated based on the OP consensus conference of the National Institutes of Health in 2000. It is composed of 20 true and false questions. Each question had true, false and “do not know” options. The last option was included to avoid guessing. The scoring of the answers was done as follows: one mark was given for every correct answer and zero for every wrong answer as well as for “do not know” responses. The total score of FOOQ ranged from 0 to 20. Knowledge was computed as a continuous variable using the cumulative score for each subject based on correct responses to the 20 questions. It has a content validity of 0.87 and an internal consistency reliability of 0.76 [25–27]. An adaptation of the FOOQ was carried out in two questions to cope with the Egyptian culture (namely those related to alcohol consumption and post-menopausal hormonal replacement therapy and replaced by two statements, number 19 and 20, that refer to the importance of sardine as a calcium rich food and the consequences of OP) [28–30]. Arabic translation of the FOOQ was done by a licensed translation office.

All enrolled women were asked to complete the self administered questionnaire given to them after being provided with all information regarding the research and they were informed that participation in the study was totally voluntary. Privacy and confidentiality of data were assured all through the research work.

2.2.1. Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 18.0). All qualitative variables were described as numbers and percentages while quantitative variables as mean \pm standard deviation (SD). The percent total knowledge score was calculated. Student *t*-test and One-Way ANOVA were used to compare between groups. If comparison of groups showed a significant difference, Bonferroni's multiple comparison test (post hoc analysis) was performed. Simple correlation was conducted using Pearson correlation test. Five percent level of significance was used to interpret results.

3. Results

This study included a total number of 532 women. The mean age of studied women was 49.92 ± 7.75 years (range 40–76 years). The marital status of studied women showed that about three quarters (75.9%, $n = 404$) of them were married, 16.5%, $n = 87$ were widows, 5.3%, $n = 28$ were single and

2.3%, $n = 12$ were divorced. Postmenopausal women represented 44%, $n = 234$ of studied females.

The majority of studied women ($n = 506$; 95.1%) reported that they are familiar with OP, more than three quarters of them (77.1%) perceive it as a serious disease and about 72.2% were aware of the presence of a diagnostic tool for OP. Only 46.3% and 16.9% respectively are either worried or very worried about getting such disease.

The main source of information regarding OP among studied women was mass media (54.2%, $n = 274$) (Table 1).

The mean total score of the FOOQ was 11.3 ± 3.6 ranging from 0 to 20. Regarding the total knowledge percent score, nearly one half of studied females (51.5%) achieved a percent score ranging from 50% to less than 75%. On the other hand, less than one fifth (18.8%) of them obtained a score of 75% or higher (Table 2). Details of women's responses to the questions are shown in Table 3. To summarize: 75.9% and 73.3% of studied women, respectively were aware that OP is both a preventable and treatable disease. Only 62.8% of studied women were aware about different consequences of OP and 65% of studied women were aware that fracture could occur due to OP when women older than 50 years do not take preventive measures for OP. High caffeine intake and smoking were identified as risk factors for OP by a high percentage of studied women (72.6% and 53.4% respectively). However, positive family history and early menopause were identified as risk factors by only 41.4% and 32.3% respectively. The beneficial effect of physical exercise in general and walking in particular was identified as true by 88.3% and 86.5% respectively.

Table 4 shows that the mean knowledge score doesn't significantly differ between different age categories (10 years intervals) ($P = 0.08$). However, a positive correlation was found between age of studied females and their knowledge score ($r = 0.129$, $P = 0.037$). The total number of women who reported their level of education was 520 women. The mean total score of the FOOQ among women just able to read and write was 9.23 ± 4.16 , and among women who received basic education 10 ± 3.38 , while women who received higher education had a mean score of 11.86 ± 3.34 and this is statistically significant ($P < 0.0001$). Post HOC test reveals a statistically significant difference between women with basic education and those with higher education ($P = 0.04$) as well as between women just able to read & write and those with higher education ($P < 0.0001$). However, the difference between read and write, and basic education is statistically insignificant ($P = 0.47$).

The mean score of the FOOQ among working women was 11.96 ± 3.54 and 10.93 ± 3.57 among non-working women,

Table 1 Distribution of studied women familiar with osteoporosis ($n = 506$) as regards their main source of information.

Source of information	Studied women ($n = 506$) n (%)	
Mass media	274	(54.2)
Physician	116	(22.9)
Friends	72	(14.2)
Readings	36	(7.1)
Others	8	(1.6)
Total	506	100

Table 2 Distribution of studied women ($n = 532$) regarding their percent total knowledge score of Facts on Osteoporosis Quiz.

