

# Assessment of Osteoporosis Preventive Lifestyle and Awareness in 13-15-Year-Old Students in Garmsar City in 2018

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## Abstract

**Background:** Known as a health and medical problem in the community, osteoporosis (OP) is the most prevalent metabolic bone disease. The most facile approach to dealing with osteoporosis is prevention and lifestyle modification. In adolescents, in particular, lifestyle plays the most important role in preventing from osteoporosis in the adulthood. This study was conducted to determine the level of osteoporosis preventive lifestyle and awareness among 13-15-year-old students in Garmsar city in 2018.

**Methods:** This descriptive cross-sectional study was conducted on 400 high school students selected by two-stage cluster sampling method in Garmsar city in 2018. The data were collected with a three-part questionnaire containing 38 questions related to personal data and measurement of the awareness and lifestyle dimensions associated with osteoporosis prevention, including habits (smoking cigarettes and hookah and exposure to the sun to mention a few), nutrition, and physical activity. Cronbach's alpha of awareness (0.84), habits (72.5), and nutrition (0.72) was calculated to specify the reliability of the tool and the content validity was calculated with Lawshe method containing CVR (0.9) and CVT (0.86). For data analysis, use made of descriptive statistics and multiple linear regression by SPSS software version 24.

**Results:** The results of awareness dimension with merely 42.77% correct answers indicated the low awareness of students. The dimension of habits in the preventive lifestyle was in optimal condition with a score of 61.1%. With scores of 33.4 and 25.2%, physical activity and activity without mobility were optimum (score: 70%). There was a direct and significant correlation between students' awareness and their performance regarding osteoporosis ( $P < 0.05$ ). A direct correlation was further observed between awareness and lifestyle ( $r = 0.255$ ).

**Conclusions:** The studied population had inadequate awareness and poor lifestyle. Given the existing risk factors, it is necessary to pay close attention to education and lifestyle changes in adolescents and their families.

**Keywords:** Awareness, Osteoporosis, Students, Preventive lifestyle

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## 1. Introduction

Millions of people around the world suffer from osteoporosis, the most common metabolic bone disease that leads to bone loss and increased fracture risk (1). Today, osteoporosis is known as a major public health problem and has become the "silent illness" of the century. The disease is asymptomatic and its complications (fractures) can inflict large and irreparable physical and financial losses on society and patients (2). The World Health Organization (WHO) has deemed the disease as the most important cause of bone fracture worldwide and the fourth most major human enemy following myocardial infarction, stroke, and cancer(3).

Lack of exercise, smoking, excessive consumption of caffeine, inadequate calcium and vitamin D intake, and a history of osteoporosis are among the most important risk factors associated with osteoporosis (4).

According to the recent estimates, more than 255 million women suffer from osteoporosis around the world. According to recent statistics from Iran, about 25,969,046 people currently suffer from osteopenia and 3,024,798 have osteoporosis, which will reach 40,303,730 and 3,592,708 by 2020 (5).

Osteoporosis is considered as a high-cost health problem with an increasing incidence (6). The mortality and burden of osteoporosis are always significant due to frequent bone fractures and the heavy costs of treatment and hospitalization, and its prevention plays a significant role in improving the quality of life and reducing mortality and the costs of treatment and care (7).

Research has shown that osteoporosis is a disease affected by nutrition and lifestyle, able to be prevented by enough nutrition and sufficient physical activity (8). The lifestyle associated with osteoporosis prevention is of particular importance in adolescence and early

adulthood because more than 20% of longitudinal bone growth and about 50% of bone density are formed in this age (9). If lifestyle modification occurs during adolescence, it can have the most optimal effect on reducing the incidence of osteoporosis, hence the fact that adolescents are considered as target populations in health planning (10).

Accordingly, the objective of this study was to determine the awareness and lifestyle of 13-15-year-old students in Garmsar in relation to osteoporosis.

