

Food Habits Related To Osteoporosis in Women in Iran

Maryam Rafrat¹, *Behnaz Bazyun²

¹Nutritional Research Center, Faculty of Health and Nutrition, Tabriz University of Medical Sciences, Tabriz, Iran

² Students' Research Committee, Faculty of Health and Nutrition, Tabriz University of Medical Sciences, Tabriz, Iran

(Received : 30 July 2011/ Accepted : 19 Nov 2011)

ABSTRACT

Background: Osteoporosis is an important public health problem. The aim of this study was to investigate food habits and some factors related to osteoporosis in women in Iran.

Methods: This cross-sectional study was conducted on 399 childbearing age women who were attending health centers and 200 healthcare providers in 2007. Food habits and dietary calcium intake was evaluated by food frequency questionnaire and 24-hour recall method. Weight and height of subjects were also measured. Independent *t*-test, Mann-withney U test, Pearson, Spearman and Partial correlation coefficient tests were used for analyzing of data.

Results: Two groups of women had calcium intake deficiency. Daily frequency of milk, cheese, fruit and coffee consumptions in healthcare providers (0.82 ± 0.82 , 0.94 ± 0.49 , 2.01 ± 1.28 and 0.84 ± 2.05 , $P<0.02$) were significantly higher than those of women attending health centers (0.58 ± 0.72 , 0.84 ± 0.32 , 1.50 ± 0.99 and 0.48 ± 1.25). Mean frequency use of dark vegetables, cola and pickles were significantly ($P<0.004$) higher in women who attending health centers (0.67 ± 0.50 , 1.55 ± 2.36 and 1.92 ± 2.03) than those of the other group (0.50 ± 0.44 , 1.09 ± 2.65 and 1.49 ± 1.72). In women who were attending health centers, negative and positive significant relationship was found between daily calcium intake with age ($P<0.04$) and educational level ($P<0.001$). No significant relationship was found between body mass index with studied variables.

Conclusion: Women of health care providers had healthier food habits compared to women who attending health centers. Educational programs are suggested to improve food habits among women to prevent osteoporosis in later life.

Keywords: Women, Food Habits, Osteoporosis, Iran

Introduction

Osteoporosis is a systemic metabolic disease resulting in low bone mass, and deterioration of bone structure, which increases the risk of fracture [1].

Several medications have recently being labeled for the treatment of osteoporosis, but their marginal benefits require careful consideration of their cost. Prevention is preferable to treatment since no

therapy fully restores lost bone mass. The attainment of a higher peak bone density has an important role in the prevention of osteoporosis later in life.

It is also known that the prevalence of osteoporosis varies from country to country, and within countries [2]. Ethnic differences in bone mass density (BMD) are well known. Blacks have greater BMD

*Corresponding Author: Behnaz Bazyun Tel: +98 9143095054;

E-mail: behnaz_bazyun@yahoo.com

than Caucasians. Hispanics are similar to Caucasians, while Asians have the lowest BMD [3]. The real incidence of osteoporotic fractures in Iran might be underestimated because of poor health records in our country. However, The results of one study on 553 subjects (34% men, 66% women) aged 20–69 yr, randomly selected from 50 blocks in Tehran (the capital of Iran), indicated that the prevalence of osteoporosis of the lumbar spine and femur was 32.4% and 5.9% in women and 9.4% and 3.1% in men, respectively [4].