Percent total knowledge score	Studied women ($n = 532$) n (%)	
0-	20	(3.8)
25-	138	(25.9)
50-	274	(51.5)
75 \leq 100%	100	(18.8)

and this difference is statistically significant ($P = 0.021$) (Table 4).

On the other hand, the difference in mean score among postmenopausal and premenopausal women, those who worry from the disease and those who didn't worry, those who consider the disease severe and those who didn't, as well as, the women's source of information was not statistically significant ($P = 0.5$, $P = 0.09$, $P = 0.28$, $P = 0.24$ respectively) (Table 4).

4. Discussion

Osteoporosis is a chronic progressive disease. It has become a major public health problem of epidemic nature [1-3]. The aim of this research was to assess knowledge of OP among Alexandrian women aged more than 40 years as well as identifying its relation with other variables. A cross sectional survey was carried out where a designed self-administered questionnaire as well as FOOQ questionnaire were used in order to collect data.

The current study included a total number of 532 women. The majority of studied women ($n = 506$; 95.1%) reported their awareness of OP as a disease and more than three quarters of them (77.1%) perceive its seriousness. Moreover, 72.2% were aware of the presence of a diagnostic tool for OP. These results were similar to what was reported in a study carried out among women who attended a senior's program in Canada, where 93% of the studied women were familiar with the disease [21]. On the other hand, these results were higher than what was reported in a population based study carried out in Singapore as well as in a study carried out among rural Turkish women (57.9%, 60.8%, respectively) [31,32]. This is considered as a good starting point and a promising base for the conduction of a community health education about OP to provide sound detailed information [33]. On studying the women's worry of suffering from OP with aging, it was revealed that the majority of studied women (83.1%) expressed their worry about suffering from the disease in the future (36.8% were very worried and 46.3% had some degree of worry). These results are in accordance with the revealed high percentage of both awareness of the disease and perception of its seriousness among those women [32,34].

As regards the main source of information about OP, it was revealed that mass media (including television, radio, newspapers and magazines) was the main source of information among more than half (54.2%) of the studied women, while physicians were ranked as the second source of information (22.9%). This was in agreement with what was reported in many studies carried out among Turkish, American, Bruneian, Indian and Singaporean women (mass media was rated as the main source of information in 53%, 55%, 70%, 74% and

Table 3 Women's responses to the Facts on Osteoporosis Quiz.

Questions	Answers from studied women (n = 532) n (%)			
	Correct	Right	Wrong	Don't know
1. Physical activity increase the risk of osteoporosis	False	312 (58.6)	118 (22.2)	102 (19.2)
2. High-impact exercise (weight training) improves bone health	True	470 (88.3)	28 (5.3)	34 (6.4)
3. Most people gain bone mass after 30 years of age	False	162 (30.5)	122 (22.9)	248 (46.6)
4. Lower weight women have osteoporosis > heavy women	True	96 (18)	300 (56.4)	136 (25.6)
5. Most important time to build bone strength is between 9 and 30 years of age	True	276 (51.9)	88 (16.5)	168 (31.6)
6. Normally, bone loss speeds up after menopause	True	354 (66.6)	40 (7.5)	138 (25.9)
7. High caffeine with low calcium intake increases the risk	True	386 (72.6)	36 (6.8)	110 (20.6)
8. There are many ways to prevent osteoporosis	True	390 (73.3)	38 (7.1)	104 (19.5)
9. Without preventive measures, 20% of women older than 50 years will have a fracture due to osteoporosis in their lifetime	True	346 (65)	36 (6.8)	150 (28.2)
10. There are treatments for osteoporosis after it develops	True	404 (75.9)	44 (8.3)	84 (15.8)
11. A lifetime of low intake of calcium and vitamin D does not increase the risk of osteoporosis	False	272 (51.1)	114 (21.4)	146 (27.5)
12. Smoking does not increase the risk of osteoporosis	False	284 (53.4)	116 (21.8)	132 (24.8)
13. Walking has a great effect on bone health	True	460 (86.5)	24 (4.5)	48 (9)
14. After menopause, women not on estrogen need about 1500 mg of calcium (for example, 5 glasses of milk) daily	True	244 (45.9)	18 (3.4)	270 (50.7)
15. Osteoporosis affects men and women	True	364 (68.4)	84 (15.8)	84 (15.8)
16. Early menopause is not a risk factor for osteoporosis	False	220 (41.4)	114 (21.4)	198 (37.2)
17. Children 9–17 years of age get enough calcium from one glass of milk each day to prevent osteoporosis	False	110 (20.7)	302 (56.8)	120 (22.5)
18. Family history of osteoporosis is not a risk factor	False	172 (32.3)	202 (38)	158 (29.7)
19. Sardines are rich in calcium and vitamin D	True	376 (70.7)	34 (6.3)	122 (23)
20. Low back pain, fractures, loss of height and loss of teeth are complications of osteoporosis	True	334 (62.8)	54 (10.2)	144 (27)

