

Assessments of dietary pattern and nutritional intake in osteoporotic patients in Tabriz

Marjan Mahdaviroshan*¹, Mehrangiz Ebrahimimeghani²

¹Students' Research Committee, National Nutrition and Food Technology Research Institute Faculty of Nutrition Sciences and Food Technology, Shahid Beheshti University of Medical Sciences, Tehran, Iran

²Faculty of Health and Nutrition Sciences, Tabriz University of Medical Sciences, Tabriz, Iran

*Corresponding Author: email address: mahdaviroshan@yahoo.com (M. Mahdaviroshan)

ABSTRACT

Osteoporosis is one of the health problems that affect lives of many people. this study was designed to assess nutritional intake and dietary habit in osteoporotic patients. The population of this analytical cross-sectional study was 120 osteoporotic patients with 45-89 years old referred to rheumatologic clinic of Tabriz. Nutritional intake and dietary habit was determined by 3 day food recall and food frequency questionnaire. individual and clinical information by questionnaire and weight and height of subjects were measured by scale. Results of this study found that mean age of patients were 57.10 years old. The mean T-score of patients was $-3.31 \pm 0.07SD$. Analysis of FFQ questionnaire showed that dietary habit and food choice in osteoporotic patients was not suitable. Mean intake of zinc, calcium and vitamin D in patients was significantly lower than normal value ($p < 0.05$) and intake of protein, iron and phosphorus was higher than normal range. With notice the vital role of nutrition and dietary intake on bone mass, nutritional education and training in osteoporotic patients beside supplementation is suggested.

Keywords: dietary intake; nutrient; osteoporosis; food groups

INTRODUCTION

Osteoporosis is defined as a skeletal disorder characterized by decreased bone mass, seems to be due to an imbalance between bone resorption and bone formation at older ages [1–3]. Osteoporosis is widely recognized as a major public health problem and is related with morbidity and mortality because of its expression in age related fractures [4]. Unfortunately in recent years the age of osteoporosis prevalence especially in women has decreased. The etiology of osteoporosis is multifactorial. Many factors—genetic differences, endocrine factors and lifestyle behavior, such as physical activity and dietary habit—are thought to play a role in osteoporosis and its prevention [5].

In Iran, the prevalence of osteoporosis in men was 12.4 percent and this value in women was 55.7 percent [6]. Because of high prevalence of this disease, all people should be encouraged to take efforts to prevent osteoporosis such as not smoking, eating balanced diet, suitable food

choice and have physical activity [7]. Osteoporosis is one of the diseases that are influenced by nutrition [8]. Risk of osteoporosis may be diminished with balanced diet that containing variety of foods [9].

Studies showed that minerals and some vitamins in diet are related to bone mass and a balanced diet is crucial for bone development and bone strength. Because of high prevalence of osteoporosis in Iran and the vital role of nutrition in preventing or delaying of osteoporosis, this study was designed to assess nutritional intake and dietary habit in osteoporotic patients in Tabriz.

MATERIALS AND METHODS

This study was conducted on 120 osteoporotic women aged between 48–89 years who were referred to the rheumatology clinic in Tabriz, Islamic Republic of Iran, from January 2011 to March 2011.

All subjects signed the informed consent for participation in this study.

Osteoporosis identification was performed by bone mineral density measurements in hip and spinal column using dual-energy X-ray absorptiometry and osteoporosis was defined as T-score \leq 2.5 standard deviations (SD).

None of the patients received nutrient supplements. Body weight of each subject was measured with a standard scale to an accuracy of ± 0.1 kg, and height was measured to an accuracy of ± 0.1 cm. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m^2).

In addition dietary intake was assessed by 3-day 24-hour food recall of subjects, including 2 weekdays and 1 weekend day and dietary habit was assessed by validated food frequency questionnaire (FFQ)[10].

Statistical Package for Social Sciences version 11.5 was used for all statistical analysis. Data were presented as mean \pm SE. Pearson correlation coefficients were used to evaluate associations and 1-sample *t*-test was used for quantitative variables. *P*-values < 0.05 were considered to indicate statistically significant differences.

RESULTS

The mean age of the participants was 57.109 ± 0.69 years. The mean weight was 68.37 ± 0.72 kg and mean height was 156.71 ± 0.48 cm, also the mean body mass index of participants was 27.82 ± 0.25 Kg/m^2 . 34.5 % of patients were illiterate.

In osteoporotic patients 8.3% had history of fracture and 73% of patients had light physical activity. The mean T-score of patients was -3.31 ± 0.07 SD. Assessment of dietary intake in osteoporotic patients showed in table 1. The mean percent intake of carbohydrate, protein and fat from diet was 48.18 ± 0.66 %, 14.2 ± 0.33 % and 38.27 ± 0.7 % respectively. As showed in table 1, mean intake of calcium ($p=0.0001$), Zinc ($p=0.0001$) and vitamin D ($p=0.0001$) from diet was significantly lower than recommended dietary allowance. There was a significant correlation between education stand and dietary intake. With increasing education stand, intake of energy ($r=-0.196$ $p=0.04$), carbohydrate ($r=-0.190$ $p=0.04$) and fat ($r=-0.217$ $p=0.02$) from diet decreased also intake of protein from diet significantly decreased with increasing of age ($r=-0.313$ $p=0.001$).

