



Knowledge and Perceptions of Obesity Prevention and Consumption of Fruits and Vegetables among High School Girl Students in Shahr-e-kord

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI:10.9734/BJMMR/2015/12716

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Complete Peer review History: <http://www.sciencedomain.org/review-history.php?iid=721&id=12&aid=7264>

Original Research Article

Received 15th July 2014
Accepted 20th November 2014
Published 15th December 2014

ABSTRACT

Background: Obesity is a major public health issue and the prevalence has increased in both the industrialized and developing world. Fruit and vegetable intake has been proposed to protect

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against Obesity. The purpose of this paper was to assess knowledge and perceptions of obesity prevention and consumption of fruits and vegetables among high school girl students in Shahr-e-kord.

Methods: This descriptive- cross-sectional survey was done on 308 high school girl students, aged 13-14 years, who were selected, based on a simple random selection method from eight schools. Data collected using a Food Frequency Questionnaire (FFQ) and researcher-made Questionnaire were based on Health Belief Model. Finally, data collected were analyzed by SPSS16.

Results: The findings showed the mean score of knowledge was 39.14 ± 20.40 , perceived susceptibility: 31.65 ± 16.40 , perceived severity: 36.31 ± 20.02 , perceived benefit: 42.69 ± 19.55 and perceived barriers was 40.50 ± 18.59 . There was a statistically significant and direct relationship between knowledge and perceived susceptibility and perceived benefit. The number of consumed units per day for fruits was 1.42 and the number of consumed serving per day for vegetables was 1.46. Also there was a statistically significant and indirect relationship between BMI of students with fruit and vegetables intake.

Conclusions: The low level of appropriate practice of fruit and vegetable consumption by students in the study area needs to be improved by health workers and teachers via the mass media, health talks and one-on-one health education of students.

Keywords: Knowledge; perceptions; consumption of fruits and vegetables; girl students.

1. INTRODUCTION

The prevalence of chronic or non-communicable disease is escalating much more speedily in developing countries than in industrialized countries. According to World Health Organization estimates, by the year 2020, non-communicable diseases will account for approximately three quarters of all deaths in the developing world [1]. Obesity is a major risk factor for chronic disease [1]. Evidence indicates that excessive weight gain in the first years of life can alter neural development, metabolic and behavioral systems in ways that increase the risk for obesity and chronic disease later in life [2,3]. Specifically, childhood and adolescent obesity is a precursor to type-2 diabetes, cardiovascular disease, hypertension, stroke, osteoarthritis, asthma, and certain cancers [2,3]. As such, many reports have projected that childhood-onset obesity will contribute significantly to increased morbidity and mortality in adulthood [4].

The perceived susceptibility and severity shows people's attitude. Basically attitude is related to people's feelings and emotions. Not only most of the adolescents did not consider their own health undesirable or in need of more attention, most of them evaluated themselves completely healthy and expressed that they do not have any concern about obesity and its complications. Even in cases that obesity was accepted as a disease by adolescents, it was considered as a problem in future and there was no need to do

any prompt action about it [5]. In addition, it was assumed that in terms of health, chubby and plump children are in a better situation and no one believed that they were at a higher risk due to obesity related complications [6]. HBM is one of the first models of the concept of perceived susceptibility. Obesity complications will appear broadly in individual, family, social, economic and cultural aspects [6] and they will lead to many dangerous and chronic diseases like various types of cancers and cardiovascular diseases. Therefore it is very important to address the perceived sensitivity.

The consumption of fruit and vegetables is considered a vital part of a healthy lifestyle. A sufficient intake of fruit and vegetables may reduce energy density, prolong satiety, increase fiber intake and decrease overall energy intake [7-9]. The national recommendations in Norway from 1996 to 2011 were to eat at least five portions of fruit and vegetables a day; three servings of vegetables and two servings of fruit [10].

