

The Relationship between Teenagers' Lifestyle and Osteoporosis in Qazvin, Iran

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ABSTRACT

Background

Osteoporosis and related fractures due to discomfort, disability, decreased quality of life and death is a major health problem in the world. According to the importance of recording and reporting osteoporosis, lifestyle in growth duration, during teenage, is the most risk factor that determines osteoporosis in adolescents and the elderly. The aim of this study was assessing adolescence lifestyle and its relation with osteoporosis among adolescents in Qazvin, Iran

Methods

In this descriptive-analytical study, 300 teenagers were selected by stratified cluster sampling. The scale for data collection was a self-administered questionnaire containing 15 items related to life style. Using SPSS 16, the data were analyzed by Chi-square and Fisher's exact tests.

Results

The results showed that the majority of teenagers (71.3%) don't regularly have physical activity. There were significant differences between physical activity patterns of male and female teenagers ($P=0.001$). It was shown that female teenagers (66.7%) use more foods containing vitamin D, cola-type beverages and caffeine than male teenagers (34.7%). Only, 26.9% the female teenagers and 33.5% of the male teenagers drink one cup of milk daily. The results showed that 29.3% of male teenagers and 24.3% of female teenagers haven't used any method for facilitating calcium absorption in the body.

Conclusion

The findings of this study showed that Iranian teenagers had several known risk factors and unfavorable behaviors. Therefore, modifying teenagers' lifestyle by preventive educational strategies on osteoporosis can help to prevent osteoporosis in adolescents.

KEYWORDS: Lifestyle; Osteoporosis; Teenagers

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INTRODUCTION

Osteoporosis and related fractures due to discomfort, disability, decreased quality of life and death is a major health problem.¹ It is a dangerous and harmful health challenge in the health system in the world. In 50 years of age and more, one in every three women and one in every 12 men are suffering from osteoporosis.² It is estimated that more than 840 million people over the age of 60 will live in developing countries by the year 2025 representing 70% of all people worldwide.³ Osteoporosis is an important public health issue among the elderly in Iran. Approximately, 6 million Iranian people have osteoporosis.⁴ It is a common and costly condition that can cause disability or death. Osteoporosis usually starts after the age of 30. During adolescence, up to the age of 20, the process of bone construction outperforms that of bone destruction. After the age of 30, due to some unknown reasons, this process reverses and the bone destruction outperforms bone construction. Bone mineral density acquisition is between 11 and 14 years of age for healthy adolescents;⁵ after this age, bone destruction starts gradually and the individual is in risk for osteoporosis.⁶ Accordingly, one of the best measures to be taken to prevent osteoporosis would be having strong bone during childhood as well as adolescence. It has been reported that lifestyle risk factors can account for as much as 20%-30% of the variance in peak bone mass.⁷

Lifestyle factors during the growth such as urban life, immobility, and fast food consumption are potentially important for fracture risk later in life, so appropriate lifestyle during childhood and adolescence is essential for prevention of osteoporosis in adulthood.⁸ The effect of calcium supplementation on bone accretion may depend on habitual dietary calcium intake, exercise, and skin sunlight exposure, habits-such as smoking, alcohol drinking, and taking drugs and chronic disease.⁹ The process of calcium metabolism in children

is complex. The calcium balance is essential for achieving the peak bone mass. Previous studies suggested that skeletal modeling is related to calcium balance in the body during growth, Previous studies suggested that skeletal modeling is related to calcium balance in body during growth, and use of calcium is highly required in childhood.¹⁰ Various factors have been recognized as osteoporosis risk factors, including genetic factors, the lack of estrogen in menopausal women, the age of the first menstruation, menopausal age, lack of enough physical activity, alcohol consumption, smoking, reduction in the absorption of calcium and vitamin D, excessively low or high level of absorption of proteins, and excessive absorption of Phosphor, Sodium and Caffeine. Several studies have assessed lifestyle and preventives behaviors regarding osteoporosis. For example, in one study, researchers found that there was an obvious reduction in the bone mass among young people, aged 31-45, who drink alcohol.¹¹ Also, another study indicated that women who have more physical activity, the mineral bone mass is higher in some bones. The health care provider have significant role for modifying unfavorable behaviors and health promotion in the society.¹² Lifestyle during adolescence plays a very pivotal role in preventing osteoporosis in adulthood. Little attention is paid to the critical issue of osteoporosis during adolescence in relation to lifestyle in Iran.