For primary prevention of disease, it is important to achieve a healthy lifestyle [5]. Adequate nutrition plays a major role in the prevention and treatment of osteoporosis. Most of the attention in research and public health efforts has been directed towards the role of calcium, dairy foods and vitamin D in bone health [6]. Calcium is an essential nutrient for bone health because its insufficient intake could adversely affect age-related bone loss and attainment of peak bone mass [7]. Higher calcium intakes have been related to higher bone mass in children, young adults, and postmenopausal women in 64 out of 86 observational epidemiologic studies [8]. In Jahrom, Iran, 89% of women aged >45 years, had calcium intake deficiency [9]. In urban areas of Iran, revealed that osteoporotic postmenopausal women had significantly lower milk, cheese, and fruit intakes than healthy ones [2]. More recently recommendations to consume a diet rich in fruits and vegetables as a preventive measure against risk of low-energy fractures has been given with increasing frequency in reviews of diet and bone health. Fruits and vegetables are key dietary sources of magnesium, potassium, vitamin C, vitamin K and folate, adequate quantities of which have been associated with higher bone mineral density (BMD), decreased bone loss with ageing or reduced risk of fracture [6]. Studies have consistently shown that higher fruit and vegeta-

ble intakes have positive effects on bone mineral status [10].

Taking in to consideration those food habits, calcium intake and some other factors such as educational level and body mass index (BMI) status of child bearing age women may be associated with osteoporosis in later life, we conducted this study to evaluate food habits regarding to osteoporosis and variables mention above in women in Tabriz, Iran.

Materials and Methods

Fifteen health centers (30% of total health centers of Tabriz, Iran) were randomly selected and 399 healthy child-bearing age women who attended these health centers during 3 months of study were included. Women of health care providers (n=200) in health centers also were studied in this cross-sectional study in 2007. Inclusion criteria were non pregnancy, non lactating, age between 15-49 yr. Subjects with any known history of diseases including diabete, cardiovascular, bone and other disease and also users of vitamin D and calcium supplements were excluded of study. Informed oral consent was obtained from each subject prior to study. The Nutritional Research Center of Tabriz University of Medical Sciences approved the study protocol (registration number: 5/71/831; 2006). Information about general characteristics was obtained by interviewing with subjects. Food habits regarded to osteoporosis including consumptions of dairy products, vegetables, beans and fruit as healthy foods and cola, coffee ,and pickles, as unhealthy foods were evaluated by semi quantitative food frequency questionnaire (FFQ). The potion sizes of food items based on exchange list were included in FFQ. Participants were asked to recall the frequency consumption of food items in FFQ based on portion sizes as daily or weekly in the past year. Dietary calcium intake was evaluated by 24- hour recall method completed for three

days including 2 weekdays and 1 weekend. Weight and height of subjects were measured with 0.1 kg and 0.5 cm, accuracy, respectively and BMI was calculated as the weight in kilograms divided by height in meters squared.

Statistical analysis was performed with SPSS for Windows; version 11.5. The results were considered statistically significant if $P < 0.05$. The FP2 (food processor) software used for analyzing of food intakes data gathered by 24-hour recall method. Mean and frequency of variables were determined. Independent *t*-test, Mann-withney U test, Pearson, Spearman and partial correlation coefficient tests were used for analyzing of data.

Results

Table 1 shows the general characteristics of the participants. The mean of age in women who attending health centers (group 1) and health care providers (group 2) were 33.13 ± 7.51 and 37.85 ± 7.91 yr old, respectively. Majority of subjects who were attending health centers had educational level at grade 8 or less. Based on independent *t*-test, the mean of BMI in group 1 was significantly higher than that of group 2 ($P < 0.001$).

Table 2 shows the mean of food consumption frequency and daily calcium intake in both groups of studied subjects. Mann-withney U test indicated that mean frequency use of milk, cheese, fruit and coffee in women of health care providers were significantly higher than those of women who attended health centers ($P < 0.001$, $P < 0.01$, $P < 0.001$ and $P < 0.02$, respectively). Mean frequency use of dark vegetables, cola and pickles also were significantly higher in women who attending health centers than those of health care providers ($P < 0.003$, $P < 0.001$ and $P < 0.004$, respectively). No significant differences were found for consumption of other foods between two groups.

There were significant adverse relationship between daily calcium intake and age, as daily calcium intake decreased with age ($r = -0.1$, $P < 0.04$), and positive relationship between daily calcium intake and educational level ($r = 0.18$, $P < 0.001$) in women who attending health centers by pearson correlation coefficient test and spearman correlation coefficient test, respectively. Based on partial correlation coefficient test, no significant correlation was found between BMI with frequency of foods and calcium intake by adjusting age in both groups (data are not shown).