Yet, research shows that less than half of adults and youth meet the recommendations for consuming at least five fruits/vegetables servings daily [11]. A potential emerging public health concern in developing countries is likely to be the increasing incidence of childhood overweight, which in the future is likely to create an enormous public health burden [12]. Despite the high and increasing prevalence of obesity in Iran, little attention has been paid to examination of

the influential factors of obesity among students. In a qualitative study by Farahmand and et al. [13] taste and food preferences, high cost of healthy foods and have been reported as being associated with Lack of fruit and vegetable consumption. In this study, constructs of the Health Belief Model (HBM), including perceived susceptibility of obesity, perceived severity of obesity, perceived benefits of consumption of fruits and vegetables, perceived cost (barriers) of lack of fruit and vegetable consumption, and self-efficacy, have been assessed. The HBM is one of the most widely used health behavior model that has been used extensively to organize theoretical predictors of preventive health actions. The HBM is a method used to evaluate and explain individual differences in preventative health behavior [14,15]. Adolescence is a critical period in development of overweight and obesity which is associated with the mortality in adulthood [16]. Adolescents are an important group in obesity prevention actions. By getting older, behaviors that related to obesity prevention are reduced. In addition, it is very probable that childhood obesity will be continued until adolescence and be increased during adulthood. Since in terms of creating healthy diet behaviors, adolescence is an important stage of life [17], identification of its important factors and promotion of healthy diet in this period of time has remarkable and long term benefits on health and especially obesity prevention.

Therefore, the current study is designed to assess the knowledge and Perceptions of Obesity Prevention and Consumption of Fruits and Vegetables among high school girl students in Shahr-e-kord.

2. PATIENTS AND METHODS

2.1 Subjects and Ethical Approval

This descriptive cross-sectional study was performed at shahr-e-kord in 2014 (5 months-December 22, 2013- April 21, 2014), supported by Shahid Beheshti University of Medical Sciences. It was performed among 308 school students aged 13–14 years, living in shahr-e-kord city.

2.1.1 Inclusion criteria

School girls in the age range of 13 to 14 years.

2.1.2 Exclusion criteria

School girls with over 15 year are old, suffering from chronic diseases, difficult diseases,

disability and student's reluctance in continuing the participation in the study.

This research proposal is approved with the row number of 8992/4 and all questions are assessed and then approved by the university research council, department of education and the security department. After obtaining permission from the shahid Beheshti University of Medical Sciences and presentation to the provincial education, the researcher entered the schools.

To begin with, the needed explanation was provided about the research goals, its advantages, and completion of the questionnaires by the respondents. They were aware of the confidentiality and gave their approval to participate in the study. Then, with giving the necessary explanations, the questionnaires were provided to students to be completed. Subsequently, all of the scales were given to subjects for responding. It was also requested that none of the questions be left blank and careful attention had to be provided to the answers. In the end, some gifts were given to each subject in order to appreciate their cooperation. The students were permitted to leave if they were not interested in participating in this study.

The method of sampling was convenient sampling as follows: eight high schools were selected from two educational areas of Shahr-e-kord, The participants were recruited randomly from these high schools; this means that Using Attendance List, Each student was given a code. Then, the samples were randomly selected from code.

2.2 Assessments

Fruit and vegetable consumption was assessed by semi-quantitative food frequency questionnaire (FFQ) including a list of 17 vegetable items and 27 fruit items with a standard serving size [18]. To assess the fruit and vegetable consumption, participants were asked to report the frequency of consuming each type of fruit and vegetable according to the measuring units (it must be mentioned that serving sizes were explained for students, for example a medium orange or apple is one serving size, a half glass of cooked vegetable or a glass of fresh vegetable is one serving size). Then the amount and frequency of consumption was changed into the daily intake and in this way, the daily consumption of fruit and vegetable was calculated according to servings.

Validity assessment of the present questionnaire was done in the following way: the questionnaire was given to 30 students who were then excluded from the main study. Then, alpha was calculated for questionnaire. Alpha coefficient was obtained as 0.91.

For each participant was considered 1 h to complete a questionnaire and as there were many questions (for FFQ) they were allowed to fill out the questionnaire at home.

The demographic information included household size, age of parents, education of parents, job of parents, family history of obesity and BMI; also knowledge and perceptions of obesity prevention questionnaires based on Health Belief Model in the Farsi language were prepared.

Health Belief Model is one of the intrapersonal health education models (derived from behavior science theory) which are administered for nutrition education in various subjects. The philosophy of this model that educators can result in creation or behavior change include Three characteristics; Firstly is that; behavior has benefits for health, economy, social, family and cultural, Secondly; health educators know the barriers related to choosing behaviors and consider them for planning. Thirdly; educational program should induce appropriate susceptibility among people that lack of health behavior can result in side effects and complications including health hazards, economic, social and family hazards.

