Evaluation of the Lifestyle of Female High School Students Regarding Osteoporosis Prevention

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A R T I C L E I N F O	A B S T R A C T
Article type: Original article *Article History:* Received: 26-Oct-2013 Accepted: 20-Dec-2013 *Key words:* Female High School Students Lifestyle Osteoporosis	***Background & aim:*** In people over 50, one out of three women and 12 men experience osteoporosis. Youth lifestyle plays an essential role in increasing bone mass and preventing osteoporosis in old ages. Thus, lifestyle changes during adolescence could cause the prevention of osteoporosis in older age. This study therefore conducted to investigate the lifestyle of female high school students in relation to prevention of osteoporosis. ***Methods:*** In this cross-sectional study 403 female students recruited from high schools in Iranshar, Iran included in the study. Data were collected using a questionnaire consisted of two parts of demographics and lifestyle issues associated with osteoporosis including nutrition, physical activity and habits. Data analysis was carried out using Chi-square and t test. ***Results:*** results showed that 57.1% of the stdents had poor nutrition. In relation to the habits including smoking, alcohol consumption, adherence to medications and weight loss regimens, 78.2% of students had a relatively favorable lifestyle. 48.1% of subjects had a desirable lifestyle in terms of physical activity. The total score of lifestyle in 82.4% of students was relatively favorable. There was a significant relationship between lifestyle and age (P = 0.027), maternal education (P = 0.035) and occupation (P = 0.034). ***Conclusion:*** Considering that the lifestyle of more than half of the students were poor in relation to nutrition, it is suggested that in addition to giving awareness to the adolescents regarding risk factors and preventive measures of osteoporosis, families should also be taught to include calcium-rich foods in the food basket of their households.

Introduction

Osteoporosis is defined as a bone disease which is characterized by low bone mass and increased fracture risk (1).

The International Osteoporosis Foundation (IOF) has defined osteoporosis as a bone disease which is characterized by low bone mass and increased risk of fracture (1). Osteoporosis is the most common bone disease diagnosed with bone density loss and loss of quality of bone microstructure in which bones become fragile and the possibility of fracture with minor impact or spontaneously is increased. These fractures lead to mortality, morbidity, decreased quality of life and enormous health care costs (2). In the United States, one third of women older than 65 years have vertebral fractures and in the elderly age, one per three women will suffer hip fracture that 20% of them die and 30% will need long-term care and have disability. It is predicted that the number of hip fractures will be six times from 1990 to 2050 (3).

In Iran, approximately 5.4% of men and 8% of women suffer from osteoporosis. Osteoporosis increases dramatically by age, therefore more than 10% of men and 20% of women over

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50 years of age are at risk of this disease. In other words, more than 2 million of the population are at risk of osteoporosis-related fractures (4).

In girls, the bone tissue accumulated during the ages 11 to 13 approximately equals the amount of bone loss during the 30 years following menopause. It is estimated that a 10% increase of peak bone mass reduces the risk of an osteoporotic fracture during adult life by 50%. Poor diet and lack of exercise, especially between the ages of 10-18 years, can lead to weaker bones in adulthood. Several lifestyle factors, particularly nutrition, physical activity, and safe sun exposure can substantially influence the gain of bone mass during childhood and adolescence (5).

Almost greatest increase is occurred in bone mass of hip and spine of women in adolescents (18 years), and especially in the years after menarche (11-14 years). The bone mass is slightly increased after adolescence and is stopped around 30 years; and after 30 years, in most people, a gradual decrease of bone mass about 0.7% occurs per year. This clearly indicated the importance of proper diet and hormonal status during adolescence (3).

In fact, the years before the onset of early adolescence play a significant role in determining the risk of osteoporosis. Strong bones in childhood and adolescence can be the best defense against osteoporosis. Osteoporosis is affected by many factors such as genetics, environmental factors and lifestyle. According to the researchers, insufficient intake of calcium and vitamin D, lack of adequate physical activity, and behaviors such as smoking and alcohol consumption are the known causes of osteoporosis (6).

Physical health is a main factor in maintaining bone density. Although adolescents and youngsters are among the most active groups in societies, only one-third of Iranian girls in this age group have organized and orderly physical activity at ages 18-65 years; in fact, less than 10% of women exercise regularly (7).