Table 1: Demographic and anthropometric characteristics of the participants

Variables	Group 1	Group 2
	(n=399)	(n=200)
	Mean \pm SD or(%)	Mean \pm SD or(%)
Age(yr)	33.13 ± 7.51	37.85 ± 7.91
Educational level %		
Illiterate	(9.3)	(0)
Grade 5 or less	(24.6)	(0)
Grade 8	(22.8)	(0)
Completed grade 12	(35.8)	(13.5)
University or other tertiary institution	(7.5)	(86.5)
Weight (kg)	67.96 ± 12.45	66.41 ± 11.04
Height (cm)	157.59 ± 5.86	159.52 ± 5.86
BMI (kg/m ²)	27.40 ± 4.95	$26.07 \pm 3.92^*$

Group 1: women who attending health centers

Group 2: women of health care providers

* Significant statistical difference between two groups by Independent *t*-test ($P < 0.001$)

Table 2: Mean of food consumption frequency and daily calcium intake in studied subjects

Variables	Group 1	Group 2	P
	Mean ± SD	Mean ± SD	
Milk (1 cup/day)	0.58 ± 0.72	0.82 ± 0.82	0.001*
Yogourt (3/4 cup/day)	1.25 ± 0.94	1.38 ± 1.02	0.12
Cheese (1slice(30gr)/day)	0.84 ± 0.32	0.94 ± 0.49	0.01*
Dried whey (1 Tbsp/week)	0.28 ± 0.51	0.53 ± 2.69	0.06
Ice cream (1/4 cup/week)	1.20 ± 1.54	1.29 ± 1.76	0.87
Cabbage (shredded,1 cup/week)	0.85 ± 1.15	1.21 ± 1.74	0.08
Spinach ((shredded,1 cup/week)	1.001 ± 1.34	0.83 ± 1.10	0.05
Beans (Cooked,1/2 cup/week)	1.73 ± 1.15	1.69 ± 1.23	0.44
Dark vegetables ((shredded,1 cup/day)	0.67 ± 0.50	0.50 ± 0.44	0.003*
Fruit (1 serving/day)	1.50 ± 0.99	2.01 ± 1.28	0.001*
Cola (1 cup/week)	1.55 ± 2.36	1.09 ± 2.65	0.001*
Coffee (1 cup/week)	0.48 ± 1.25	0.84 ± 2.05	0.02*
Pickles (1 Tbsp/week)	1.92 ± 2.03	1.49 ± 1.72	0.004*
Calcium intake (mg/day)	689.08 ± 393.15	755.93 ± 450.46	0.12

Group 1: women who attending health centers

Group 2: women of health care providers

1 cup= 240cc

Tbsp= Table spoon

* Significant statistical difference between two groups by Mann-withney U test

Discussion

Osteoporosis has recently been recognized as a major public health problem by some governments and health care providers [11]. Prevention is the most cost-effective means of managing osteoporosis [12]. One of the important preventive habits is diet [13-17]. The role of nutrition is perhaps the most controversial area in the causation of osteoporosis [2].

Our findings (Table 2) indicated that, mean daily calcium intake in both studied groups was lower than recommended level (1000 mg), thus increasing the risk of osteoporosis [19]. Similarly, non adequate calcium intakes have been reported in women in other studies [19-23]. It was shown that 89% of women in Jahrom, Iran, had calcium intake lower than 1200 mg/day [9]. Studies on women of other countries such as Caucasian and African-American and Hispanic women in the US, and Asian and Caucasian women in Australia, also have shown that most of women

did not fulfill the suggested calcium intake [24-26]. The results of the present study and studies mentioned above shows that although women are under risk of osteoporosis, but their calcium intakes are not adequate.