According to the above-mentioned points, the researchers decided to conduct a research in this field to present lifestyle as the first step in the process of preventing osteoporosis. The specific aims of the present study are determining the teenagers' lifestyle in relation to preventing osteoporosis in different fields including nutrition, smoking, alcohol use, BMI as well as exercising and physical activities and using calcium absorption facilitating methods. In addition, some individual features and teenagers' lifestyle related to prevention of osteoporosis

have been determined in Qazvin, Iran.

MATERIALS AND METHODS

In this descriptive-analytical study has been conducted in 2010 aiming at assessing and analyzing the lifestyle and preventive behaviors of osteoporosis. The sample size was calculated based on $n = [Z^2_{(1-\alpha/2)} \cdot P(1-P)] / d^2 = [(2^2)(0.12)(0.88)] / 0.04^2 = 264 (+\%10)$ and therefore it was estimated to be 290.¹ We included 300 teenage students in the city of Qazvin prevention of osteoporosis in 2010. The inclusion criterion for participants was age between 13-18 years old and the exclusion criterion was lack of agreement to fill out the questionnaire.

Subjects

The participants of this study consisted of 300 teenagers studying in the 1st, 2nd and 3rd grade in high schools. The sample selection was done through stratified cluster sampling. So Qazvin city was divided into four districts: North, South, East and West. Each region was used as one cluster. Finally, 6 high schools were selected. Approval of this project was obtained from the Ethics Committee of Qazvin Medical University. The questionnaires were administered by the researcher and the objectives of this study were described for students; then consent form was signed by the participants.

Measurements

Data collection instrument was a questionnaire consisting of 2 parts. The first part considered the demographic information and the second included some information on different aspects of their lifestyle related to osteoporosis prevention, including nutrition, physical exercise, skin sunlight exposure, exercises, calcium absorption facilitating methods, habits such as smoking, alcohol drinking, and taking drugs and chronic diseases related to osteoporosis. These questions were subsequently scrutinized by a panel of experts to establish content validity.

The questionnaire was pretested on a volunteer sample of 12 experts before data collection to assess the comprehension of the questionnaire. To assess reliability of the questionnaire, 12 students volunteered to complete the questionnaire twice within a 2-week time frame. Test-retest reliability was obtained ($r=0.78$); the questionnaires were administered by a researcher during the participants' class time and took approximately 10 minutes to be completed.

Statistical Analysis

After collecting the data, this study used SPSS for Windows version 16 to adopt the following several kinds of statistical method to carry on analysis according to the aim of the study: (1) Distribution of frequency and percentage were used to describe the personal characteristics. (2) Chi-square test and Fisher's exact test were used to explore the related risk factors of osteoporosis and genders.

RESULTS

The subjects were aged from 13 to 18 years old. The average age of males was 16 years and the average age of females was 15. The Average Body Mass Index was 19.56 ± 2.94 in male students and 20.64 ± 3.42 in female students. Regarding the education status of parents, 32.5% of the fathers had education under high school whereas 48.9% of the mothers were high school graduates. 52.63% of the females and 59.1 of the male students had family history of osteoporosis. The history of chronic disease was 7.9% in the females and 4.55 in the male students. Intestinal malabsorption was shown to be 23.69% in the females and 13.6% in the male students; 2.63% of the females and 9.1% of the male students suffered from hyperparathyroidism. Also, history of long immobility was minor in students, as shown in table 1.

The findings of this study regarding the drug use history as a risk factor for osteoporosis showed that the majority of students had never used drugs (96%) equally

Table1: The frequency distribution of medical history and pattern of physical activity related to osteoporosis between male and female students

Medical history and pattern of physical activity	Males N (%)	Females N (%)	Total N (%)
Family History of Osteoporosis	13(59.1)	20(52.63)	33(55)
History of chronic disease (Diabetic , Epilepsy, etc)	1(4.55)	3(7.9)	4(6.66)
History of hyperthyroidism	2(9.1)	3(7.9)	5(8.34)
History of hyperparathyroidism	2(9.1)	1(2.63)	3(5)
Intestinal Malabsorption	3(13.6)	9(23.69)	12(20)
History of long immobility	1(4.55)	2(5.25)	3(5)
<i>Drug history</i>			
Corticosteroids (Prednisone, Betametazon, etc)	4(2.6)	1(0.66)	5(1.67)
Immunosuppressant drugs (Methotrexate, Cyclosporine, etc.)	1(0.7)	1(0.66)	2(0.67)
Antidepressants and sleeping pills	0	1(0.66)	1(0.33)
Anti-acid drugs	1(0.7)	0	1(0.33)
Thyroid drugs	0	1(0.66)	1(0.33)
Other Drugs(Feroglobin and Mefenamic acid)	0	2(1.36)	2(0.67)
Using no drugs	144(96)	144(96)	288(96)
<i>Pattern of physical activity</i>			
Every day	47(34.1)	12(8)	59(20.6)
3-5 times a week	38(27.5)	13(8.7)	51(17.6)
Less than 2 times a week	53(38.4)	94(62.6)	147(51)
Never	0	31(20.7)	31(10.8)