## 2. Objectives

The current study aimed to determine the level of awareness and lifestyle associated with osteoporosis, including habits (exposure to sunlight and cigarette smoke, cigarette and hookah smoking, and consumption of vitamin D3 supplementation), nutrition, and physical activity as controllable factors in osteoporosis prevention. Accordingly, by identifying the risk factors, we proposed solutions to changing the lifestyles and increasing awareness during adolescence.

## 3. Methods

This descriptive cross-sectional study was carried out on 400 13-15-year-old students in Garmsar city after obtaining the required certificates from Semnan and Garmsar provincial education departments. Informed consent was also obtained from study participants. The required sample number was calculated as 346 according to Cochran's formula for a confidence level of 95%,  $\alpha$  was 0.05, and the critical value was  $Z=1.96$ .

$$d=0.05$$

$$P=q=0.5$$

$$Z=1.96$$

$$n = \frac{NZ^2Pq}{Nd^2 + Z^2Pq}$$

Thus, the obtained sample size was assigned to proportionately female and male size:

$$N_1=1641 \quad \text{All female students aged 13-15 years in Garmsar City}$$

$$N_2=1629 \quad \text{All male students aged 13-15 years in Garmsar City}$$

$$W_h = \frac{N_h}{N}$$

$$n_h = n \cdot W_h$$

$$n_1=346 \times 0.501=174$$

$$n_2=346 \times 0.497=172$$

The final obtained sample size was  $n=400$ . Two-stage cluster sampling was employed to complete the samples from all regions of the city. In the first stage, urban areas and in the next stage, schools were considered as clusters. Accordingly, a list of all-girls and all-boys schools was extracted. Next, eight schools were randomly selected from all regions via simple sampling method. In a simple random manner, the samples were chosen from the selected schools. The number of required samples was calculated using the following formula with 95% confidence ( $Z_{1-\alpha}=0.95$ ), 80% power ( $Z_{1-\beta}=0.80$ ) and 20% loss:

$$W_h = \frac{N_h}{N} = \frac{\text{Number of people in the class } h}{\text{Number of people in the statistical population}}$$

$$n_h = n \cdot W_h$$

The data were collected with a three-part questionnaire containing 38 questions related to personal data, measurement of awareness and lifestyle associated with preventive habits (smoking cigarettes and hookah and exposure to the sun to name a few), nutrition (consuming dairy products, fruits, vegetables, soda, tea, and coffee) and physical activity. Questionnaire items were designed according to expert reviews and the review of studies by Ahmadinea, Hernandez, Weaver, and, Falahi (11-14). In order to examine the face and content validities, the comments of 10 experts in nutrition groups, psychology, health education, and school health were considered. Afterwards, the obtained CVR and CVT validity indices were 0.9 and 0.86. To specify the reliability of the tool, the Cronbach's alpha index was calculated through conducting a pretest on a 30-subject sample. The reliability was examined in regard to awareness (0.84), habits (72.5), nutrition (0.72), and physical activity (71.5). It was proved acceptable for the questionnaire.

Questions related to personal characteristics were associated with age, basic education, parents' education, and number of family members, and questions of awareness included 18 items. The choices were "correct, incorrect, and neutral". In the awareness dimension, the scores above 70, between 50 and 70, and below 50 were considered as optimal, average, and weak, respectively. The lifestyle section included habits (six questions), nutrition (six questions), and physical activity (two questions). Based on the literature and evidence, the daily physical activity of adolescents was at least 60 minutes or

more and the activities without mobility were less than 2 hours (15). To receive adequate vitamin D and prevent osteoporosis, the daily exposure to sunlight was 15-30 minutes or more without wearing physical or chemical protection (sunscreen) on the face, hands and feet; also, sufficient calcium was obtained by the consumption of dairy products three times a day (16-18).

Descriptive and inferential statistics were used to analyze the data. Descriptive statistics were mean and standard deviation, number and percentage, and multiple linear regression coefficients. The tables contain the respondents' demographic characteristics. The data were analyzed using SPSS software version 24.