As indicated in Table 2, mean frequency of milk and cheese intake which accounted as important resources of calcium, were lower than 1 times per day in both groups of women. However mean frequency consumption of those foods in healthcare providers were significantly higher than women who attending health centers. Yogurt consumption was more frequent than milk and cheese in both groups. So, it seems that yogurt is the main source of calcium intake in studied subjects. Low frequency consumptions of dairy foods such as milk and cheese also reported in osteoporotic postmenopausal women in urban areas of Iran [2].

Mean frequency consumption of fruit in women of health care providers (Table 2) was significantly higher than that of group 1. According to other studies, higher fruit and vegetable intake was associated with greater BMD in men and women [2]. The women's health initiative (WHI) dietary modification trial which was the first large-scale randomized trial to test the effect of increased fruit, vegetable, and grain dietary pattern on the risk of osteoporotic fractures in postmenopausal women, also demonstrated that increased fruit and vegetable diet intervention modestly reduced the risk of multiple falls and slightly lowered hip BMD in postmenopausal women [27]. A 3-mo dietary approaches to stopping hypertension (DASH) intervention study involving 186 men and women aged 23–76 y found that a diet high in fruit and vegetables significantly reduced bone turnover [28]. The DASH diet reduced significantly serum osteocalcin by 8–11% and C-terminal telopeptide of type I collagen by 16–18% compared with controls [29]. In Iran daily consumption of fruits was shown as a protective factor in subjects against osteoporosis [2]. Therefore, by considering beneficial effects of milk and fruit in prevention of osteoporosis, it seems that in our studied population (Table 2), women of healthcare providers had better food habits regarding to milk, cheese and fruit consumption than group 1. However, food habit regarding to consumption of dark vegetables was better in women who were attending health centers than group 2 (Table 2). The low frequency use of dark vegetables in healthcare providers compared to group 1 might be resulted of their employment and so, not having adequate time for cleaning of these foods.

Daily drinking of several cups of caffeinated coffee and colas increases urinary calcium loss. High drinking of the carbonated colas containing high phosphorous will be resulted lower calcium/phosphorous ratio in blood and reduced calcium resource in bones. A high sodium intake

also contributes to lower renal resorption of calcium and higher urinary calcium losses [18]. Our results (Table 2) showed that, habits of coffee consumption in women of health care providers, and cola and pickles use in women who were attending health centers were not healthy compared to each other.

The finding of positive significant correlation between calcium intake and educational levels of women, who were attending health centers in our study, indicates that higher educational level may be associated with healthier diet. Similarly, positive correlation between calcium intake and educational levels of women has been reported [30]. Higher educational level may be related to higher income, and therefore choosing better sources of calcium such as milk and milk products. Thus, women with low educational level are at risk of osteoporosis more than others. Reverse effects of education level on osteoporosis have been reported in some other studies. The reason probably is the effect of education on lifestyle, nutrition and economic status. The other possibility is the effect of economic status in education level [2].

Negative significant correlation between calcium intake and age in group 1 may be related to low attention or knowledge level of older subjects about nutritional status. No significant relationship between daily calcium intake with age and educational level in women of health care providers, maybe somehow due to similarity of educational level in this group.

There were no significant statistics relationships between BMI with calcium intake and daily frequency of foods by adjusting age in both groups of our study. Some other studies showed similar results [31-33]. High calcium intake may reduce overweight and obesity. Suggested mechanisms are, reduced parathormone secretion, and 1,25 (OH) vitamin D, which inhibit lipogenesis and increasing fecal excretion of lipids [18]. Based on results (Table 2),

calcium intake in both groups was lower than recommended allowances. So, being not significant relationship between these two variables may be due to calcium intake deficiency in our studied subjects.

As a conclusion, low calcium intake as an important health problem was prevalent in studied subjects. Women of health care providers had better food habits regarding to consumption of milk, cheese, fruit, cola and pickles compared to women who attending health centers. Habits of dark vegetable and coffee consumptions were better in women who attending health centers than the other group. Establishment of educational interventions is suggested as a primary approach to prevention of osteoporosis in our community.