Chi-square test showed that medical history and pattern of physical activity related to osteoporosis differ between the females and the males students (P=0.0001).

and the history of the use of other drug such as Feroglobin and Mefenamic acid was in the highest level (1.36%) in female students; corticosteroids consumption (Prednisone, Betametazon) was 2.6% among male student. The findings of drug usage history are summarized in table 1.

Results of this study demonstrated that only 47.7% of teenagers don't have regular physical activity; approximately, 55.3% of male students and 87.3% of female students didn't have any regular physical activity. Frequencies of physical activity indicated that 62.5% of the female students and 38.4% of the male students had scores which shows the physical activity of less than twice a week. Frequencies for the physical activity data are shown in table 1. 50.4% of male students and 28% of female students walk 3 times a week for 30 minutes, as a protective factor. Also, 5.6% of female and 6% of male students had swimming exercises; 7.2% of male and 4.6% of female students did bodybuilding exercises. Only 1.6% of male students had both walking and bodybuilding. 0.8% of male students and 34.4% of female students

had three kinds of exercises, and 61.4% of female students do other exercises (table 2).

Nutritional pattern (i.e. estimated daily calcium intake) was collected via the self-reported Teenagers' nutrition questionnaire. Finding of this study showed that 49.3% of teenagers don't consume vitamin D-rich foods and approximately 65.3% of the male students didn't have vitamin D rich foods whereas 66.7% of female students consumed vitamin D rich foods. To get the recommended dose of calcium (300 mg), teenagers require at least four glasses of milk each day or the equivalent, such as one cup of yogurt or 1.5 oz of cheese whereas in this study 60% of teenagers don't drink milk and only 26.6% of females and 33.5% of males drink one cup of milk (250 mgr) every day. Frequencies of data analysis showed that overall, 66.7% of female students consume dairy products (such as cheese and yogurt) while only 34.7% of male students consume these products. Another study indicated that red meat consumption more than 4 times per week was a risk factor among Iranian; on the contrary, chicken and fish consumption more than 2 times per week

Table2: The frequency distribution of the kind of exercise as a protective factor of osteoporosis between male and female students

Kind of physical activity	Males	Females	Total
	N (%)	N (%)	N (%)
Walking	63(50.4)	42(28)	105(39.2)
Swimming	7(5.6)	9(6)	16(5.8)
Bodybuilding	9(7.2)	7(4.6)	16(5.9)
Walking and bodybuilding	2(1.6)	0	2(0.8)
Walking, swimming and bodybuilding	1(0.8)	0	1(0.4)
Other exercises	43(34.4)	92(61.4)	135(47.9)

Chi-square test showed related to kind of exercise differ between the females and the males students (P=0.0001).

was shown as a protective factor. 53.2% of male students and 64.5% of female students in this study consume vegetables and fruits one time daily and only 13.5% of females and 5.2% of males don't consume cola-type beverages. The results revealed that approximately 46.8% of male students didn't have caffeine consumption whereas 53.8% of female students consume caffeine less than 2 times per week (table 3).

Chi-square test showed that the amount of consumption of coffee and cola differ between the females and the males students (P=0.0001). The results indicated that only 9% of male students and 6.7% of female students are exposed to sunlight, and as our findings showed 26.9% of female students and 24.3% of male students have never used calcium absorption facilitating methods (table 4).

Chi-square test showed that calcium

Table3: The frequency distribution of nutritional habits between males and females students

Nutritional habits	Every day		More than 4 times per week		3-4 times per week		2 and less than 2 times per week		Never	
	Male %	Females %	Male %	Females %	Male %	Females %	Male %	Females %	Male %	Females %
Cola-type beverages	0	2	2.9	2	6.9	13.2	85	69.3	5.2	13.5
Caffeine	2.9	2.6	1.2	4.8	4	12.1	45.1	53.8	46.8	26.7
Milk	33.5	26.9	13.3	13.8	30.6	26.6	20.2	26.2	2.3	6.6
Red meat	7.5	12	21.4	26.7	37	36.6	31.2	21.9	2.9	2.7
Fish and chicken	4.1	5.4	12.2	23.6	37.8	45.9	45.3	24	0.6	1
Diary product	68.8	60.4	14.5	17.7	9.2	13	7.5	8.9	0	0
Cereal	30.6	24.7	19.7	21.3	31.2	31.8	17.3	22	1.2	0.3
Fruits and Vegetables	53.2	64.5	22	15.4	20.2	15.1	4.6	4.7	0	0.3