Proper nutrition and exercise in young people increases the likelihood that these individuals have genetically determined peak bone mass gain (8).

In addition to calcium, protein plays an important role in bone mass acquisition. During growth, insufficient caloric and protein intake can impair bone development. Low protein intake lowers both the production and action of growth factors which increase bone formation. In addition, growth factors stimulate intestinal absorption of calcium and phosphate; therefore, a positive correlation can be found between protein intake and bone mass gain in children (9)

Several studies evaluated the negative effects of coffee and caffeine relation to bone mass density; high consumption of coffee (more than 4 cups per day) was significantly associated with increased risk of hip fracture in males and females. Other factors influencing bone mass loss in adults are living habits such as drinking tea or coffee, smoking and alcohol consumption (7).

Osteoporosis has multi-factorial nature. It is estimated that 46-52% of bone mass density (BMD) is influenced by genetic factors. Various studies have estimated that between 20 to 50% of the changes in bone density is influenced by lifestyle and diet on top of them. Nutrition plays a role in creating the greatest skeletal bone density during growth and also, protects the skeleton against calcium deficiency during puberty. Calcium and vitamin D intake during growth is required to achieve maximum bone mass and also, during adulthood and aging to deal with loss of bone mass. So, the first step in the prevention or treatment of osteoporosis in all ages is appropriate nutrition and making sure to get enough calcium and vitamin D. Physical activity as a strong and independent factor to achieve maximum bone mass and also to decrease bone mass is effective (10).

Lifestyle plays a significant role in all aspects of human life. Its importance in health and specifically osteoporosis prevention during adolescence and early youth must be acknowledged. This means that more than 20% of bone growth and acquisition of bone density occurs in about 50% of this age group (12, 11).There is a large concern for the future of today's young generation that has no enough exercise and don't receive adequate calcium and vitamin D (10).

The best way to control this incurable disease is through prevention, which includes recognition, and improving lifestyle quality and daily habits. The prevalence of osteoporosis varies from one country to another and also within one country. Variations in race, nutritional status, physical activity and lifestyle all lead to these differences. Considering the importance of lifestyle-related diseases, less attention has been paid to the lifestyle of adolescents in relation to the prevention of osteoporosis.

This study aims to evaluate osteoporosis-related lifestyle of female students in Iranshahr, Iran. Education authorities and health care planners hoped that the results would help promote awareness among female students.

Materials and Methods

This study cross-sectional study was performed with the aim to evaluate the lifestyle of high school girl students related to prevention of osteoporosis in Iranshahr at 2009. To determine the sample size formula $N=Z2PQ/D2$ with *P*=0.5, 95% confidence interval was used to determine the sample size of was 400.

The study population was calculated as 403 female students educating in the first, second, and third grades of high school and pre-university level. They had no known physical/mental illness or condition to cause physical limitations or dietary restrictions; also they did not deliberately take any particular medications except weight-loss drugs. Sampling was carried out using the simple random method, and stratified random clustering was conducted.

Detection of groups in terms of economic, ethnic and cultural was not possible because the girls' high schools were located in a region of the city and the boys' high schools were located in another region of the city, therefore, one center was selected from 3 centers of pre-university and among 5 classes of the center, 3 classes with all students presented in classes were randomly selected. Then, the subjects completed questionnaires. From 10 present high schools, 3 high schools and from each high school, among first, second, and third classes, one class was selected by simple randomly method. All the students present in the class were enrolled in the study. This study was conducted with informed

consent and informing the patients from confidentiality of data. Data was collected by a researcher-made questionnaire including 2 sections and 42 questions which its validity and reliability were confirmed. The validity, content validity and reliability of the method was determined by Cronbach's alpha. The first section contains 11 questions related to personal characteristics and the second section 31 questions related to various aspects of lifestyle associated with osteoporosis prevention including nutrition, physical activity and habits (tobacco using, use of weight loss diet and drugs, menstrual pattern and exposure to direct sun) which had been given to the students and after a brief explanation was completed by the students. To determine the population size, height was divided to wrist size as cm; the number >10.9 was considered as small, between 9.9 to 10.9 as the average and less than 9.9 as big.

