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RELATIONSHIP BETWEEN LIFESTYLE AND OSTEOPOROSIS IN WOMEN REFERRED TO BONE DENSITOMETRY CENTERS IN BEHBAHAN, IRAN IN 2015

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Abstract

Background: Osteoporosis is the most common metabolic bone disease starting by loss of bone mass and deterioration of bone tissue, making bones thin and brittle. According to studies, many factors are involved in development of osteoporosis. This study focuses on relationship between lifestyle and osteoporosis in women. Methods: This cross-sectional study was conducted in 2015 with 80 samples selected by census. The studied population included women referred to the bone densitometry centers in Behbahan. Data was collected by a questionnaire. Data was analyzed by Chi-square test, Fisher's exact test and ANOVA. Results: ANOVA results showed a significant relationship between diet and BMD (P = 0/005), as well as a significant relationship between BMD and safety and prevention (P = 0.024). No significant relationship was found between other factors discussed in this study and BMD. Conclusions: considering the significant relationship between some lifestyle factors such as diet and risk of osteoporosis and its complications such as fracture and mortality, it is essential to provide the required trainings for women to improve their lifestyle. In this case, the health system, nurses and mass media like radio and television can play an important role.

Key words: Bone mineral density, Lifestyle, Osteoporosis.

Introduction

Osteoporosis is the most common metabolic bone disease starting by loss of bone mass and deterioration of bone tissue, making bones thin and brittle. This can be attributed to the increased life expectancy and aging, as well as unfavorable changes in lifestyle and diet. Osteoporosis is one of the major health problems in the world (Ebadi et al., 2012). Currently, 10 million Americans (8 million women and 2 million men) suffer osteoporosis. In addition, 18 million suffer

bone mineral density (BMD) loss; however, only a small fraction of this number are diagnosed and treated. It is estimated that the cost of hip fractures and relevant cases will be at least doubled in the United States by 2040 (Beyat et al., 2009). In European societies, one fracture occurs due to osteoporosis every 30 minutes; osteoporotic hip fractures are crucially important due to the subsequent morbidity and mortality (Rahnavard et al., 2006). In Iran, 41.7% of women and 10.2% of men suffer vertebral osteoporosis, and 4.7% of women and 1.2% of men suffer femoral osteoporosis (Ahmadi et al., 2012). Currently, one of the practices used for continuous control of chronic diseases is the focus on promotion of self-care behaviors and application of new technologies for these patients. One of these technologies modifies life-style of patients.

Lifestyle is a unique pattern of characteristics, behaviors and habits, which may expose one to the risk of diseases if it is defective. According to the studies conducted in America, mortalities are associated with lifestyle (53%), environmental factors (21%), heritage (16%) and health care services (10%). Adopting a lifestyle involving diet, exercise and not smoking performs activities for health promotion and disease prevention (Mora et al., 2013). Osteoporosis is a global concern for the second half of this century, particularly in Asia; therefore, timely diagnosis and treatment is very important. According to the studies conducted so far, there are nearly 80 factors associated with osteoporosis; however, 15% of these factors have a greater role in onset of osteoporosis. The role of these risk factors is different in various places (Larijani et al., 2003). In some studies, calcium supplementation is a risk factor for developing osteoporosis (Suleiman, 1997); however, this is inconsistent with Filip et al (Filip et al., 2005). Jamshidian found that the number of cigarette packs smoked in a year was as an aggravating factor for osteoporotic femur (Shilbayeh, 2003).

Kidambi et al showed that smoking was associated with BMD loss in the heel (Kidambi et al., 2005). Bener et al found that BMD was higher in people who regularly used dairy products such as yogurt and cheese than those who did not consume dairy products (Bener et al., 2005) while Filip et al found no significant relationship between dairy consumption and risk of osteoporotic (Suleiman, 1997). According to Micklesfield et al, people who exercise three or more times a week are exposed to the risk of osteopenia 0.32 times less than people who do not exercise and bone mass density is higher in people who exercise regularly than those who do not exercise (Micklesfield et al., 2005). however, Bener et al did not found no relationship (Bener et al., 2005). Spencer et al found that young people (31-45) who drank alcohol had significantly lower bone mass (Spencer et al., 1986).