Table4: The frequency distribution of facilitating methods of calcium absorption between male and female students

Calcium absorption facilitating methods	Males N (%)	Females N (%)	Total N (%)
Sunlight exposure 15 min/day	6(4)	10(6.7)	20(6.67)
Dietary intake of calcium	25(16.67)	81(54)	106(35.33)
Regular physical activity	41(27.33)	7(4.7)	48(16)
Dietary intake of calcium and Sunlight exposure 15 min/day	6(4)	8(5.3)	13(4.33)
Sunlight exposure 15 min/daily and Regular physical activity	4(2.67)	1(0.7)	6(2)
Dietary intake of calcium and Regular physical activity	20(13.33)	5(3.3)	23(7.67)
Sunlight exposure 15 min/day, Dietary intake of calcium and Regular physical activity	4(2.67)	6(4)	11(3.67)
Using no Ca absorption facilitating method	44(29.33)	32(21.3)	73(24.33)

absorption facilitating methods are different between the female and the male students ($P=0.0001$). Results of this study indicated that frequency of smoking in Iranian teenagers was zero and none of them consumed alcohol.

Results of Chi-square distribution test showed that using calcium absorption facilitating methods are different between the female and the male students ($P=0.0001$). It was shown that 73% of male students and 62.7% of female students had no awareness regarding the preventive measures of osteoporosis. Results of this study showed that 29.9% of female students started their menstruation under 12 years of age and 0.7% above 16 years of age.

DISCUSSION

This study described lifestyle risk factors of osteoporosis in Iranian teenagers. Physical activity of teenagers decreases osteoporosis and its complications such as fractures in adolescence and elderly.^{1,13} Exercises such as aerobic, swimming, weight lifting have been shown as protective factors against osteoporosis in Iran.¹⁴ Lack of physical activity is recognized as an important contributing factor in various health problems such as osteoporosis in other studies.¹⁵ Previous studies indicated that walking and aerobic exercise for 20-30 minutes three times a week will increase bone mineral density,¹³⁻¹⁸ whereas amongst females 20.7% reported that they haven't regular physical activity at all but among males student there were nobody who didn't have regular physical activity. Our findings support the results of previous studies which showed that certain sports and exercises greatly promote skeletal development in children and adolescents and augment bone strength in adults.¹⁶ According to the results of the present study, students, especially females, have no regular exercise program. Exercise has been shown as a protective factor of osteoporosis. It has recently been indicated that the type of exercise used by the majority of students was walking and

swimming, respectively. Also, other researchers showed that walking and other exercises (aerobics, weight lifting, swimming and others) were protective factors among Iranian subjects. It is recommended that an individual should perform 20 to 30 minutes of aerobic exercise such as walking 3 to 4 times weekly to increase bone mass.¹⁴ Simple exercises such as walking can help strengthen the bone and muscles. There is strong evidence that if physical activity begins early in life, it contributes to higher peak bone mass.^{17,18} In this study, the majority of students didn't consume vitamin D and calcium food supplementation. Also, the results of another study showed that the effect of calcium supplementation on bone accretion may depend on habitual dietary calcium intake, calcium supplementation, vitamin D that mainly affects individuals with low habitual intakes of calcium.¹⁰ Findings of the this study showed that 45.3% of the male students and 21.9% of the female students consume chicken and fish less than 2 times per week and only 26.6% of female and 33.5% of male students consume red meat every day. According to previous studies, higher fruit and vegetable intake was associated with greater BMD in men and women.^{18,19} Retrospective studies show that bone density in adolescents is associated with childhood high vitamin D food consumption such soya, cereal, milk, egg, fish, chicken, etc.²⁰ Also, in the same line with the present study, another study showed that optimal intake of calcium, vitamins D and K are important factors in primary as well as in secondary prevention of osteoporosis. Prevention should start in childhood, when bone formation is very intensive and achievement of optimal peak bone mass is a necessary requirement for optimal bone density in older age. Results of the present study showed that the majority of male students consume poultry less than 2 times every week; also, the majority of students consume red meat 3-4 times every week. Results of previous studies support our finding in the present study in that they indicated that red meat consumption more than 4 times per week was a risk factor among Iranian subjects; on the contrary, chicken consumption

more than 2 times per week was shown to be a preventive factor. Moreover, excessive protein consumption may lead to increased urinary calcium excretion.²¹