Body mass index (BMI) obtained by dividing weight as kilograms to the square of height as meters; the number <18.5 was considered as lean, between 18.5 to 25 as normal and more than 25 as overweight (14). In terms of nutrition, daily 2 to 3 units dietary, no use of drinks, weekly 2 or more units of red meat and fish, daily drinking of 3 cups of coffee and tea, daily use of 3 to 5 units of green and yellow vegetables, fruit eating twice a day or more and low-salt diet were considered as proper behavior and two points were given. Collection of the score of nutrition from lifestyle was 16 scores that were categorized into three levels of undesirable (<50%) zero to eight, relatively desirable (50-84%) 8-13.5, and desirable (85-100%) 13.6-16. In terms of physical activity according to the criteria of daily at least 20 minutes of walks (15) and exercise at sport class of school, 3 scores was given to the people.

In terms of habits, 9 proper habits such as not smoking, hookah, NAS, weight loss diet and slimming drugs, and use of calcium - vitamin D supplements, multivitamin drugs and no history of irregular menstruation or amenorrhea, daily 20 minutes exposure in direct sunlight, one point was given to each which 9 scores were total of them and was categorized into three levels of undesirable (0-4.5), relatively desirable (4.5-7.6), and desirable (7.6-9). Total score on

three dimensions of nutrition and physical activity and habits was 28 categorized into three levels of undesirable (<50%) <14, relatively desirable (50-84 %) 14-23.8, and desirable (85-100%) 23.8-28. To analyze the data, descriptive statistics (absolute and relative frequency Tables) and inferential statistics (Chi-square test and independent t-test) were used.

Results

Results showed that 30.5% of cases were in the age group of 17 years with mean height of 156.7 cm and mean weight of 47.8 kg and mean body mass index of 18.19 kg per square meter. In 28.8% of cases, the father had high school and in 43.9%, mother had primary education. Mean number of children in the family was 5.84 and 25% of them had eight children and more. Monthly income of 46.1% was reported that is enough and 90.8% of them had no family history of osteoporosis and 74.8% mentioned no history of bone fracture in parents. 54% of cases had a history of irregular menstrual cycles and 10% of cases used slimming drugs.

The results showed that lifestyle of 57.1% of girls in terms of nutrition related to the prevention of osteoporosis was undesirable, lifestyle of 78.2% of cases in terms of habits related to the prevention of osteoporosis was relatively desirable and lifestyle of 48.1% in terms of physical activities and exercise related to the prevention of osteoporosis was desirable;

totally, lifestyle of most cases (82.4%) was relatively desirable (Table 1).

Also, according to the results, there was significant relation between the mother's occupation (*P*=0.034), mother's education (*P*=0.035), family history of osteoporosis (*P*=0.045) with lifestyle (Table 2). But no significant relation was found between ethnicity, field and level of education, occupation and education level of father, family economic status, parental history of fracture, BMI and body with lifestyle.

Discussion

The study findings showed that most of the cases had undesirable lifestyle in terms of nutrition related to the prevention of osteoporosis. In the studies that have been conducted in Iran by Rahnavard and Kholdi, similar results were reported (16, 17). Zhang et al in their study concluded that Japanese women had significantly less menarche age and calcium-rich food habits in high school age and now; they have had higher level of bone density compared to Mongol young women, ie differences in hormonal and nutritional status in adolescence makes a difference in bone mass density (18).

Fuji and colleagues investigated the daily intake of green and yellow vegetables and its effect on maintaining bone mass in young women and found that bone density is associated with lifestyle factors including nutrition,

Table 1. Frequency distribution of various aspects of lifestyle related to the prevention of osteoporosis among girl high school students in Iranshahr in 2009

Aspects of lifestyle/ status of lifestyle	Nutrition N (%)	Habits N (%)	Physical activities and exercise N (%)	Total lifestyle N (%)
Undesirable	230(57.1)	5(1.2)	63(15.6)	71(17.6)
Relatively	173(42.9)	315(78.2)	146(36.2)	332(82.4)
Desirable	-	83(20.6)	194(48.1)	-
Total	403(100)	403(100)	403(100)	403(100)