Young women are key members of the community, forming half the world's population; thus, their health is particularly important. Osteoporosis is a preventable disease; one of the easiest inexpensive ways of prevention is to identify the risk factors and provide opportunities for trainings and further studies on osteoporosis. As the Iranian society has a different lifestyle, this study focuses on the relationship between lifestyle and osteoporosis in women referred to the bone densitometry centers in Behbahan in 2015 by identifying the risk factors of osteoporosis in order to promote the health of women.

Materials and Methods

This cross-sectional study evaluated the factors related to lifestyle (diet, safety and prevention, physical activity, stress management, social and interpersonal relationships) and osteoporosis. The studied population included women referred to bone densitometry centers in Behbahan. At first, the subjects were enrolled in a group; then, they were divided into three groups (normal, osteopenia and osteoporosis) based on results of BMD test. According to Krejcie-Morgan table, 80 samples were selected by census from patients referred to the bone densitometry centers (Parsian Tasvir and Arjan Teb) on all days of the week with the prior written consent of the subjects.

Data was collected by two questionnaires: 1) a researcher-made questionnaire for demographics, and 2) Miller-Smith lifestyle assessment inventory. The latter was scored on a Likert scale. Considering the given scores, lifestyles of people were divided into three levels: favorable, medium and unfavorable. This inventory was developed by scientific studies of domestic and foreign researchers. Information on height, weight, and bone densitometry results was acquired from the test sheets; other information was acquired through face-to-face interviews with subjects.

Validity was confirmed by content validity. Reliability (85%) was calculated by Cronbach's alpha. BMD was measured in femoral neck and second to fourth lumbar vertebrae by Norland dual-energy X-ray absorptiometry (DEXA) machine, America. Results were based on the scale of T-SCORE suggested by World Health Organization.

According to results of bone densitometry, subjects were divided into three groups including osteopenia with BMD loss (-2.5<T-SCORE<-1), osteoporosis (T-SCORE <-2.5) and normal BMD (T-SCORE >-1). Data was analyzed by SPSS software, version 23. This study used the descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (Chi-square and Fisher's exact test, Pearson correlation test, Spearman correlation test, one-way analysis of variance and T-tes).

Results

The studied participants included illiterate (36.3%) women and women with college education (27.5%). Majority of participants (70%) were married. They were mostly housewives (70%) and the rest were employed. The highest and lowest frequency was related to average income (51.3%) and low income (48.8%). Moreover, 85% of women were postmenopausal (mean age 46.4) and 43.8% of the participants had their first menstruation at age 13. The highest number of pregnancies and children was related to 25% and 23.8% of participants, respectively. The results showed that 79.3% of the participants had the history of underlying disease and 73.8% had continuous drug intake. The mean and standard deviation of age and body mass index were 65.2 ± 9.6 years and 73 ± 11.6 kg/m^2, respectively. Table 1 and 2 lists the mean and standard deviation of lifestyle scores in terms of demographic variables and characteristics of the menstrual cycle. The results showed a significant relationship between lifestyle score and the examined variables including age over 60 years, number of pregnancies, number of children, age of menopause, education, age at marriage, income and medications, while no significant relationship was not found for other variables.

Table-1: Mean and standard deviation of lifestyle score in terms of demographic variables.

Variable		Mean and standard deviation of lifestyle score	P
Age	<50	86.7 ± 6.4	<0.001
	50-59	71.3 ± 17.3	
	60-69	65.2 ± 9.6	
	>70	65.2 ± 5.9	
BMI	Underweight	73.7 ± 18.5	0.24
	Normal	73.3 ± 13.6	
	Overweight	73 ± 11.6	
	Obese	64.6 ± 17.9	
Education	Illiterate	66.2 ± 10.3	<0.001
	Elementary	62.5 ± 2.8	
	Middle school	66.6 ± 25.7	
	High school	72.4 ± 10.1	
	College	85 ± 6.4	
Marital status	Married	75 ± 13.7	0.001
	Single	64.3 ± 10.6	

Table-2: mean and standard deviation of lifestyle score in terms of menstruation and childbirth.