#### 4. Results

In this study, girls and boys accounted for 50.9% and 49.1% of the statistical population, respectively. The most frequent level of education in parents was high school education (49.1%); moreover, families with four

members had the highest household dimension (61.3%).

The majority of the students had a low and limited awareness on the study subject; 42.77% of the students answered the questions correctly (Table 1).

In the four stages of backward regression, the age variable was effective in the last stage (Table 2). The results of the regression analysis showed that age with regression coefficient (0.908), number of family members ( $B=0.576$ ), and father's education ( $B=0.706$ ) had a direct predictive effect on the girls' awareness (Table 2). Age had the most predictive effect on girls, meaning that with the passage of each year, 0.908 was added to the awareness level of female students. In boys, however, the above variables were not significant, and only age had a negative effect on prediction, with the level of awareness decreasing with age. Out of the total population, 66.4% had daily exposure to sunlight, out of whom 35.2% were exposed less than 15 minutes and 31.2% more than 15 minutes. 21.7% of the research

**Table 1:** Frequency of correct answers by the population in terms of awareness

| Questions   | %     |
|---|-------|
| 1. Have you ever heard of osteoporosis?   | 0.96  |
| 2. Does osteoporosis cause death?   | 0.16  |
| 3. Is osteoporosis a great health problem?  | 28.90 |
| 4. Is osteoporosis more prevalent in men?   | 30.20 |
| 5. Is osteoporosis more prevalent in the elderly?   | 76.30 |
| 6. Is osteoporosis more common in some races?   | 22.90 |
| 7. Does smoking cause osteoporosis?   | 40.10 |
| 8. Does one's exposure to the sun cause osteoporosis?   | 67.60 |
| 9. Does one's drinking tea cause osteoporosis?  | 7.00  |
| 10. Does one's drinking coffee cause osteoporosis?  | 24.70 |
| 11. Is osteoporosis hereditary?   | 42.90 |
| 12. Does one's smaller figure cause osteoporosis?   | 15.20 |
| 13. If a person in your first-degree family suffers from osteoporosis, does the likelihood of developing disease in you increase? | 16.70 |
| 14. Does high- calcium food prevent osteoporosis?   | 80.30 |
| 15. Does lack of adequate physical activity cause osteoporosis?   | 46.40 |
| 16. Is a person with osteoporosis allowed to be involved in intense physical activity?  | 47.90 |
| 17. Does walking to do the daily purchase prevent osteoporosis?   | 37.50 |
| 18. Is taking Vitamin D recommended to prevent osteoporosis?  | 73.30 |

**Table 2:** Linear regression: the correlation between awareness and the underlying variables in male and female students

| Model                    | Female          |            |       |
|--------------------------|-----------------|------------|-------|
|                          | Coefficients(B) | Std. Error | Sig.  |
| Constant)                | 4.785           | 0.868      | 0.003 |
| Age                      | 0.908           | 0.239      | 0.008 |
| Number of family members | 0.576           | 0.316      | 0.007 |
| Father's education       | 0.706           | 0.228      | 0.002 |
|                          | Male            |            |       |
| Constant)                | 9.155           | 0.812      | 0.637 |
| Age                      | -1.067          | 0.201      | 0.008 |

**Table 3:** Frequency distribution of dairy consumption based on gender

| Gender | Rarely-never |         | Less than 3 units |         | 3 units or more |         |
|--------|--------------|---------|-------------------|---------|-----------------|---------|
|        | Number       | Percent | Number            | Percent | Number          | Percent |
| Male   | 9            | 4.57    | 88                | 44.67   | 100             | 50.76   |
| Female | 21           | 10.40   | 117               | 57.92   | 64              | 31.68   |
| Total  | 30           | 7.49    | 205               | 51.30   | 164             | 41.22   |