Data collection was done through a questionnaire consisting of the following parts: The first section covered knowledge with nine questions about Number of serving of fruit and vegetable consumption, fruit and vegetable consumption by different age groups and Etc. (For example: Which substances are more in fruits and vegetables? How much of fruits should be consumed daily?), the second section was about perceived susceptibility with six questions (For example: My chances of getting obesity are great, Within the next year I will get obesity.), The third section was about perceived severity with five questions (For example: I am afraid to even think about obesity, If I got obesity, it would be more serious than other diseases), The fourth section covered perceived benefit with five questions (For example: If I eat enough fruit and vegetable, I will have less concern about obesity, When I consume enough fruit and vegetables to prevent obesity, I feel better.) and finally the fifth

section was about perceived barriers with five questions (For example: Fruits and vegetables are so expensive, I don't like fruit and vegetables, Fruit and vegetables consumption means changing my diet and it is hard for me). (Table 1).

The scoring method of the questionnaire in the knowledge part was each correct answer to the knowledge questions was given one point and "I don't know" or incorrect answer was given zero points.

Perceptions questions including HBM constructs were designed by use of lickert scale (from "completely agree" to "completely disagree") and each answer was given zero to four points: so that "totally disagree" scored 0, "disagree" 1, "I have no idea" 2, "agree" 3 and "completely agree" scored 4. The scale scores of knowledge, attitude were calculated out of 100.

The questions of parts of the validity were confirmed by face validity and content validity. Knowledge and perceptions questionnaires were given to 30 students that were similar to the studied students in terms of demographic characteristics and, 10 days later, only knowledge questions were given to the same 30 people again. After filling them out, the reliability of knowledge questions was confirmed by $\alpha = 0.80$. Alpha of perceptions questions were estimated ≤ 0.7 and confirmed. At the end, Weight was measured by a standard scale with the accuracy of 0.1 kg, without wearing shoes and with the least possible clothing. Height was measured by a tape measure while standing without shoes beside the wall. BMI was calculated by dividing weight in kg by square of height in square meter.

2.3 Statistical Analysis

SPSS v.16 was used for analysis. Results were analyzed by descriptive or analytical statistics: frequency tables, cross tabulations, mean \pm standard deviation (S.D), Spearman (for assessment relationship between knowledge, attitude and BMI) and Pearson correlation coefficient.

3. RESULTS

76% of their mothers were housewives. 46% of their fathers and 57% of their mothers were diploma (Table 2). Table 3 showed Mean \pm SD of knowledge and constructs of health belief model. There was a statistically significant and positive

relationship between knowledge and perceived susceptibility and perceived benefit. There was not relationship between knowledge and perceived severity and barriers and also, between perceived severity and perceived susceptibility.

Also, there was a statistically significant and positive relationship between jobs of Mother with perceived barriers. Also there was a statistically significant and positive relationship between fathers Age with perceived susceptibility and between fathers Job with perceived susceptibility and between with Education of Mother and perceived severity, Also there was a statistically significant and positive relationship between BMI of students with knowledge, perceived susceptibility and perceived benefit (Table 4). Based on the findings, the mean daily serving of fruit was 1.42 and the mean daily serving of

vegetables was 1.46. Also there was a statistically significant and negative relationship between BMI of students with fruit and vegetables intake.

There was a statistically significant and positive relationship between knowledge, perceived susceptibility, perceived severity, perceived benefit and perceived barriers with fruit and vegetables intake.

4. DISCUSSION

Adolescence is a crucial period in life and implies multiple physiological and psychological changes that affect lifestyle habits. Adolescents have particular food habits and their meal choices may differ from both adults and children [19].

Table 1. Measurement scales

| Constructs | Questions |
|--------------------------|---|
| Perceived susceptibility | My chances of getting obesity are great Because I have an especial body form, I think the probability of obesity is high for me. Within the next year I will get obesity I am worry about getting obese. When I get older, I will be worry about my overweight. Because of the family history of obesity, the probability of getting obese is high for me. |
| Perceived severity | I am afraid to even think about obesity. If I get obese, I will be unable to do many things. If I get obese, my feeling about myself will be changed. When I think about obesity, I get depressed. If I got obesity, it would be more serious than other diseases. |
| Perceived benefits | Eating fruit reduces my hunger feeling. Eating vegetables reduces my hunger feeling. Fruit and vegetable consumption prevents obesity. If I eat enough fruit and vegetable, I will have less concern about obesity. When I consume enough fruit and vegetables to prevent obesity, I feel better. |
| Perceived barriers | Fruits and vegetables are so expensive. Fruit and vegetables don't agree with me. I don't like fruit and vegetables. Fruit and vegetables consumption means changing my diet and it is hard for me. If I want to eat fruit and vegetable, I have to leave my favorite foods. |
| Knowledge | Which substances are more in fruits and vegetables? How much of fruits should be consumed daily? How much of vegetables should be consumed daily? In whose diet fruit and vegetable should be available? Which of the followings are fruits and vegetables? |