Variable		Mean and standard deviation of lifestyle score	P
Age at first menstruation (year)	10	74.5 ± 7.8	0.07
	11	71 ± 6.6	
	12	66.9 ± 11.6	
	13	76.7 ± 14.3	
	14	65 ± 22.6	

	15	79 ± 0	
Age at marriage	<15	67 ± 6.3	<0.001
	15-17	67.3 ± 10.9	
	>17	80.3 ± 16.2	
Number of previous pregnancies	2	85.7 ± 8.4	<0.001
	3	79.4 ± 8.4	
	4	70.5 ± 13.8	
	5	64.8 ± 13.8	
	6	63.1 ± 3.3	
	7	63.8 ± 16.2	
	8 and more	61.9 ± 7.1	
Number of children	2	84.5 ± 8.5	<0.001
	3	79.4 ± 10.3	
	4	68.5 ± 16.1	
	5	68.6 ± 7.5	
	6	65.3 ± 6.7	
	7	61.5 ± 13.8	
	8 and more	60.8 ± 3.5	

T-paired test showed a significant difference in mean BMD of femoral neck and lumbar spine (0.314 ± 0.161 and 0.965 ± 0.321, respectively), as shown in Table 3. There was a significant difference (P<0.001) in mean T-Score of femoral neck (-1.819 ± -1.83) and lumbar spine (-1.261 ± 1.266).

Table-3: mean and standard deviation of BMD for femoral neck and lumbar spine.

Area	Mean BMD	Standard deviation	Minimum	Maximum	P
Femoral neck	0.314	0.161	-2.3	1.09	<0.001
Lumbar spine	0.965	0.321	0.55	2	
Total	0.639	0.411	-0.65	1.18	

Table-4: mean and standard deviation of T-score for femoral neck and lumbar spine.

Area	Mean T-score	Standard deviation	Minimum	Maximum	P
Femoral neck	-1.819	1.83	-4.83	2	<0.001
Lumbar spine	-1.261	1.266	-3.35	1.8	
Total	-1.54	1.291	-4.11	1.9	

Results showed that femoral neck BMD was normal in 11 patients (13.8%), osteopenic in 35 patients (43.8%) and osteoporotic in 34 patients (42.4%); in addition, lumbar spine BMD was normal in 33 patients (41.3%), osteopenic in 29

patients (36.3%) and osteoporotic in 18 patients (22.4%). Based on T-Score results, BMD was normal in 14 patients (17.5%), osteopenic in 38 patients (47.5%) and osteoporotic in 28 patients (35%). In total, 3.7% of subjects suffered low BMD and 7.7% had osteoporosis with low lifestyle score. Women with normal femoral BMD did not have low lifestyle score; based on Fisher's test, there was a significant difference in distribution of lifestyle score in terms of femoral BMD (P≤0.001). Lifestyle was low for 2.9% of women with normal lumbar spine BMD and 9.4% of women with BMD loss. In contrast, high lifestyle was observed in 71.4% of normal, 34.4% of osteopenic and 23.1% of osteoporotic cases. Based on Fisher's test, there was a significant difference in distribution of lifestyle score in terms of lumbar spine BMD (P=0.002). Among 38 patients with BMD loss, 44.7% had average and 52.6% had high lifestyle. Among 28 patients with osteoporosis, 71.4% had average and 17.9% had high lifestyle. According to Fisher's test, there was a significant difference in distribution of lifestyle score in terms of BMD (P =≤0.001). The mean score of diet and stress management was 7.6 ± 1 and 24.4 ± 5, respectively. One-way ANOVA showed a significant relationship between BMD and diet (P =0.005). The mean score of physical activity, substance abuse and social and interpersonal relationships was 7.3 ± 3.5, 10.9 ± 3.7 and 21.6 ± 4.2, respectively. One-way ANOVA showed no significant relationship between BMD and safety and prevention, physical activity and social and interpersonal relationships (Table 5).