Acknowledgments

We thank the Nutritional Research Center of Tabriz University of Medical Sciences, Tabriz, Iran for financial support, and the women who participated in the study. The authors declare that there is no conflict of interests.

References

- [1] Langsetmo L, Poliquin S, Hanley DA, Prior JC, Barr S, Anastassiades T. Dietary patterns in Canadian men and women ages 25 and older: relationship to demographics, body mass index, and bone mineral density. *BMC Musculoskelet Disord* 2010; 11(20): 1-11.
- [2] Keramat A, Patwardhan B, Larijani B, Chopra A, Mithal A, Chakravarty D, et al. The assessment of osteoporosis risk factors in Iranian women compared with Indian women. *BMC Musculoskelet Disord* 2008; 9(28):1-10.
- [3] Handa R, Ali Kalla A, Maalouf G. Osteoporosis in developing countries. *Best Pract Res Clin Rheumatol* 2008; 22(4): 693-708.
- [4] Larijani B, Hossein-Nezhad A, Mojtahedi A. Normative data of bone mineral density in healthy population of Tehran, Iran: a cross sectional study. *BMC Musculoskelet Disord* 2005; 6(38): 1-6.
- [5] Yahata Y, Aoyagi K, Okano K, Yoshimi I, Kusano Y, Kobayashi M, et al. Metacarpal bone mineral density, body mass index and lifestyle among postmenopausal Japanese women: relationship of body mass index, physical activity, calcium intake, alcohol and smoking to bone mineral density: the hizen-Oshima study. *Tohoku J Exp* 2002; 196(3): 123-9.
- [6] Thorpe DL, Knulsen SF, Beeson WL, Rajaram S, Fraser GE. Effects of meat consumption and vegetarian diet on risk of wrist fracture over 25 years in a cohort of peri- and postmenopausal women. *Public Health Nutr* 2008; 11(6): 564-72.
- [7] Uenishi K, Ishida H, Nakamura K. Development of a simple food frequency questionnaire to estimate intake of calcium and other nutrients for the prevention and management of osteoporosis. *J Nutr Sci Vitaminol* 2008; 54(1):25-9.
- [8] Nieves JW. Osteoporosis: the role of micronutrients. *Am J Clin Nutr* 2005; 81(suppl):1232S-9S.
- [9] Shahsavari Isfahani S and Mosallanezhad L. Assessment of daily calcium intake in women aged older than 45 years in Jahrom, Iran. *Proceeding of the Eighteen Iranian Nutrition Congress* 2004; 355-6.
- [10] Sahni S, Hannan M, Blumberg J, Cupples LA, Kiel DP, Tucker KL. Inverse association of carotenoid intakes with 4-y change in bone mineral density in elderly men and women: the Framingham Osteoporosis Study. *Am J Clin Nutr* 2009; 89(1):416-24.
- [11] Kutsal YG, Atalay A, Arsalan S, et al. Awareness of osteoporotic patients. *Osteoporos Int* 2005; 16(2):128-33.
- [12] Orces CH, Casas C, Lee S, et al. Determinants of osteoporosis prevention in low-income Mexican-American women. *South Med J* 2003; 96(5):458-64.
- [13] Chang SF, Hong CM, Yang RS. Cross-sectional survey of women in Taiwan with first-degree relatives with osteoporosis: knowledge, health beliefs, and preventive behaviors. *J Nurs Res* 2007; 15(3):224-32.
- [14] Von Hurst PR, Wham CA. Attitudes and knowledge about osteoporosis risk prevention: a survey of New Zealand women. *Public Health Nutr* 2007; 10(7):747-53.
- [15] Suleiman S, Nelson M, Li F, Buxton M, Moniz C. Effect of calcium intake and physical activity level on bone mass and