Scoring according to 5 choice lickert scale: 0 to 4 (completely agree 4, agree 3, no idea 2, disagree 1, completely disagree 0), For Knowledge questions: true =1, false or "I don't know" = 0

Table 2. Demographics of students of Shahr-e-kord, 2014

| | No | % |
|----------------------------|-----|-------|
| BMI (students) | | |
| 18.55-24.99 | 286 | 92.85 |
| >25 | 22 | 7.15 |
| fathers Age | | |
| <40 | 140 | 45.50 |
| 40-50 | 136 | 44.20 |
| >50 | 32 | 10.40 |
| Mothers age | | |
| <30 | 46 | 14.90 |
| 30-40 | 227 | 73.70 |
| >40 | 35 | 11.40 |
| Education of father | | |
| Illiterate | 9 | 2.90 |
| Primary | 22 | 7.10 |
| Middle | 98 | 31.80 |
| Diploma | 142 | 46.10 |
| Academic | 37 | 12.00 |
| Education of mother | | |
| Illiterate | 2 | 6.00 |
| Primary | 13 | 4.20 |
| Middle | 70 | 22.70 |
| Diploma | 176 | 53.80 |
| Academic | 47 | 13.00 |
| Father job | | |
| Employee | 69 | 22.40 |
| Self-employed | 150 | 48.70 |
| Worker | 61 | 19.80 |
| Unemployed | 7 | 2.30 |
| Other | 21 | 6.80 |
| Mother job | | |
| Employee | 39 | 12.70 |
| Self-employed | 35 | 11.40 |
| Housewife | 234 | 76.00 |

Table 3. Knowledge and perceptions of students about obesity prevention

| | Mean±S.D |
|--------------------------|-------------|
| Knowledge | 39.14±20.40 |
| Perceived susceptibility | 31.65±16.40 |
| Perceived severity | 36.31±20.02 |
| Perceived benefit | 42.69±19.55 |
| Perceived barriers | 40.50±18.59 |

SD=Standard Deviation

They also differ in other respects, having irregular eating patterns and indulging in frequent snacking and/or skipping meals [20].

At this stage of the lifespan, adolescents are confronted with body weight problems and pressure concerning eating (both with respect to the type of food they are eating and the amounts of food).

This study aimed to investigate the knowledge and perceptions of obesity prevention and consumption of fruit and vegetables among high school girl students in Shahr-e-kord. The results indicated the average knowledge of students about the Number of serving of fruit and vegetable consumption, detection of fruit and vegetables, Fruit and vegetables consumption by different age groups and Etc is 39.14±20.40 and is consistent with the results of most similar studies conducted [21-24].

Short- and long-term effects of overweight and obesity and its association with mortality is increasing, therefore, raising knowledge and giving attention to the importance of this issue as one of the major health problems in children and adolescents is necessitated. Also Students aware that Overweight and obese adolescents may experience discrimination, rejection, and low self-concept at the individual and social levels. Years of study in a school is where teenage life-style is shaped for adulthood. Dietary patterns are developed in this age may have a great impact in the future on the health and family of the individual; therefore, increasing the nutritional knowledge in this age is essential.

Results showed that perceived susceptibility, perceived severity, perceived benefit and perceived barriers were 31.65±16.40, 36.31±20.02, 42.69±19.55 and 40.50±18.59 respectively in Students studied. In our society, it seems that attitude to obesity particularly among children is based strengthening the notion that obesity of a child is a sign of health, happiness, and lack of diseases and parents convey the view to their children and consider thinner kids as ill. These findings agreement with the results obtained from the similar studies conducted by Tavassoli and et al. [24], Abood and et al. [25].

It was also encouraging that our sample expressed a moderate perception that Fruit and vegetables intake does provide positive preventive health benefits; but students were relatively weak in other structures, Because in their view, Not obese; obesity is not a problem and ...