**Table 4:** Frequency distribution of vegetable consumption based on gender

| Gender | Vegetable Consumption |         |                   |         |                 |         |        |         |
|--------|-----------------------|---------|-------------------|---------|-----------------|---------|--------|---------|
|        | Rarely-Never          |         | Less than 3 units |         | 3 Units or more |         | Total  |         |
|        | Number                | Percent | Number            | Percent | Number          | Percent | Number | Percent |
| Male   | 108                   | 54.8%   | 57                | 28.9%   | 31              | 15.7%   | 197    | 100.0%  |
| Female | 125                   | 61.6%   | 56                | 27.1%   | 22              | 10.8%   | 203    | 100.0%  |
| Total  | 233                   | 58.3%   | 113               | 28.0%   | 53              | 13.3%   | 400    | 100.0%  |

population were exposed to cigarette smoke, with 10.7% being exposed to cigarette smoke for 1-2 hours, 3.7% for 3-4 hours, and 7.2% for over five hours a day. 5.5% of the participants in the study responded positively to smoking, out of whom 1.5 and 2.5% mentioned daily, weekly and monthly smoking, respectively. 18% of the subjects smoked hookah, with 3.5, 6, and 8.5% having daily, weekly, and monthly habits of smoking.

According to the Ministry of Health's instructions, a 50,000 IU vitamin D3 per month is recommended for osteoporosis prevention. In this study, 61.1% of the students consumed a vitamin D3 pearl per month. In terms of dairy consumption, 41.22% were in the optimal range.

Dairy consumption was observed more in boys (50.76%) than girls (31.68%) (Table 3). Only about 19.5% were educated on osteoporosis prevention.

In terms of vegetable consumption, 13.3 had more than three units a day (Table 4).

The results of the research in physical activity dimension showed that 49.6, 25.2, and 25.2% spent more than two and less than two hours a day on watching television, using tablets, and playing non-mobile games, respectively. Regarding physical activity, 21.4% of the population did not have a targeted weekly activity. 45.1% had less than seven hours a week, and 33.4% had more than seven hours a week of activity. In general, 33.4% had optimal activity, which was higher in boys (49.7%) than in girls (17.6%).

## 5. Discussion

The present study showed that the awareness of

most students was low (below 50%) and limited. In a cross-sectional study by Mir Aghae and colleagues titled "Awareness of high school girl students about osteoporosis and its factors", the results showed that the awareness of female students about the factors affecting the disease (gender, race, cigarette, sunshine, exercise, and menopause and its complications) was generally low (24.4% were below the 25<sup>th</sup> percentile). The level of optimal awareness (above 75<sup>th</sup> percentile) was 40.8% (19), which is consistent with the results of the present study. In a study by Afrasiabi and co-workers on high school female students on osteoporosis in 2011, 58.90% answered the questions correctly (20), which is higher than the current study possibly because of their higher education level and information. In a study by Saleh and colleagues, 52% of the participants had adequate overall awareness, almost consistent with the current study (21).

In the present study, 61.1% had an optimal lifestyle. In a study by Yekefallah and co-workers, only 6% of boys and 6.7% percent of girls were exposed to sunlight (14), which is lower than the present study; such difference might be attributed to awareness regarding sunlight exposure. In a descriptive study by Dehghan Manshadi and colleagues, 71.2% were exposed to sunlight (22), slightly more than the present study.

In general, 21.7% were exposed to cigarette smoke in this study. Ahmadiania and co-workers reported that more than one-third of the subjects were exposed to cigarette smoke (11), which is slightly more than the present study. 5.5% of our participants were smokers. No smoking was reported in Ahmadiania and co-workers who studied girls, among who smoking was naturally less than boys. In a descriptive study by Dehghan Manshadi and colleagues, 3.7% were

smokers (22). Stránský and Rysavá conducted a study on nutrition as a prevention and treatment of osteoporosis. They reported that calcium and vitamin D3 supplement reduced the risk of bone fractures by 24% and significantly decreased the bone mass loss (8).