- turnover in healthy, white, postmenopausal women. *Am J Clin Nutr* 1997; 66(4):937-43.
- [16] Carlsson L, Johnson CS. Osteoporosis health beliefs and practices among Korean immigrants in Nova Scotia. *J Immigr Health* 2004; 6(2):93-100.
- [17] Sato Y, Tamaki J, Kitayama F. Development of a food-frequency questionnaire to measure the dietary calcium intake of adult Japanese women. *Tohoku J Exp Med* 2005; 207(3):217-22.
- [18] Gallagher ML. The nutrients and their metabolism. In: Krause's Food & Nutrition Therapy . Mahan LK , Escott – Stump S . 12th ed , Saunders Company, Canada. 2008 PP: 105-110.
- [19] Hernandez-Rauda R, Martinez-Garcia S. Osteoporosis-related life habits and knowledge about osteoporosis among women in EL Salvador: a cross-sectional study. *BMC Musculoskelet Disord* 2004; 5(29): 1-14.
- [20] Saw SM, Hong CY, Lee J. Awareness and health beliefs of women towards osteoporosis. *Osteoporos Int* 2003; 14(7):595-601.
- [21] Winzenberg TM, Riley M, Frendin S. Socio-demographic factors associated with calcium intake in premenopausal women: cross-sectional study. *Eur J Clin Nutr* 2005; 59(3):463-6.
- [22] Winzenberg TM, Riley M, Frendin S. Socio-demographic factors associated with calcium intake in premenopausal women: cross-sectional study. *Asia Pac J Clin Nutr* 2003; 12 suppl:S25.
- [23] Kasper MG, Peterson MG, Allegrante JP. Knowledge, beliefs and behaviors among-college women concerning the prevention of osteoporosis. *Arch Fam Med* 1994; (8):696-702.
- [24] Kasper MJ, Peterson MG, Allegrante JP. The need for comprehensive educational osteoporosis prevention programs for young women: results from a second osteoporosis prevention survey. *Arthritis Rheum* 2001; 45(1):28-34.
- [25] Liew YL, Mann D, Piterman L. Osteoporosis risks; A comparative study of Asian Australian and Caucasian Australian women. *Aust Fam Physician* 2002; 31(3):291-7.
- [26] 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.
- [27] Prentice RL, Caan B, Chlebowski RT. Low-fat dietary pattern and risk of invasive breast cancer: the Women's Health Initiative Randomized Controlled Dietary Modification Trial. *JAMA* 2006 ; 295(6):629-42.
- [28] Lin PH, Ginty F, Appel LJ. The DASH diet and sodium reduction improve markers of bone turnover and calcium metabolism in adults. *J Nutr* 2003; 133(10):3130-6.
- [29] McTiernan A, Wactawski-Wende J, Wu L, Rodabough RJ, Watts NB, Tylavsky F. Low-fat, increased fruit, vegetable, and grain dietary pattern, fractures, and bone mineral density: the Women's Health Initiative Dietary Modification Trial. *Am J Clin Nutr* 2009; 89(6):1864-76.
- [30] Winzenberg TM, Riley M, Frendin S. Socio-demographic factors associated with calcium intake in premenopausal women: cross-sectional study. *Asia Pac J Clin Nutr* 2003; 12 suppl:S25.
- [31] Rosell M, Hakanson NN, Wolk A. Association between dairy food consumption and weight change over 9 y in 19,352 perimenopausal women. *Am J Clin Nutr* 2006; 84(6): 1481-8.
- [32] Gunther CW, Legowski PA, Lyle RM, McCabe GB, Eagan MS, Peacock M, et al. Dairy products do not lead to alteration in body weight or fat mass in young women in a 1-y intervention. *Am J Clin Nutr* 2005; 81(4): 751-6.
- [33] Rajpathak SN, Rimm EB, Rosner B, Willett WC, Hu FB. Calcium and dairy intakes in relation to long-term weight gain in US men. *Am J Clin Nutr* 2006; 83(3):559-66.