Table 4 The effect of studied variables on the Facts on Osteoporosis Quiz (FOOQ) score of studied women.

Studied variable	FOOQ total score mean ± SD	Test of significance
<i>Age (years)</i>		
40-	10.86 ± 3.47	(F) 2.33
50-	11.64 ± 3.75	(P) 0.08
60-	12.51 ± 3.84	
70-	10.25 ± 2.21	
<i>Level of education (n = 520)</i>		
Read & write (n = 78)	9.23 ± 4.16	(F) 10.5
Basic education ^a (n = 30)	10 ± 3.38	(P) < 0.0001*
Higher education ^b (n = 412)	11.86 ± 3.34	
<i>Working status (n = 518)</i>		
Working (n = 222)	11.96 ± 3.54	(t) 2.33
Not working (n = 296)	10.93 ± 3.57	(P) 0.021*
<i>Menopause (n = 532)</i>		
Post-menopause (n = 234)	11.5 ± 3.62	(t) 0.68
Pre-menopause (n = 298)	11.2 ± 3.59	(P) 0.5
<i>Worry from osteoporosis (n = 532)</i>		
Worried (n = 442)	11.5 ± 3.62	(t) 1.72
Not worried at all (n = 90)	10.49 ± 3.44	(P) 0.09
<i>Consider the disease as serious (n = 518)</i>		
Yes (n = 410)	11.49 ± 3.7	(t) 1.07
No (n = 108)	10.91 ± 3.22	(P) 0.28
<i>Source of information (n = 498)</i>		
Mass media (n = 274)	11.21 ± 3.6	(F) 1.42
Physician (n = 116)	11.95 ± 3.7	(P) 0.24
Friends (n = 72)	10.57 ± 3.36	
Readings (n = 36)	12.33 ± 3.87	
^a Primary or preparatory education.		
^b Secondary education or higher.		
* P significant at ≤0.05.		

76.4% of the studied women respectively) [31,32,35–37]. This result should raise attention toward the content of health messages included in mass media programs, articles and advertisements, as it was reported in a study conducted to assess the quality of medical information in newspapers where it was revealed that up to 50% of medical information posted in newspapers was inaccurate [21,38].

So, what was revealed on studying the main source of information regarding OP in the studied women can explain the revealed moderate average score of OP knowledge measured by FOOQ among them [11.3 out of 20 total score (56.5%)]. However, this score was higher than what was reported in a study carried out among Australian women [39] and another study carried out among rural Turkish women [32] [8.8/20 (44%) and 5.5/20 (27.5%) respectively]. On the other hand,

this score was lower than what was reported in another two studies, one was carried out among New Zealand women [40] and the other was carried out among Turkish women [18] [16.4/26 (63.1%) and 63/100 (63%) respectively]. This difference may be attributed to differences in cultures or characteristics of studied women.

As regards the association between the total knowledge score for OP and women's age, it was found that the highest score was among the age group of 60 to less than 70 years. However, this was statistically insignificant ($P = 0.075$). But on the other hand, there was positive correlation between age and the total score ($r = 0.129$, $P = 0.037$) which may be attributed to the perceived risk of developing the disease with the advancement of age. This was in agreement with the previous study [19].

Several previous studies found that the mean knowledge of OP was significantly higher among highly educated women [20,31]. This was in accordance with the current study. Moreover, the same relation was found between knowledge score and employment status as knowledge was significantly higher among currently working females compared to housewives (P is < 0.0001 and $P = 0.021$ respectively). These results might be attributed to the higher socioeconomic level of educated and working women which was associated with easier and more access to health information of high quality.

On studying the details of FOOQ and studied women answers, it was revealed that about three quarters of the studied women knew that OP is a preventable and treatable disease (73.3%, 75%). This was comparable to other studies [1,3,21]. The awareness of the preventable nature can be used as a motive to stimulate women to accept and comply with the health education messages regarding prevention of OP. Moreover, women awareness of the availability of treatments for OP can be used as a motive to increase women's demand for diagnostic services and increase the utilization of these services [19,27,41].