There was a statistically significant and direct relationship between BMI of students with knowledge, perceived susceptibility and perceived benefit; Students who had a normal BMI; had a higher knowledge, perceived susceptibility and perceived benefit.

Table 4. Correlation coefficients between students' knowledge and perceptions with demographic variables

| | BMI | | Father age | | Mother age | | Father job | | Mother job | | Education of father | | Education of mother | |
|--------------------------|---------|--------|------------|---------|------------|--------|------------|---------|------------|--------|---------------------|--------|---------------------|--------|
| | p-value | r | p-value | r | p-value | r | p-value | r | p-value | r | p-value | r | p-value | r |
| knowledge | .001 | 0.043* | 0.657 | 0.025 | 0.269 | -0.063 | 0.499 | 0.039 | 0.753 | 0.018 | 0.351 | 0.053 | 0.067 | 0.105 |
| perceived susceptibility | .001 | 0.097* | 0.017 | -0.136* | 0.146 | -0.083 | .001 | -0.209* | 0.618 | 0.029 | 0.152 | 0.082 | 0.519 | 0.037 |
| perceived severity | 0.065 | 0.085 | 0.999 | 00 | 0.619 | 0.028 | 0.312 | -0.058 | 0.890 | 0.008 | 0.772 | -0.017 | 0.050 | 0.112* |
| perceived benefit | .001 | 0.023* | 0.108 | -0.092 | 0.138 | -0.085 | 0.014 | 0.140 | 0.080 | 0.100 | 0.182 | 0.076 | 0.519 | 0.037 |
| perceived barriers | 0.421 | 0.032 | 0.549 | 0.034 | 0.678 | -0.24 | .001 | 0.299* | 0/129 | -0.087 | 0.036 | 0.119* | 0.462 | -0.042 |

**All significant correlation coefficients are at 0.01 level*

There was a statistically significant and indirect relationship between BMI of students with fruit and vegetables intake; Students who had a normal BMI; consumed more fruits and vegetables and Students who had a higher weight; consumed fewer fruits and vegetables.

Adolescents who had employed mother were more at risk of lacking in daily fruit and vegetables intake; it seems that presence of mother at home or unemployed mother had positive effects on adolescent's food consumption. Mother is traditionally responsible for meal preparation. Mother employment may change or intervene with their useful support like healthy food/ fruit and vegetables preparation, home obtainability, parental supervision, positive role modeling. This results are consistent with previous findings [26,27].

Fruit and vegetables are an important part of a balanced diet, and they are important source of vitamins, minerals, dietary fiber, and phytochemicals. They are high in moisture and low in energy. Studies have shown that a diet rich in fruits and vegetables is very important for maintaining normal intestinal function, improving immunity, and reducing the risk of obesity [28,29] diabetes [30], hypertension [31], Coronary Heart Disease [32] and lung cancer [33]. Therefore, fruits and vegetables consumption is an important, indispensable component of a balanced diet; inadequate consumption of fruits and vegetables is a cause of great concern.

Research also has found that replacing foods of high energy density (high calories per weight of food) with foods of lower energy density, such as fruits and vegetables, can be an important part of a weight-management strategy [34,35].

The results of the present study showed that fruit or vegetable consumption in students was low that could be one of the causes of obesity and overweight.

Low level consumption of fruit and vegetables among adolescents during school times is common and might be explained by several factors including exposure to unhealthy foods, their autonomy to select and intake the desirable, satisfactory snacks, eating away from home, peer influences, higher school assignments, lack of time or experiences to make healthy snacks by parents or by themselves.

In a study on women from Tehran, it was found that prevalence of obesity was 67% and mean

BMI were 25.9 [36]. In another study in the U.S. on children, increased vegetable and fruit intake compared with decreased fat and sugar intake had a significant reduction in percentage of overweight of children. Furthermore, in a cross-sectional study on Mediterranean population, increased vegetable, fruit and fiber intake had an inverse significant correlation with weight gain. Moreover, in a prospective study on 89,432 men and women from five countries participated in the European Prospective Investigation into Cancer and Nutrition (EPIC), there was an inverse significant correlation between fruit and vegetable intake with body weight. This study showed that weight would be reduced 14 g per day with 100 g of fruit and vegetable [37].

Other studies demonstrate, fruit and vegetable consumption is substantially lower than recommended for both children and adults, regardless of food security status [38-40].

