



The relation of household food security with osteoporosis in 40-50 year non-menopausal women referred to Karaj DEXA center

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ABSTRACT

Osteoporosis is now recognized as a community health problem, and its complications can impose a lot of financial and psychological damage to the community. This study was conducted to investigate the relationship between food insecurity with osteoporosis in 40 to 50-year-old non-menopausal women. In this study, 280 non-menopausal women aged 40 to 50 years old referred to the Alborz Bone Mineral Density Center (Karaj, Iran) in a case-control study were compared in two groups of 140 with osteoporosis and normal bone in 2018. The Household Information Insecurity Access Scale (HFIA) was completed. Finally, the data were analyzed using χ^2 and one-way ANOVA and correlation. In this study, there was a significant relationship between food security and osteoporosis ($p < 0.001$). 77.9% of healthy subjects and 87.1% of people with osteoporosis had food insecurity. The associated factors with osteoporosis were the age ($p = 0.01$), number of children ($p = 0.002$), number of breastfeeding months ($p < 0.001$), age of menarche ($p = 0.001$), exposure to direct sunlight ($p = 0.05$), physical activity ($p < 0.001$), history of osteoporosis ($p = 0.018$), economic status ($p < 0.001$) and smoking ($p = 0.02$). After the adjustment of confounding factors in the regression analysis, predictive factors for osteoporosis were the age of menarche, physical activity, and household economic status. Considering the factors associated with osteoporosis and the association of food insecurity with osteoporosis in non-menopausal women, provision of proper nutrition guidelines and preventive measures seem to be necessary.

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1. Introduction

Osteoporosis is an age-related metabolic disorder that is more common in women and causes demineralization of the bone as a result of fracture (1). This disease occurs when bone mineral density decreases significantly (2). Studies show that about 25 million women and 12 million people in the world are affected by the disease. In Iran, 41.7% of women and 10.2% of men with osteoporosis have lumbar spine and 4.7% of women and 1.2% of men with femoral osteoporosis. The economic consequences of this disease are also significant, according to the Ministry of Health, the annual cost of pelvic bone fracture in Iran is between \$ 8,000,000 and \$ 16,000,000 (3). Several risk factors, such as nutritional patterns, physical activity level, and body mass index, contribute to the incidence of this disease, all of which are factors to change (4-6). Considering the high prevalence of osteoporosis and the high

cost of treatment, and also considering the importance of controllable factors such as balanced diet and appropriate physical activity in the onset of this disease, this study was conducted to determine the association between osteoporosis and its related factors. With food insecurity, women were referred to the Alborz Bone Density Center in Karaj.

2. Materials and methods

This case-control study was conducted on 280 non-menopausal women between the ages of 40 to 50 years referred to Alborz Bone Density Assessment Center (Karaj, Iran). The study of the population consists of 140 patients diagnosed with osteoporosis and 140 patients with normal bone density. Participants were provided with the objectives of the study. Following by filling out the consent form by the participants; the researcher made a socioeconomic

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questionnaire. The questionnaire included questions about the socioeconomic status, demographic variables (age, marital status, ethnicity), socioeconomic status (level of education, employment status), lifestyle and health status (smoking, physical activity, number of pregnancies, age of the first pregnancy, history of multi-treatment, history of lactation, total lactation period, duration of pregnancy, duration of exposure to sunlight, age of menarche) were collected by means of a face-to-face interview with demographic questionnaire. Also, a nine-point questionnaire on nutritional and food safety (HFIAS) was completed. 8-item household food security scale developed by the U.S. Department of Agriculture were used respectively to extract general information as well as the food security status of the participants. The questionnaire includes 9 questions about occurrence followed by the frequent occurrence, which are respectively the severity of food insecurity (in terms of access). For each question, there are five answers to the number of times that this situation is experienced: the question is many times (0=never, 1=rarely (one or two times), 2=sometimes (three to ten times), 3=often (more than ten Times) is considered for one month (30 days ago). Then, after answering these questions, people are divided into 4 categories: safe food, mild insecurity, moderate insecurity, and severe insecurity. On the same day, anthropometric indices including height, weight were measured according to standardized protocols and BMI was calculated. Exclusion criteria included having any type of chronic diseases such as diabetes, kidney and liver problems, hypothyroidism and hyperthyroidism, alcohol consumption, history of hormone therapy and corticosteroid therapy, consume calcium supplements or any other supplements over the past year.

DEXA (Dual Energy X-ray Absorptiometry) method was used to determine the BMD and bone mass of the subjects, which is a gold standard for the diagnosis of osteoporosis and osteopenia (6). The device used was a Discovery W Series bone densitometer for the QDR series of the American Hologic Discovery W factory. The BMD of the women was measured in the left femoral neck and lumbar spine (L1-L4) in grams per centimeter by the technician of the bone densitometry center of Alborz hospital and DEXA method. The results were analyzed by a rheumatologist and the bone mass condition in each of the studied areas. The determination of bone mass according to WHO criteria was performed according to which the values of T score are greater than 1 indicates the normal bone mass, values between 1 to 2.5 represent osteopenia and values less than 2.5 indicates osteoporosis. The level of physical activity of individuals was categorized as follows: Low physical activity; without targeted physical activity, Medium physical activity; less than 150 minutes per week, and Extreme physical activity; have more than 150 minutes of physical activity per week. The level of exposure to direct sunlight considered as follows: No exposure to direct sunlight during daytime; no exposure, Low exposure to direct sunlight during the day; less than an hour per day, and Exposure to direct sunlight during the day; more than an hour per day. Data were analyzed by SPSS software version 19.

Descriptive statistics, the Kolmogorov-Smirnov test and independent t-test, ANOVA and Chi-square and correlation as well to predict the relationship between food security with osteoporosis as a multi-variable linear regression test were used.