On assessing women's knowledge regarding bone growth, it was found that only half of the studied women (51.9%) knew the most important time in age for bone building is between 9 and 30 years old [1]. On the other hand, studying the risk factors for OP showed that a high intake of caffeine with a low intake of calcium was identified as a risk factor for OP by about three quarters of the studied women (72.6%), but smoking was identified as a risk factor by only about half of the studied women (53.4%) [18,41]. Moreover, it was revealed that most of the studied women lack knowledge about the role of positive family history for OP as well as early menopause as risk factors for the disease (67.7% and 58.6% respectively) and only 18% of them were aware that weight loss and being underweight are important risk factors for OP [1,42].

This was comparable to a Turkish study in which it was reported that 80.4%, 67.6%, 60.4%, 53%, and 52.6% of women respectively knew that low calcium and vitamin D in diet, premature menopause, family history of OP, lack of activity and smoking are risk factors for OP [18]. However, a minority of them determine that underweight (29.3%) is a risk factor for OP [18]. These figures were much higher than those reported in an Iranian study, in which only 31.7%, 45.3%, 28.5% and 62.6% indicated low calcium consumption in diet, premature menopause, hereditary factors and smoking considered risk factors for OP [41].

There was also a marked lack of knowledge among studied women regarding the proper amount of milk that should be

given to children as well as postmenopausal women in order to provide the daily requirements of calcium (identified only by 56.8% and 45.9% respectively).

Regarding the role of exercise on bone physiology, 88.3% of the participants knew the fact that high-impact exercise in the form of weight training improves bone health. About 86.5% of the studied women knew that walking had an essential role in bone health. This suggests that most of the women understand that walking has a beneficial effect on bone density similar to that of high impact exercise, in addition to, its obvious cardiovascular benefits [15,43].

Hence, on planning health education programs for prevention of OP, the health education messages should emphasize on the age period through which bone growth takes place, the different risk factors of OP, and preventive measures [19,27,44]. Nutritional education should also emphasize on the importance of dairy products in preventing OP and the proper quantities for different ages. Moreover, nutritional educators should also motivate women as well as men to intake Sardine, as it is a food item available in the market and of low cost and the study revealed that most of studied women (70.7%) were aware of the high calcium and vitamin D content in Sardine.

Controlling the quality of health information provided through the mass media by the Egyptian health authorities is a must, as it is the main source for health information for the public as revealed by the current study results. In addition, health care providers role in providing information regarding OP should be enhanced and different communication channels should be provided in order to reach the biggest sector of the population.

Education of the public regarding prevention of OP must be incorporated in the health services provided for school children, adolescents, and maternity care and extended to postmenopausal and elderly care services.

The present study is limited by selecting a convenient sample of neighbors and relatives of medical students rendering it a less representative sample which decreases the generalizability of the results. Moreover, exclusion of illiterate females because of using a self-administered questionnaire who represent an important category of women in the community affects the total knowledge score that was expected to be lower. Third one was that not all risk factors for OP had been assessed in the current study. Corticosteroid utilization, endocrine disorders and articular disorders such as rheumatoid arthritis were not assessed whether there are considered risk factors for OP or not by women. This could be explained by the need to concentrate on the risk factors of primary OP especially postmenopausal OP among women [1].

The current study concluded that the knowledge of OP among Alexandrian Egyptian women could be considered moderate as regards its risk factors, preventive measures and consequences. Controlling the quality of health information provided through the mass media as well as motivating health care providers to play a role in providing information regarding OP are recommended.

Conflict of interest

None declared.