Only 19.5% had been educated on the prevention of osteoporosis. In Dehghan Manshadi's study, 16.6% of students were trained, which is almost consistent with the present study (22).

Dairy consumption was favorable at 41.22%, which is below the expected level. In the study of Yekefallah, only 26.9 and 33.5% of the girls and boys had milk on a daily basis (14), which is in line with the present study. In a research carried out by Kostecka in Poland, 47% of the respondents consumed 550 to 750 mg (less than three units) of calcium per day, and merely 21% had more than 1200 mg daily intake of calcium (23), which is lower than the current study. 27.7, 13 and 32.2% consumed protein 3-4 times a week, more than four times per week, and daily (red and white meat). In Yekefallah's study, 7.2% did not use protein, 19.5% had red meat, and 9.5% had white meat daily, which is almost in accordance with the present study (14). In a prospective study by Munger and co-workers, the results showed that protein intake, particularly from animal sources might be associated with a reduction in the incidence of pelvic fractures in postmenopausal women. As a nutrient-varying animal resource, protein was negatively correlated with the risk of acute fractures in women living in Iowa. Protein from plant sources was protective against pelvic fractures (24). 13.2% of students in the present study had an optimal consumption of vegetables. The consumption of vegetables was higher in boys than girls. In Yekefallah's study, the consumption of fruits and vegetables was 64.5 and 53.2% among boys and girls, which is consistent with this study in terms of gender proportion (14). In the review article by Weaver and colleagues, the results indicated a positive relationship between fruit and vegetable consumption and bone density (12).

In terms of drinking coffee, 8% drank four cups or more, which was optimal in the present study. Hernandez-Avila and colleagues studied the effect of caffeine consumption, reporting that high consumption of coffee (equivalent to or more than four cups per day) in men and women was significantly associated with increased risk of pelvic fracture (13).

Drinking soda was optimal in 47.1% and higher in

boys. In Yekefallah's study, only 13.5 and 5.2% of girls and boys did not drink soda. There was a significant difference between drinking soda among girls and boys (14), which is consistent with present findings in terms of gender. Wyshak studied soda consumption and bone fracture in girls. Their results showed a direct correlation between drinking soda and bone fractures in physically active girls (25). Weaver and colleagues showed that soda consumption and bone results in young children or adults were significantly associated with an increase in wrist and forearm fractures (12).

We observed that the rate of optimal physical activity was 33.4% and physical activity was higher in boys. Nobakht Motlagh and co-workers studied the prevalence of osteoporosis and its related factors in 2012-2013, where only 16% of the women had continuous physical activity, which is less than the present study. Nobakht Motlagh's study was conducted on women aged 56 (4±8) and with less mobility compared with adolescents; however, the present study was carried out on boys and girls, with the former having more physical activity (26). In the study of Yekefallah and colleagues, the results showed that most girls did not have a regular exercise program during the week (20.7% did not exercise at all). There was a significant difference between the physical activity pattern of girls and boys. Daily physical activity was 34.1% in boys and 8% in girls (14), which is in line with the present study. Takakura and co-workers studied the health behavior patterns among Japanese high school students. They found that 52.1% of female students suffered from physical inactivity (27); this is more than the present study in which the year of study and students' age can be effective. High school students had less physical activity than the studied group.

## 6. Conclusion

This study showed that students' optimal awareness was low and their lifestyle regarding habits, physical activity, and immobile activity fell under optimal conditions. Lack of awareness, inappropriate lifestyle, and absence of mobility can put students at risk of osteoporosis. Therefore, it is necessary to pay close attention to education and change the lifestyle of adolescents and their families.

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### Ethical Approval

This study was approved by the Research Deputy of Shahid Beheshti University of Medical Sciences and Health Services with the ethics code IR.SBMU.SME.REC.1397.018.

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