3. Results

Based on demographic data (Table 1), the mean age of women was 37.45 ± 11.3 years old and 83% were married. The mean body mass index was 28.8 ± 21.42 . Mean and standard deviation of marriage age in the case and control groups were 30.21 ± 3.09 and 22.21 ± 3.68 , respectively. Approximately 61% of people with low physical activity had osteoporosis, which was 4.2% for healthy people. 11% of people with osteoporosis used cigarettes and only 3.5% of healthy people smoked.

Table 1. Demographic data.

Variable	Study group		P value*
	Case	Control	
Age of menstruation	13.05±1.67	11.59±1.50	0.001
Gravida	2.37±0.85	2.35±0.88	0.841
Number of children	1.86±0.79	2.23±0.98	0.002
Lactation duration (Month)	19.61±15.20	28.30±17.92	0.001

*P value <0.05 is considered as significant.

Based on BMI, 26 persons had normal or lean osteoporosis (18.5%). This number was 28 in healthy people (20%). Persons with osteoporosis and overweight were 60 (42.8%), and this figure was 61 (43.5%) in healthy subjects. The number of people with osteoporosis and obesity was 54 (38.5%) and the number of obese subjects was 51 (36.4%) in the healthy group. BMI was not significantly different in both quantitative and qualitative values in two healthy and osteoporotic groups.

The results of exposure to direct sunlight and physical activity have shown in Table 2. Results showed that patients in the case group had lower physical activity and lower exposure to medium sunlight (p-value=0.001 and 0.05, respectively).

Table 2. Results of exposure to direct sunlight and physical activity.

Variables		Study groups		P value
		Case	Control	
Exposure to direct sunlight	Low	92(65.7)	78(55.7)	0.05
	Medium and High	48(34.2)	62(44.2)	
Physical activity	Low	85(60.7)	34(24.2)	0.001
	Medium	52(37.1)	82(58.5)	
	High	3(2.1)	24(17.1)	

The absolute and relative abundance of food security categorization have shown in Table 3. Food insecurity was consistently associated by using chi-square analysis (p=000). Spearman correlation test showed that food insecurity had a significant direct correlation with osteoporosis (correlation coefficient=0.27 and p=000). Even when controlled for potential confounders in multivariate linear and regression analyses (demographics, socioeconomics, BMI; body mass index).

Table 3. The absolute and relative abundance of food security categorization.

Variable	Study groups		P value	
	Case	Control		
Food insecurity	Severe	14 (10%)	10 (7.1%)	0.05
	Moderate	66 (47.1%)	25 (17.9%)	
Food security	Mild	42 (30%)	74 (52.9%)	0.001
	Secure	18 (12.9%)	31 (22.1%)	

4. Discussion

As far as we know, this study is the first study to examine the relationship between food security and osteoporosis of non-menopausal women. The results showed that 87.14% of the subjects had osteoporosis and 77.85% of the healthy subjects were food insecure (mild, moderate and severe), and the two groups showed a significant difference in terms of food security and the highest insecurity rates in all studies in Iran (7-9). The findings of the present study indicate that more than half of overweight and obesity patients, according to the studies of Zhao et al. (10), have no protective effect on bone mass. Researches have shown that physical activity is effective during osteoporosis in the second and third decades of life, and that middle-aged risk factors are hormonal and genetic factors (11, 12). The consistent study was Wang et al. (13) found that individuals with osteoporosis had fewer physical activity. Baczyk et al. (5) also observed significant relationships. Nguyen et al. (14) stated in his study that lack of physical activity can reduce bone density. Tanko et al. (15) reported that obese women have the least bioavailability to estradiol. Therefore, since estrogen levels can affect bone mineral density, obesity can also be effective in reducing bone mass. Also, most of participants had little physical activity in this study, which is similar to the results of other studies (16, 17). Physical activity appears to be directly affected by mechanical or indirect pressure by hormonal agents on bone metabolism (18). Osteoporosis is a disease that is known to reduce bone density and loss of bone quality gradually. Since osteoporosis is a chronic disease that manifests over time, food security and the extent to which a person follows a healthy diet can be associated with the disease. In addition, food security is considered as an indicator of individual health, and food insecurity and hunger can have adverse social and physical effects (19). The present study was conducted on non-Iranian women with the goal of assessing food insecurity before reaching menopause and accelerating their disease due to endogenous estrogen deficiency, only the one study pointed at the relationship between osteoporosis and food security, which was done on postmenopausal women. Considering that the association of food insecurity with osteoporosis was significant in women and also in general, both healthy and patients with food insecurity were more than 75%, so national planners should reduce food insecurity in society, especially women, attention should be paid to measures to improve the economic situation and to reform the dietary patterns of the household. Given the high prevalence of food insecurity in both healthy people and patients. Educating of women's groups of society about the principles of nutrition seems to be

necessary. Finally, by performing multivariate regression analysis, the most important predictors of osteoporosis were the age of menarche, physical activity, and economic status. The study consistent with the present study in order to significance of the relationship between subject's height and food security (20).

5. Conclusion

Due to the high cost of measuring bone density and a small number of non-menopausal clients for this test in private clinics, sampling was done for study at the Center for Bone Density Assessment at Alborz Social Security Hospital, so sampling from different community groups was not performed. A similar study is recommended in different age groups and groups of men is suggested. Also, we suggest studies in private and public centers together to explore the diversity of people in the community. In order to prove strong causative relationships, it is better to investigate the association of food insecurity with osteoporosis in prospective studies.

Ethical approval

This study, with the code IR.IAU.SRB.REC.1396.112 has been approved by the Ethics Committee of the Research Center of Islamic Azad University, Science and Research Branch of Tehran.

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