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Calcium Intake Pattern among Postmenopausal Women in Ahwaz, Iran

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Abstract: The aim of this cross-sectional study was to determine the calcium intake pattern among post menopausal women in Ahwaz, Iran. Fifty-three post menopausal women (age 57±9 year) were selected randomly. Calcium intake was estimated with a Food Frequency Questionnaire (FFQ) including fourteen items of the richest food sources of calcium. In order to evaluate calcium intake pattern, the food items divided into three categories, as dairy, grain and vegetable. Mean and standard deviation of total daily dietary calcium intake and from dairy, grain and vegetable groups were 984±354, 629±318, 200±133 and 167±151 mg, respectively. Mean and standard deviation of the daily total calcium contribution of dairy, grain and vegetable groups in calcium intake was 61±19, 22 ±16 and 17±14%, respectively. The results of this study suggested that the dietary calcium intake pattern in Ahwazian postmenopausal women is not suitable with regard to high servings of milk and dairy products; because of the effect of this food group (particularly, high fat items) on cardiovascular diseases.

Key words: Calcium, dairy, milk, post menopause

INTRODUCTION

Calcium intake is necessary for bone mass synthesis and also for protection against osteoporosis. Osteoporosis is an important public health problem in post menopausal women (Ettinger and Deluca, 1996; World Health Organization, 1994). It is estimated that osteoporosis prevalence will increase until 2050 (Cooper *et al.*, 1992). The estrogen secretion decreases after post menopause due to higher rate of bone turnover which is related to more bone loss (Gamero *et al.*, 1996). Dietary calcium intake has been shown to vary widely in global nutrition (Food and Agriculture Organization/World Health Organization, 2004). Many studies in Asia and Africa have reported the inadequate intake of dietary calcium in different populations where, milk and milk products are limited in the usual diet or such food items are not consumed habitually (Prentice *et al.*, 1993; Administrative Committee on Coordination/Subcommittee on Nutrition, 1997). According to the Food and Nutrition Board, the recommended daily allowance of calcium for female adults in Asia is 400-500 mg day⁻¹, although a number of investigators believed that this level of intake is extremely low for postmenopausal women (Hickler and Wayne, 1984; Heaney *et al.*, 1989). A low level of dietary calcium intake is common in developing countries where

diets are not rich in milk and dairy products (Administrative Committee on Coordination/Subcommittee on Nutrition, 1997). The main sources of calcium in the low-income Bangladeshi women are cereals, vegetables and fish, whereas calcium sources in the high-income group are fish, milk products and cereals. Milk and milk products are no longer part of the typical Bangladeshi diet (Islam *et al.*, 2003). In Chinese postmenopausal women, possibly due to the effects of education or dietary and health counseling, dietary calcium intake has significantly increased, with an increase in the consumption of vegetables, milk and soy foods and notably the proportion of calcium intake from dairy sources (Ho *et al.*, 2004). Although, milk and dairy foods are strongly effective in increasing calcium intake, but the proportion of calcium intake obtained from milk and dairy foods is positively associated with the proportion of energy derived from fat, while the proportion of calcium obtained from plant foods is negatively associated with such energy (Zhang *et al.*, 2007).

In Asia, there are few published studies on calcium intake pattern especially among post menopausal women. In the current study, pattern of dietary calcium intake among Iranian post menopausal women in Ahwaz was investigated.

MATERIALS AND METHODS

Fifty-three healthy postmenopausal women in two large educational hospitals were recruited. They were not patient, but attended their relatives in the hospitals. The study was conducted in 2007 in Ahwaz, located in South-West of Iran. All subjects were nonsmokers. Anthropometric measurements were done between 08:00 to 10:00, according to the World Health Organization's standard protocols (World Health Organization, 1995). Calcium intake was estimated by a Food Frequency Questionnaire (FFQ) which included 14 items of rich dietary calcium sources. The items were classified in three groups: dairy, grain and vegetable. Participants were also asked about consumption of calcium supplements. Calcium intake from each group was calculated using food composition tables (Dorosti and Tabatabai, 2007). The presented results are only from dietary calcium intake and calcium supplements were not included.

Statistical analysis: The data were analyzed by computer using Statistical Package for Social Science (SPSS for Windows, SPSS Inc. Chicago, IL, Version 11.5). Statistical significance level was $p < 0.05$.

RESULTS AND DISCUSSION

Demographic characteristics of participants are shown in Table 1.

The mean, standard deviation and percentage of calcium intake from various food sources are shown in Table 2. As it is shown in the Table 2, dairy products were the main source of dietary calcium intake. Grains and vegetables sources supplied 22 and 17% of dietary calcium intake in Ahwazian post menopausal women, respectively.

The reported calcium intake from the FFQ was $984 \pm 354 \text{ mg day}^{-1}$. Seventy-eight percent of these women

failed to meet the recommended Adequate Intake (AI) of calcium for this age group (1200 mg day^{-1}).