Table 2. Frequency distribution of lifestyle related to the prevention of osteoporosis among girl high school students in terms of demographic characteristics at 2009

lifestyle/demographic characteristics		Undesirable N (%)	Relatively desirable N (%)	Total N (%)	Statistical test
Mother's occupation	Housewife	68(17.9)	312(82.1)	380(100)	X^2=1.834 df=2
	Employer	1(6.7)	14(93.3)	15(100)	*P*=0.034
	Free	2(28.6)	5(71.4)	7(100)	
Mother's education	Illiterate	31(23.8)	99(76.2)	130(100)	
	Primary	24(13.6)	153(86.4)	177(100)	X^2=8.581 df=3
	Secondary	13(22)	46(78)	59(100)	*P*=0.035
	High school and University	3(8.1)	34(91.9)	37(100)	
Family history of osteoporosis	Yes	11(29.7)	26(70.3)	37(100)	X^2=4.008 df=1
	No	60(16.5)	303(83.5)	363(100)	*P*=0.045

especially daily consumption of green and yellow vegetables and physical activity are presented, because fruits and vegetables are rich in vitamin C and have a favorable effect on bone metabolism as well as their influence on collagen formation. These findings confirm the results of other studies in this field (19).

From the perspective of the researcher, since a small percentage of the study participants had a desirable economic status, so it seems that in addition to lack of knowledge about proper nutrition related to the prevention of osteoporosis, economic status especially considering the households is also effective on undesirable nutritional status of the lifestyle.

Therefore, training the health and ultimately increasing awareness and changing behavior and easier access to calcium-rich foods can play an important role in improvement of the lifestyle and the promotion of public health. Most of the studied subjects had relatively desirable lifestyle in terms of osteoporosis prevention-related habits. These findings confirm the results of other studies in this field (16, 17).

In this study, the studied subjects were exposed to sunlight for about 22 minutes during the day which was enough to make daily vitamin D, but about 38% of girls were sufficiently exposed to sunlight. The studies have shown that in the areas of the world where sunlight is less, shortage of vitamin D is expected. But in Iranshahr, where the sun shines directly about 9 months of the year, perhaps due to excessive sun exposure and its effects on the health and beauty of skin can make a lot of residents in this area not exposed to sunlight. The other point is related to the type of their dress and cloths that given the religious and cultural beliefs of the area, a large number of women cover her faces with a mask when they are out of house.

Most of the studied subjects had desirable lifestyle in terms of physical activity and exercise related to the prevention of osteoporosis. Rahnavard's results indicated that the 57.7% of subjects had undesirable lifestyle in terms of physical activity and exercise. This result is against the result of the present study. The difference may be due to differences in scoring of physical activity and exercise of students in schools and the other reason is that a lot of high school students from surrounding villages come to the city's school with foot. Significant relation is observed between mother's education level and occupation and lifestyle. Takakvra and colleagues reported that smoking and no physical activity were more observed in the students whose parents have less than a high school education (19, 20).

Significant association was also observed between family history of osteoporosis and lifestyle, but the lifestyle was more desirable in the girls who had no family history. This relationship can indicate that because the lifestyle of these individuals (mothers and grandmothers) in relation to the prevention of osteoporosis has been true, have been less complicated to osteoporosis in previous generations and now have no history of osteoporosis in the family. This result is inconsistent with the results of the present study so that women who have a positive family history of osteoporosis have more desirable lifestyle than others (18, 21).

One of the study limitations was that self-reported information obtained from the students and opportunities in the field of nutrition were inaccurate. Also, only a small number of female students were examined. It is suggested that a similar study be conducted on adolescent girls and the youngsters, based on the results of proper planning by the authorities in order to increase awareness among the youth.

Conclusion

Today, half of hip fractures in older people in North America and Europe are included, but the preventive measures that are currently focused on young girls, 2050, this amount are a fourth.

According to the new guidelines related to osteoporosis among women, adolescent girls should be more medically advised on their lifestyles and behaviors which can lead to fractures and osteoporosis. These behaviors include smoking, BW more than reduction, and poor eating habits. To prevent osteoporosis, action should be taken from an early age, since bones reach their maximum strength in the third decade of life. Therefore, the only way to deal with osteoporosis is exercise, proper nutrition and vitamin D intake.

Conflict of Interest

No conflict of interest exists.

Acknowledgments

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