Table 1. Nutrients intake in osteoporotic patients

Nutrient	Intake from diet	Percent from RDA & DRI
Energy	1934 \pm 49.81 Kcal	87.74 \pm 2.15 %
Protein	55 \pm 1.92 gr	117.76 \pm 4 %
Carbohydrate	228.13 \pm 7.53 gr	165.59 \pm 5.81 %
Calcium	732.35 \pm 26.64 mg	56.33 \pm 2 %
Phosphor	791.69 \pm 22.63 mg	110.53 \pm 3.36 %
Zinc	3.87 \pm 0.13 mg	48.51 \pm 1.67 %
Iron	9.41 \pm 0.22 mg	117.74 \pm 2.79 %
Vitamin D	84.57 \pm 6.47 UL	20.89 \pm 1.67 %

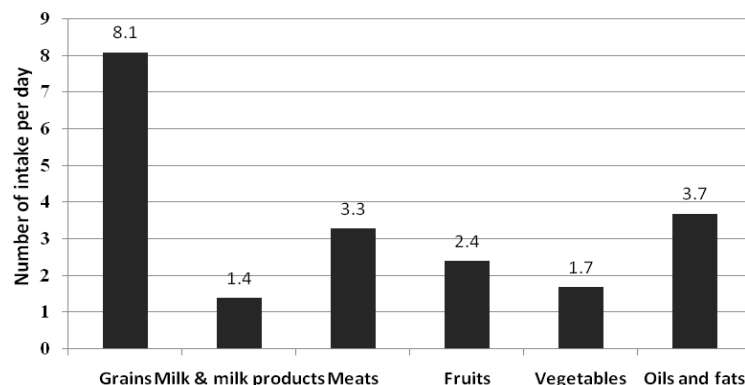


Figure 1. Food groups intake in osteoporotic patients

Assessment of dietary habit (figure 1) showed that osteoporotic patients intake Fruits ,vegetables and milk lower than recommended value . Among meats group mean intake of fish was limited to one times per months and intake of legumes was 1.6 times per week. Most of the patients (91.2%) said that for coking they used plant frying oil more than hydrogenated oil or animal oil . Analysis of nutrient intake in patients also showed that mean intake of saturated fatty acid , monounsaturated fatty acid and polyunsaturated fatty acid from diet was 17.28 ± 0.55 gr, 31.78 ± 0.74 gr and 25.27 ± 0.63 gr respectively .

DISCUSSION

The results of this study demonstrated that food choice and dietary habit in osteoporotic patients are not suitable. Among of food groups intake of milk and milk products, fruits and vegetable that are related to bone health are lower than recommended value.

In the study of Hosokawa et al [11] frequency of having unbalanced diets was significantly higher in osteoporotic patients and they had significantly lower frequency of drinking milk, and significantly higher frequency of eating meat, dried fish and eggs . Wosje et al [12] in study to identify dietary pattern related to bone health found that high intakes of dark green and yellow vegetables and limiting fried food intake has positive effect on bone mass and it may be related to high content of minerals such as potassium in vegetables and fruits. Higher dietary potassium intake is related to lower net endogenous acid production and higher bone mass in adults [9].

Heaney et al [13] in a study about relationship between diet and bone health have showed that high intake of meat that is acid forming food can increase urinary calcium and cause bone loss. One longitudinal study for 9 years reported that elevated intake of fruit, vegetables and low intake of processed food in late pregnancy was associated with greater bone mass density in the offspring at 9 years of age [14]. In Speer et al [15] study, milk consumption correlated with BMD of the total femur, whereas calcium from other foods or total daily calcium intake had no such relationship.

In this study intake of zinc ,calcium and vitamin D from diet was significantly lower than recommended value. Calcium, zinc and vitamin D, which are nutrients, were noticed in maintaining bone health with preservation of bone mineral components [16]. Czernichow et al [17] in a study To assess dietary calcium and vitamin D intake among postmenopausal women with osteoporosis in France in 2010 reported that daily vitamin D intake among this groups was significantly lower than recommended dosages but the average daily dietary calcium intake was in normal range. Speer et al in their study in 2013 [15] conclude that calcium intake in Hungarian osteoporotic patients is much lower than the current recommendation.

According to the result of Yamaguchi [16] study, Nutritional zinc has a physiologically important role in bone growth and zinc plays a pivotal role in the regulation of bone homeostasis. Some studies demonstrated that inadequate intakes of zinc are important risk factors for osteoporotic fractures [18,19]. In contrast Reginster et al [20] reported that there is no significant difference in postmenopausal women with osteoporosis in terms of Cu and Zn as compare to the non-osteoporotic controls. zinc plays a pathophysiological role in the development of bone disorder with increasing age [21]. It has been shown that the skeletal unloading-induced decrease of zinc content in femoral tissues has a role in the deterioration of bone formation in the unloaded rat [21]. Because of the zinc role in bone density, it is important to assess zinc deficiency in osteoporotic patients.