References

- [1] Horowitz M, Eastell R, Insogna K, editors. Essentials of the pathogenesis of osteoporosis. London: Current Medicine Group (Springer Healthcare); 2010.
- [2] Reginster JY, Burlet N. Osteoporosis: a still increasing prevalence. *Bone* 2006;38(2 Suppl. 1):S4–9.
- [3] Watts NB, Bilezikian JP, Camacho PM, Greenspan SL, Harris ST, Hodgson SF, et al. American Association of Clinical Endocrinologists Medical Guidelines for Clinical Practice for the diagnosis and treatment of postmenopausal osteoporosis. *Endocr Pract* 2010;16(Suppl. 3):1–37.
- [4] Wright NC, Looker AC, Saag KG, Curtis JR, Delzell ES, Randall S, et al. The recent prevalence of osteoporosis and low bone mass in the United States based on bone mineral density at the femoral neck or lumbar spine. *J Bone Miner Res* 2014;29(11):2520–6.
- [5] Hernlund E, Svedbom A, Ivergård M, Compston J, Cooper C, Stenmark J, et al. Osteoporosis in the European Union: medical management, epidemiology and economic burden. A report prepared in collaboration with the International Osteoporosis Foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA). *Arch Osteoporos* 2013;8:136.
- [6] Taha M. Prevalence of osteoporosis in Middle East systemic literature review. In: Proceedings of the 10th ECOO: 2011 April 14–16. Cairo, Egypt. Available online at URL: <<http://www.scribd.com/doc/53103901/Osteoporosis-Cairo-April-2011-v1>> [accessed January 2015].
- [7] Salem D, Tattawi S, Ebrashi H. Evaluation of osteoporosis among males and females in clinical practices bone densitometry. *Med J Cairo Univ* 2000;68:89–92.
- [8] Barrett-Connor E, Wade SW, Do TP, Satram-Hoang S, Stewart R, Gao G, et al. Treatment satisfaction and persistence among postmenopausal women on osteoporosis medication: 12-month results from POSSIBLE US™. *Osteoporos Int* 2012;23:733–41.
- [9] Kanis JA, Burlet N, Cooper C, Delmas PD, Reginster JY, Borgstrom F, et al. European guidance for the diagnosis and management of osteoporosis in post-menopausal women. *Osteoporos Int* 2008;19:399–428.
- [10] Sayed S, Darweesh H, Fathy K, Mourad AM. Clinical significance of bone mineral density in Ankylosing Spondylitis patients: relation to disease activity and physical function. *The Egyptian Rheumatologist* 2015;37:35–9.
- [11] Gheita T, Fawzy S, Rizk A, Hussein H. Impaired bone formation and osteoporosis in postmenopausal elderly onset rheumatoid arthritis patients. *The Egyptian Rheumatologist* 2011;33:155–62.
- [12] Bainbridge KE, Sowers M, Lin X, Harlow SD. Risk factors for low bone mineral density and the 6-year rate of bone loss among premenopausal and perimenopausal women. *Osteoporos Int* 2004;15:439–46.
- [13] De Laet C, Kanis JA, Odén A, Johanson H, Johnell O, Delmas P, et al. Body mass index as a predictor of fracture risk: a meta-analysis. *Osteoporos Int* 2005;16:1330–8.
- [14] Shea B, Wells G, Cranney A, Zytaruk N, Robinson V, Griffith L, et al. Meta-analyses of therapies for postmenopausal osteoporosis. VII. Meta-analysis of calcium supplementation for the prevention of postmenopausal osteoporosis. *Endocr Rev* 2002;23:552–9.
- [15] Bonaiuti D, Shea B, Iovine R, Negrini S, Robinson V, Kemper HC, et al. Exercise for preventing and treating osteoporosis in postmenopausal women. *Cochrane Database Syst Rev* 2002(3):CD000333.
- [16] Chesnut 3rd CH. Osteoporosis, an underdiagnosed disease. *JAMA* 2001;286:2865–6.
- [17] Wang XF, Seeman E. Epidemiology and structural basis of racial differences in fragility fractures in Chinese and Caucasians. *Osteoporos Int* 2012;23:411–22.
- [18] Ungan M, Tümer M. Turkish women's knowledge of osteoporosis. *Fam Pract* 2001;18:199–203.
- [19] Riaz M, Abid N, Patel M, Tariq M, Khan MS, Zuberi L. Knowledge about osteoporosis among healthy women attending a tertiary care hospital. *J Pak Med Assoc* 2008;58(4):190–4.
- [20] Kutsal YG, Atalay A, Arslan S, Başaran A, Cantürk F, Cındaş A, et al. Awareness of osteoporotic patients. *Osteoporos Int* 2005;16:128–33.
- [21] Juby AG, Davis P. A prospective evaluation of the awareness, knowledge, risk factors and current treatment of osteoporosis in a cohort of elderly subjects. *Osteoporos Int* 2001;12:617–22.