Finding in this study showed that dairy products used by teenagers were limited to only one cup of milk. However, all individuals are advised (9-18 years old) to obtain an adequate dietary intake of calcium (at least 1,200 mg per day) or 4-5 cups of milk per day. Adequate dairy intake (>4 serving per day) had a favorable effect on adolescents.²²

A recent study indicated that the majority of students drink cola-type beverage. Also, the frequency of drinking cola-type beverage in female students was more than male ones. In addition, young people prefer to consume drinks with cola on a daily basis and they have a tendency to skip meal to avoid weight gain.²³ In this study, the results showed that cereal consumption in the majority of students was 3-4 times every week. The majority of students consume fruits and vegetables daily. The findings of a previous study showed that consumption of almond and soya products was shown to be a protective factor in osteoporosis,²⁴⁻²⁶ vegetarian diets may be more beneficial than animal protein diet in many respects.

Also, recent studies confirmed that tea and coffee have adverse effects on skeletal modeling. Daily consumption of coffee up to 300 mg of caffeine daily (3-5 dl) has no effect on bone density as long as there is sufficient intake of calcium. Adverse effect has only been found in subjects with higher coffee intake and concurrent calcium intake of less than 750 mg/day.²⁶ In this study, coffee consumption in female students was 2 and less 2 times every week whereas the majority of male students didn't have caffeine consumption.

Prevention of vitamin D deficiency and having adequate intake of vitamin D and calcium throughout childhood may reduce the risk of osteoporosis in adulthood. Also, sunlight helps to trigger vitamin D

synthesis.^{10,20} One of the substances which influence absorption of calcium most significantly is vitamin D which increases its intestinal absorption and, thus compensating its lesser intake. By supplementation with 20 micrograms of vitamin D, together with 1,200 mg of calcium, it is possible to reduce the risk of fractures,²⁷ although it is nearly impossible to get adequate amounts of vitamin D from your diet. Sunlight exposure is the only reliable way to generate vitamin D in your own body whereas our results in this study indicated that female students use sunlight exposure which contributes to the synthesis of D₃. Also, one study showed that the main source of vitamin D has been its synthesis in the skin from cholesterol after exposure to UV-B light. Full body exposure during summer months for 10 to 15 minutes in adults with lighter pigmentation will generate between 10000 and 20000 IU of vitamin D₃ within 24 hours; individuals with darker pigmentation require 5 to 10 times more exposure to generate similar amounts of vitamin D₃.²⁸ Vitamin D acts as a key to let calcium shift to the bone. Calcium and vitamin D have a synergetic effect for bone structure building up. In addition to the dietary vitamin D, sunshine exposure is a natural source of vitamin D; about 10 to 15 minutes of sunlight several days a week is enough for human body to produce adequate quantities of vitamin D.⁷ The results of a study confirm our findings indicating that low education was shown to be a risk factor of osteoporosis. Education less 12 years of schooling remained significant as a risk factor in osteoporosis.¹⁴ Also, in another study in Iran it was shown that parental education status has a key role in prevention of osteoporosis.²⁸ Results of the present study indicate that chronic diseases and immobility occur more in female students than male ones. A number of factors influence peak bone mass.²⁶ These include heredity, sex, nutrition, endocrine factors and chronic diseases, taking drugs, mechanical influences (physical activity,

body mass) and some risk factors (smoking, excessive alcohol intake, etc.). Results of a study showed that the age of menstrual cycle in the majority of female students was 12 years. Another study showed that early menopause (before 45 years), late menarche (after 14 years) and post-menopausal duration more than 5 years were shown as significant risk factors in Iran.¹⁴ Also, we found that approximately two thirds of the students in their study had no information concerning preventive behaviors and desirable lifestyle for prevention of osteoporosis in future.

CONCLUSION

Changing the lifestyle of the students could play an influential role in the prevention of osteoporosis in the future. Some appropriate healthy behaviors to prevent osteoporosis are proper nutrition, physical activity, avoiding harmful habits such as smoking and alcohol drinking and many others which are important during the growth age when the skeletal modeling process takes place. In addition, since the mass media and particularly TV is the most important medium through which teenagers receive health education, it is recommended to introduce healthy lifestyle via the mass media.

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