This finding underscores the need for well-funded, comprehensive, efficacious efforts to improve food environments, promote healthful living, and strengthen policies aimed at improving children's health.

Consumption of fruits and vegetables having a high nutritional value is important, as much research has shown that consumption of fruits and vegetables reduces the risk of cancer, cardiovascular disease, and is an appropriate diet for weight management and protection of overweight children. A cross-sectional study in the United States showed inverse associations between childhood overweight and fruit consumption during this period. The results of the study showed an inverse relationship between vegetable consumption and overweight in males. Also, consuming foods that are rich in fiber such as whole grains and calcium have a protective role in the prevention of overweight and obesity [41-43].

With regard to the important role of students in foundation of a family and community, this study has provided valuable insight into the consumption of fruits and vegetables. It identifies areas where further research would provide a more comprehensive picture. Such information will be critical to the future development of effective health promotion programs for the healthy life style and prevention of chronic diseases.

Healthy People 2020 identifies "Nutrition and Weight Status" as one of their major objectives to

“promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights.” This objective emphasizes that efforts to change diet and weight should address the policies and environments that support these behaviors in settings such as schools [44]. Although few attempts have been made to prevent obesity during the first years of life, this period may represent the best opportunity for obesity prevention. Results should inform both the fields of childhood obesity prevention and early childhood research about the effects of an obesity prevention program housed in the childcare setting. As childhood obesity continues to be a topic of national interest in the best interest of health care providers, educators, and parents to begin thinking about this as a priority for ensuring the healthy future of our community’s children. The recommendation is to develop nutritional education and design more nutritional intervention programs for the students in general; especially focusing on the nutrients and their benefits to the body, the consequences of skipping meals, the way they prepare their food. Results from eating practices showed that a high percentage of the students have not healthy eating practices with less than recommended dietary guidelines for fruit and vegetables groups therefore major changes in eating habits of this sample are required. Strengths of this study were the study design based on Health Belief Model that helps to better identify existing weaknesses And classification of true knowledge and attitude and so better and more efficiently for the training.

Among the several behavior-directed models, Health Belief Model (HBM) can specify the perception of a person about the intensity of complications of unhealthy behaviors, perception of the capacity to catch disease and its complications and determining the benefits of having healthy behavior in the patient's opinion and barriers that can influence healthy behavior. Determining these issues can help health researchers to assess the future behavior of a person.

The main limitation of this study was its cross sectional nature that might reduce the strength of clinical significance of correlations. In addition, because this analysis reports consumption according to the number of times per day that fruits and vegetables are eaten, the results may over or underestimate the calculated proportion and As the questionnaire was self-completed, it

is possible that some study participants may have miss reported either intentionally or inadvertently on any of the questions asked.

5. CONCLUSION

We found that majority of the participants consumed 4 or less servings of fruits and vegetables per day with only one third attaining WHO recommendations. This provides alarming evidence for policy makers and health care professionals to pay more attention to improve this concern. Low level of education and low socioeconomic status influenced this dietary habits, Nutrition education of the students and their families is advocated. Clearly, health system policy makers must prepare educational programs based on HBM and there is a vital need to establish a national strategy for integrating preventive measures including lifestyle modification, notably dietary changes including higher consumption of fruits and vegetables.

CONSENT

All authors declare that 'written informed consent' was obtained from the enrolled students.

ACKNOWLEDGMENTS

The authors acknowledge and appreciate the support of the faculty of health of Shahid - Beheshti University of medical sciences and the school masters of schools by permitting the research to be carried out at the school campus; and all of the students who participated in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Kelishadi R. Childhood overweight, obesity, and the metabolic syndrome in developing countries. *Epidemiol Rev.* 2007;29(1):62-76.
2. Birch LL, Anzman SL. Learning to eat in an obesogenic environment: a developmental systems perspective on childhood obesity. *Child Dev Persp.* 2010;4(2):138–143.