Table-5: mean and standard deviation of lifestyle score in terms of BMD.

Lifestyle variables	BMD	Mean	Standard deviation	P
Diet	Normal	8.2	1.7	0.005
	Osteopenic	7.9	1.6	
	Osteoporotic	6.9	1.3	
	Total	7.6	1.6	
Substance abuse	Normal	7.6	3.2	0.46
	Osteopenic	7.6	3.5	
	Osteoporotic	6.6	3.5	
	Total	7.3	3.5	
Physical activity	Normal	11.9	3.7	0.1
	Osteopenic	11.4	3.9	
	Osteoporotic	9.7	3.4	
	Total	10.9	3.7	
Stress management	Normal	26.4	3.5	0.024
	Osteopenic	25.2	4.7	
	Osteoporotic	22.4	5.6	
	Total	24.4	5	
Social and interpersonal relationships	Normal	22.2	3.3	0.08
	Osteopenic	22.4	3.5	
	Osteoporotic	20.1	5.1	
	Total	4.2	21.4	

The results showed a significant relationship between diet and stress management and osteoporosis in women referred to the bone densitometry centers.

Discussion

A significant relationship was found between diet and osteoporosis (P = 0.005). These findings are consistent with Mahan Escott, Burger et al who have noted the effects of caffeine on BMD (Mahan and Escott, 1996; Burger et al., 1998) while Jamshidian, Filip, and Micklesfield found no relationship between coffee consumption and osteoporosis. (Jamshidian-Tehrani et al., 2004; Filip et al., 2005; Micklesfield et al., 2005).

Environmental factors such as lifestyle and diet can be important in interpreting the results. This study found no significant relationship between physical activity and BMD in women. This is consistent with Jamshidian, Filip et al who argued that only relatively intense strength training and aerobic exercise were effective in prevention of osteoporosis. (Jamshidian-Tehrani et al., 2004; Filip et al., 2005). Keramat, Stransky et al reported that physical activity could increase calcium absorption and BMD, which is inconsistent with the present study (Keramat et al., 2008; Stransky and Rysava, 2009).

These inconsistencies can be attributed to different lifestyles and genetic differences of people. The results showed a significant relationship between stress management and BMD (P=0.024), which is consistent with Zabihi et al who suggested that patients with major depression had lower BMD and higher osteoporosis than controls (Zabehi Yagane et al., 2012). However, Saei Gharenaz et al found no significant relationship between BMD and depression (Saei Gharenaz et al., 2014). This difference can be attributed to different methodologies used for the studies as well as inclusion criteria.

No significant relationship was found between substance abuse and BMD.

Nikpour et al found no significant relationship between current smoking and osteoporosis, which is consistent with the present study (Nikpour et al., 2009). Dermann et al reported that smoking and alcohol consumption led to low BMD in adolescents (Dermann et al., 2008). Kanis et al showed that hookah smoking is a risk factor for osteoporosis and osteopenia (Leslile et al., 2012).

This study found no significant relationship between social and interpersonal relations and BMD, while Hassanzadeh et al found a significant relationship between social activities and interpersonal relations and osteoporosis (Hassanzadeh et al., 2012). This difference can be explained by gender and cultural differences.

Conclusion

Findings of this study showed a significant direct relationship between BMD and lifestyle. Lower lifestyle is associated with BMD loss. Osteoporosis and osteopenia is more prevalent in women with lower living standards. Moreover, diet is the most important lifestyle variable effective on osteoporosis. Considering the high prevalence of food insecurity among Iranian women, lack of healthy nutrition and wrong food culture, it is recommended to promote public awareness on lifestyle and provide food sources containing inorganic compounds, particularly calcium and vitamins, public sports and mobility for elderly in order to provide better knowledge, attitude and performance regarding lifestyle and prevent the prevalence of osteoporosis in society, particularly among older women.

In evaluating the results, there were limitations; for example, genetic factors were not considered in BMD and health of subjects was only evaluated by the questionnaire. Separate studies on males and females as well as specific age groups, such as pre- and post-menopausal women can provide accurate results.

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