CONCLUSION

In conclusion this study demonstrated that nutritional status of calcium ,vitamin D and zinc in women with osteoporosis were lower than normal range and dietary habit was not suitable. With notice the vital role of nutrition and dietary intake on bone health , nutritional education and training for suitable food choices and dietary intake for maintenance of bone density in osteoporotic patients and for preventing bone loss in people that are at risk for osteoporosis is suggested also in osteoporotic patient routinely mineral supplementation beside healthy diet is recommended .

REFERENCES

1. Nishimoto SK et al. The effect of aging on bone formation in rats: biochemical and histological evidence for decreased bone formation capacity. *Calcified Tissue International*, 1985,37:617–624.
2. Schapira D et al. Calcium and vitamin D enriched diets increase and preserve vertebral mineral content in aging laboratory rats. *Bone*, 1995, 16:575–582.
3. Wild RA et al. Declining adrenal androgens: an association with bone loss in aging women. *Proceedings of the Society for Experimental Biology and Medicine*, 1987, 186:355–360.
4. Zhong J, Igarashi A. Enhancing effect of zinc and vitamin K2 on bone components in the femoral tissue of female elderly rats. *Journal of Health Science*, 2001, 47:40–45.
5. Mahdaviroshan M, Golzarand M, Rahbar Taramsari M, Mahdaviroshan M. Effect of zinc supplementation on serum zinc and calcium levels in postmenopausal osteoporotic women in Tabriz, Islamic Republic of Iran. *Eastern Mediterranean Health Journal*, 2013, 19 : 270-275.
6. Porhashem Z., Biani M., Noreddini H., Bijani A., Hosseini R. Prevalence of osteoporosis and its association with serum vitamin D level in older people in Amirkola, North of Iran. *Caspian J Intern Med* 2012; 3(1): 347-353.
7. Gueldner SH., Grabo TN., Newman ED., Coopeer DR. Osteoporosis, clinical Guidelines for prevention, diagnosis and management. New york, springer publishing company, 2008.
8. NIH Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. Consensus panel on osteoporosis prevention.. *JAMA* 2001; 285:785-95.
9. Haghighian Roudsari, A, mirmiran P, Mahdavi M. Do the other nutrients except calcium and vitamin D prevent the incidence of osteoporosis? *Journal of Paramedical Sciences (JPS)*. 2013 , 4:1
10. Mirmiran P, Hosseini Esfahani F, Mehrabi Y, Hedayati M, Azizi F. Reliability and relative validity of an FFQ for nutrients in the Tehran Lipid and Glucose Study. *Public Health Nutr* 2009; 7:1-9.
11. Hosokawa M, Yanagi H, Kawanami K, Tanaka K, Kobayashi K, Amagai H., Nihon Koshu .Relationship between dietary life style in youth and osteoporosis. *Eisei Zasshi*. 1996,43(8):606-14.
12. Wosje KS, Khoury PR, Claytor RP, Copeland KA, Hornung RW, Daniels SR, Kalkwarf HJ. Dietary patterns associated with fat and bone mass in young children. *Am J Clin Nutr*, 2010; 92:294-303.
13. Heaney RP and Layman DK. Amount and type of protein influences bone health. *Am J Clin Nutr* 2008; 87(suppl):1567S-70S.
14. Cole ZA, Gale CR, Javaid MK, Robinson SM, Law C, Boucher BJ, Crozier SR, Godfrey KM, Dennison EM, Cooper C. Maternal Dietary Patterns During Pregnancy and childhood Bone Mass: A Longitudinal Study. *J Bone Miner Res*, 2009; 24:663-668.
15. Speer G, Szamosujvári P. Dietary Calcium Intake and Calcium Supplementation in Hungarian Patients with Osteoporosis. *International Journal of Endocrinology*, 2013.1-8.
16. Yamaguchi M. Osteoporosis Treatment with New Osteogenic Factors. *J Mol Genet Med* 2013, 7:2.
17. Czernichow S, Fan T, Nocea G, Sen SS. Calcium and vitamin D intake by postmenopausal women with osteoporosis in France. *Curr Med Res Opin*. 2010 Jul;26(7):1667-74.
18. Elmstahl S, Gullberg B, Janzon L, Johnell O., Increased incidence of fractures in middle-aged and elderly men with low intakes of phosphorus and zinc. *Osteoporos Int* 1998;8:333–40.
19. Igarashi A, Yamaguchi M. Increase in bone protein components with healing rat fractures: enhancement by zinc treatment. *Int J Mol Med* 1999;4:615–20.
20. Reginster JY, Strause L, Saltman P, Frachimont P. Trace elements and osteoporosis: a preliminary study of decreased serum manganese. *Med Sci Res* 1998;16:337-8.
21. Zang YH, Cheng YY. Effects of zinc deficiency on bone mineralization and its mechanism in rats. *Zhaong Fang Yi Xue Zhi* 2003;37:121-124.