3. Gluckman PD, Hanson MA, Cooper C, Thornburg KL. Effect of in utero and early-life conditions on adult health and disease. *NEJM*. 2008;359:61–73.
4. Sun SS, Liang R, Huang TT, Daniels SR, Arslanian S, Liu K, et al. Childhood obesity predicts adult metabolic syndrome: the Fels longitudinal study. *J Pediatr*. 2008;152(2):191–200.
5. Amiri P, Ghofranipour F, Ahmadi F, Hooman H, Hosseinpanah F, Jalali-Farahani S. Personal Barriers to Life Style Modification in Overweight/Obese Adolescents: A Qualitative Study. *Iranian Journal of Endocrinology and Metabolism*. 2010;11(5):521-530.
6. Ebadifard Azar F, Solhi M, Pakpoor Haji agha A, Yekaninejad M. The impact of health education through Health Belief Model (H.B.M) on mother's perceptions about obesity children obese male student in elementary schools (17th district, Tehran City). *Journal of Health Administration*. 1384;8(22):7-15.
7. Rolls BJ, Ello-Martin JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev*. 2004;62:1–17.
8. Andersen LF, Overby N, Lillegaard IT. Intake of fruit and vegetables among Norwegian children and adolescents [in Norwegian]. *Tidsskr N or Laegeforen*. 2004;124:1396–1398.
9. Newby PK. Plant foods and plant-based diets: Protective against childhood obesity? *Am J Clin Nutr*. 2009;89(1):1572–1587.
10. Bjelland M, Brantsæter AL, Haugen M, Meltzer HM, Nystad W, Andersen LF. Changes and tracking of fruit, vegetables and sugar-sweetened beverages intake from 18 months to 7 years in the Norwegian mother and child cohort study. *BMC Public Health*. 2013;13:793.
11. Wilson DB, Jones RM, McClish D, Westerberg AL, Danish S. Fruit and vegetable intake among rural youth following a school-based randomized controlled trial. *Preventive Medicine*. 2012;54:150–156.
12. Kelishadi R, Ardalan G, Gheiratmand R, Gouya MM, Razaghi EM, Delavari AR , et al. Association of physical activity and dietary behaviours in relation to the body mass index in a national sample of Iranian children and adolescents: CASPIAN Study. *Bulletin of the World Health Organization*. 2007;85:19-26.
13. Farahmand M, Ramezani Tehrani F, Amiri P, Azizi F. Barriers to healthy nutrition: perceptions and experiences of Iranian women. *BMC Public Health*. 2012;12:1064.
14. Li K, Kay NS. Correlates of cigarette smoking among male Chinese college students in China- a preliminary study. *Int Electron J Health Educ*. 2009;12:59-71.
15. Janz NK, Champion VL, Strecher VJ. The health belief model. In: Glanz K, Rimer BK, Lewis FM, editors. *Health behavior and health education: Theory, research, and practice*. 3rd ed. San Francisco, CA: Jossey-Bass. 2002;45-66.
16. Khosh-Fetrat MR, Rahmani KH, Kalantari N, Ghafarpor M, Mehrabi YA, Esmailzadeh A. Assessment and comparison diet patterns and BMI among between urban and rural adolescent boys (Zarrin shahr 2001-2002). *Payesh*. 2007;2:119-27.
17. Spear BA. Adolescent growth and development. *J Am Diet Assoc*. 2002;102(3):S23-S29.
18. Esmailzadeh A, Mirmiran P, Azizi F. Whole grain intake and prevalence of the hypertriglyceridemic waist phenotype in tehranian adults. *Am J Clin Nutr*. 2005;81:55-63.
19. Moreno LA, Kesting M, De Henauw S. How to measure dietary intake and food habits in adolescence: the European perspective. *Int J Obes*. 2005;29:S66–S77.
20. Moreno LA, Rodríguez G. Dietary risk factors for development of childhood obesity. *Curr Opin Clin Nutr Metab Care*. 2007;10:336–341.
21. Hashemi B, Omidvar N, Bondarianzadeh D, Shakibazadeh E, Rashidkhani B, Abbasian F. Effect of a family-based intervention based on social-cognitive theory on fruit and vegetable intake of middle school female students in a District of Tehran. *Hakim*. 2012;15(1):44-52.
22. Najimi A, Ghaffari M, Alidousti M. Social cognitive correlates of fruit and vegetables consumption among students: a cross-sectional research. *Pajoohandeh Journal*. 2012;17(2):81-86.