- [22] Hossein YE. Osteoporosis: knowledge practices and prevention among female adolescent in El-Minia. *Egypt J Res Nurs Midwifery* 2014;3:66–72.
- [23] Wahba SA, El-Shaheed AA, Tawheed MS, Mekkiy AA, Arrafa AM. Osteoporosis knowledge, beliefs, and behaviors among Egyptian female students. *J Arab Soc Med Res* 2010;5:173–80.
- [24] Mahfouz EM, Kamel EG, Mosalem FA, Sameh S. Osteoporosis-related lifestyle choices and knowledge among adolescent females in El-Minia city. *Egypt El-Minia Med Bull* 2007;18(1):29–41.
- [25] Ailinger RL, Lasus H, Braun MA. Revision of the Facts on Osteoporosis Quiz. *Nurs Res* 2003;52:198–201.
- [26] Ailinger RL, Harper DC, Lasus HA. Bone up on osteoporosis. Development of the Facts on Osteoporosis Quiz. *Orthop Nurs* 1998;17:66–73.
- [27] Werner P. Knowledge about osteoporosis: assessment, correlates and outcomes. *Osteoporos Int* 2005;16:115–27.
- [28] Farag MMA. Effect of different cooking methods on nucleic acid nitrogen bases content of fresh sardine fish and its nutritive value. *World J Dairy Food Sci* 2013;8(2):156–64.
- [29] Iwasaki M, Nakamura K, Yoshihara A, Miyazaki H. Change in bone mineral density and tooth loss in Japanese community-dwelling postmenopausal women: a 5-year cohort study. *J Bone Miner Metab* 2012;30:447–53.
- [30] Iolascon G, Gimigliano F, Malavolta N, Tarantino U, Fornari R, Greco E, et al. Effectiveness of teriparatide treatment on back pain-related functional limitations in individuals affected by severe osteoporosis: a prospective pilot study. *Clin Cases Miner Bone Metab* 2012;9(3):161–5.
- [31] Saw SM, Hong CY, Lee J, Wong ML, Chan MF, Cheng A, et al. Awareness and health beliefs of women towards osteoporosis. *Osteoporos Int* 2003;14:595–601.
- [32] Gemalmaz A, Oge A. Knowledge and awareness about osteoporosis and its related factors among rural Turkish women. *Clin Rheumatol* 2008;27:723–8.
- [33] Tellier V, De Maeseneer J, De Prins L, Sedrine WB, Gosset C, Reginster JY. Intensive and prolonged health promotion strategy may increase awareness of osteoporosis among postmenopausal women. *Osteoporos Int* 2001;12:131–5.
- [34] Matthews HL, Laya M, DeWitt DE. Rural women and osteoporosis: awareness and educational needs. *J Rural Health* 2006;22:279–83.
- [35] Geller SE, Derman R. Knowledge, beliefs, and risk factors for osteoporosis among African-American and Hispanic women. *J Natl Med Assoc* 2001;93(1):13–21.
- [36] Liza H, Darat HN, Pande KC. Knowledge about osteoporosis in Bruneian women attending an orthopaedic clinic. *Malays Orthop J* 2009;3(1):28–31.
- [37] Pande K, Pande S, Tripathi S, Kanoi R, Thakur A, Patle S. Poor knowledge about osteoporosis in learned Indian women. *J Assoc Physicians India* 2005;53:433–6.
- [38] Molnar FJ, Man-Son-Hing M, Dalziel WB, Mitchell SL, Power BE, Byszewski AM, et al. Assessing the quality of newspaper medical advice columns for elderly readers. *Can Med Assoc J* 1999;161:393–5.
- [39] Winzenberg T, 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 Musculoskeletal Disord* 2003;4:17.
- [40] Von Hurst PR, Wham CA. Attitudes and knowledge about osteoporosis risk prevention: a survey of New Zealand women. *Public Health Nutr* 2007;10:747–53.
- [41] Jalili Z, Nakhaee N, Askari R, Sharifi V. Knowledge, attitude and preventive practice of women concerning osteoporosis. *Iran J Public Health* 2007;36(2):19–24.
- [42] Saarelainen J, Kiviniemi V, Kroger H, Tuppurainen M, Niskanen L, Jurvelin J, et al. Body mass index and bone loss among postmenopausal women: the 10-year follow-up of the OSTPRE cohort. *J Bone Miner Metab* 2012;30:208–16.
- [43] Yamazaki S, Ichimura S, Iwamoto J, Takeda T, Toyama Y. Effect of walking exercise on bone metabolism in postmenopausal women with osteopenia/osteoporosis. *J Bone Miner Metab* 2004;22:500–8.
- [44] Malak MZ, Toama ZT. The effect of osteoporosis health education program based on health belief model on knowledge and health beliefs towards osteoporosis among Jordanian female teachers. *Eur Sci J* 2015;1:385–98.