Results of this cross sectional study showed that although, mean of dietary calcium intake is close to the recommended adequate intake, but a large proportion of the participants did not consume enough amounts. In Rassuli *et al.* (2001) study, on 73 post menopausal Tehranian women, it was reported that calcium intake was $448 \pm 178 \text{ mg}$. Daily calcium intake in post menopausal osteoporotic women in North West of Iran was 510 ± 351.3 (Hejazi *et al.*, 2009). Daily calcium intake in Ahwazian post menopausal women is higher than their peers in Tehran and North West of Iran. It may be due to differences in socio-demographic and dietary habits between these geographic regions of Iran. Tehran is the capital city of the country located in the center, but Ahwaz located in the south-west. Food and Agriculture Organization's report in 1990 demonstrated that the mean calcium intake in the developing world was 344 mg day^{-1} (Hejazi *et al.*, 2009), which is less than findings of this study (984 mg day^{-1}). The reported dietary calcium intake in postmenopausal Malaysian women was $447 \pm 168 \text{ mg day}^{-1}$ (Chee *et al.*, 2002). This could be due to differences in consumption of dairy products among participants of these studies, as it is indisputable that milk and milk products are rich sources of calcium. Dairy products contributed 26% of the total calcium intake in Malaysian women against 61% in this study and 50% reported in Western diets. Mean per capita daily consumption of calcium in U.S. population was 737 mg (Fleming and Heimbach, 1994), which is close to our results. This is possibly due to similar dietary calcium intake pattern of the U.S. population with post menopausal women in this study. In this study, main source of dietary calcium in post menopausal women was dairy products (600 mg day^{-1}) (61%). This is equivalent to intake of two exchanges of such food group. Unlikely, In Malaysian women's calcium intake pattern, most of the calcium was from vegetables and bean sources (32%), dairy products (26%), eggs, meat and seafood (16%) and cereals (12%) (Chee *et al.*, 2002). Similar to results of this study, in the U.S. population, about 50% of total dietary calcium is supplied by milk and milk products. Milk as an ingredient in such foods accounted for about 20% of total dietary calcium intake. Grains and grain products, supplied 12% of calcium and fruits and vegetables together supplied 6%. The remaining dietary calcium was contributed by meat, poultry, fish, eggs, legumes and beverages (Fleming and Heimbach, 1994). Zhang *et al.* (2007) investigated calcium intake pattern among Japanese women and showed that plants and fish were the top dietary calcium sources in Japanese women. It is

Table 1: Demographic characteristics of postmenopausal women participated in dietary calcium pattern study in Ahwaz, Iran (N = 53)

Variables	M±SD*
Age (year)	57±9
Weight (kg)	68±13
Height (cm)	156±2
BMI (kg m^{-2})	28±5

*Mean±SD

Table 2: Calcium intake and contribution of food groups in dietary calcium pattern study in postmenopausal women in Ahwaz, Iran (N = 53)

Food groups	Calcium intake* (mg day^{-1})	Calcium intake (%)
Dairies	629±318	61±19
Grains	200±133	22±16
Vegetables	167±151	17±14
Total	984±354	100

*Mean±SD

an expected fact, because many factors affect pattern of nutrient intake in different populations.

Although, milk and dairy foods are strongly effective in increasing calcium intake that is directly associated with the proportion of energy derived from fat, the proportion of calcium obtained from plants and fish is negatively associated with such energy source Horwath *et al.* (1995) have revealed that increasing intake of milk products results in increased dietary fat and high cholesterol levels. Therefore, it is important to take into account the fat content of dairy products especially in the elderly. It is the limitation of this study that fat content of milk and dairy foods was not determined and it is suggested that this matter be considered in future studies.

In the present study, grains and vegetables were the second and third sources of calcium intake, respectively. In the Framingham osteoporosis study, Tucker *et al.* (2002) evaluated the association between dietary patterns and Bone Mineral Density (BMD) in older adults. Six dietary patterns were identified. Dairy, meat and bread consumers group had the highest dietary calcium intake (933 ± 20 mg day⁻¹). Fruit, vegetable and grain consumers group was the second (873 ± 33 mg day⁻¹). These results are similar to our study findings. In the Framingham study, older women and men, in fruit, vegetable and grain group had the highest BMD. They suggested that higher fruit and vegetable intake is associated with higher BMD in men and women. Ebrahimof *et al.* (2004) in Tehranian rural postmenopausal women showed that daily intake of more than 1.5 servings of vegetables is associated with higher heel BMD in women but there was no significant association for fruits. Therefore, it is necessary to consider calcium content of vegetables while evaluating dietary calcium intake.

In the present study, calcium intake of seventy-eight percents of participations was lower than current recommendation. It seems necessary to study the calcium intake pattern of Iranian postmenopausal women at the national level. Similar to our results, Fifty-six percent of Malaysian women failed to meet the Malaysian RDA for calcium (450 mg day⁻¹) (Chee *et al.*, 2002) and 76% of Australian women have consumed less than the recommended intake even when supplemental calcium was included (Pasco *et al.*, 2000). Mean dietary calcium intake in 55-92 years Australian women was 646 mg day⁻¹. For most groups of U.S. females, calcium intake was substantially less than the RDA (Fleming and Heimbach, 1994).

In present study, dietary calcium intake was determined by using FFQ. Chee *et al.* (2002) compared food frequency questionnaire and three days food recalls, in estimation of dietary calcium intake in Malaysian post menopausal women. The mean difference between the two

methods was 51.3 mg and was not statistically significant. They concluded that FFQ had estimated Malaysian post menopausal women's calcium intake correctly. As a result, FFQ is a useful and rapid instrument for evaluating calcium intake. Takahashi (2003) have validated the food frequency questionnaire based on food groups and showed it was a useful instrument.

CONCLUSION

In conclusion, low dietary consumption of calcium in these postmenopausal women has important implications for their risk of developing osteoporosis. There arises a need for nutritionists and dietitians in the country to place emphasis on adequate calcium intake within the population. findings of this cross sectional study showed that dietary calcium intake pattern in Ahwazian post menopausal women is not suitable because of higher consumption of milk and dairy products and the possible effect of this food group on cardiovascular diseases. A recent national study in Iran showed that at least 40% of postmenopausal women have low back pain (Saiedpour *et al.*, 2008) and they may be recommended to increase dairy products. So, it is necessary to educate post menopausal women about more consumption of vegetables and grains and also selection of low fat dairy foods.

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