23. Najimi A, Ghaffari M. Increasing Fruit and Vegetables Consumption among Elementary School. *Health System Research*. 2013;9(4):395-402.
24. Tavassoli E, Reisi M, Javadzade H, Mazaheri M, Gharli pour Z, Ghasemi S, et al. The effect of the health belief model-based education & improvement of consumption of fruits and vegetables: An interventional study. *Journal of Health in the Field*. 2013;1(2):1-5.
25. Abood D, Black DR, Feral D. Nutrition education worksite intervention for university staff: application of the health belief model. *Nutria Educe Behave*. 2003;35(5):260-67.
26. Reinaerts E, De Nooijer J, Candel M, Deries N. Explaining school children's fruit and vegetable consumption: The contributions of availability, accessibility, exposure, parental consumption and habit in addition to psychosocial factor. *Appetite*. 2007;48:248-58.
27. Videon TM, Manning CK. Influences on adolescent Eating Patterns: The importance of family meals. *Journal of Adolescent Health*. 2003;3(32):365-373.
28. Shi Z, Hu X, Yuan B, Hu G, Pan X, Dai Y, et al. Vegetable-rich food pattern is related to obesity in China. *Int J Obes*. 2008;32:975-984.
29. Schroder KE. Effects of fruit consumption on body mass index and weight loss in a sample of overweight and obese dieters enrolled in a weight-loss intervention trial. *Nutrition*. 2010;26:727-734.
30. Harding AH, Wareham NJ, Bingham SA, Khaw K, Luben R, Welch A, et al. Plasma vitamin C level, fruit and vegetable consumption, and the risk of new onset type 2 diabetes mellitus: the European prospective investigation of cancer-Norfolk prospective study. *Arch Inter Med*. 2008;168:1493-1499.
31. He FJ, Nowson CA, MacGregor GA. Fruit and vegetable consumption and stroke: meta-analysis of cohort studies. *Lancet*. 2006;367:320-326.
32. Ellingsen I, Hjerkin EM, Seljeflot I, Arnesen H, Tonstad S. Consumption of fruit and berries is inversely associated with carotid atherosclerosis in elderly men. *Br J Nutr*. 2008;99:674-681.
33. Büchner FL, Bueno-de-Mesquita HB, Ros MM, Kampman E, Egevad L, Overvad K, et al. Consumption of vegetables and fruit and the risk of bladder cancer in the European Prospective Investigation into Cancer and Nutrition. *Int J Cancer*. 2009;125:2643-2651.
34. Tohill BC, Seymour J, Serdula M, Kettel-Khan L, Rolls BJ. What epidemiologic studies tell us about the relationship between fruit and vegetable consumption and body weight. *Nutr Rev*. 2004;62:365-374.
35. Rolls BJ, Ello-Martin JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev*. 2004;62(1):1-17.
36. Azadbakht L, Mirmiran P, Shiva N, Azizi F. General obesity and central adiposity in a representative sample of Tehranian adults: Prevalence and determinants. *Int J VitamNutr Res*. 2005;75:297-304.
37. Buijsse B, Feskens EJ, Schulze MB, Forouhi NG, Wareham NJ, Sharp S, et al. Fruit and vegetable intakes and subsequent changes in body weight in European populations: Results from the project on Diet, Obesity, and Genes (DiOGenes). *Am J Clin Nutr*. 2009;90:202-209.
38. Lorson BA, Melgar-Quinonez HR, Taylor C. Correlates of fruit and vegetable intakes in US children. *J Am Diet Assoc*. 2009;109:474-478.
39. Guilloford M, Mahabir D, Nunes C. Self-administration of a food security scale by adolescents: item functioning, socio-economic position and food intakes. *Public Health Nutr*. 2005;8:853-860.
40. Hofferth S, Curtain S. Poverty, food programs, and childhood obesity. *J Policy Anal Manag*. 2005;24:703-726.
41. Ritchie LD, Welk G, Styne D, Gerstein DE, Crawford PB. Family environment and pediatric overweight: What is a parent to do? *J Am Diet Assoc*. 2005;105:70-79.
42. McAleese JD, Rankin LL. Garden-based nutrition education affects fruit and vegetable consumption in sixth-grade adolescents. *J Am Diet Assoc*. 2007;107:662-665.
43. Azadbakht L, Surkan PJ, Esmailzadeh A, Willett WC. The Dietary approaches to

stop hypertension eating plan affects C-reactive protein, coagulation abnormalities, and hepatic function tests among type 2 diabetic patients. J Nutr. 2011;141:1083-1088.

Available:<http://www.healthypeople.gov/2020/topicsobjectives2020>.

(Accessed: Jan 11, 2014).

44. HHS (U.S. Department of Health and Human Services): Healthy People 2020. 2013.

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