Improvement of Consumption of fruits and vegetables aimed at the prevention of obesity in girl students

Mahmoud Mobasheri[1], Elahe Tavassoli[2], Ali Ramezankhani[3], Parvin Mirmiran[4], Yadollah Mehrabi[5], Masoome Alidosti[6], Arsalan Khaledifar[7]

[1]Department of Epidemiology and Biostatistics, Faculty of Health, Shahrekord University of Medical Sciences, Shahrekord, Iran.
[2]PhD Candidate in Health Education & Health promotion,Department of Public Health, Faculty of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
[3]Department of Public Health, School of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
[4]Department of Clinical Nutrition and Dietetics, Faculty of Nutrition Sciences and Food Technology, National Nutrition and Food Technology Research Institute, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[5]Department of Biostatistics and Epidemiology, School of Public Health, Shahid Beheshti Medical University, Tehran, Iran
[6]Lecturer, Department of Public Health, Behbahan Faculty of Medical Sciences, Behbahan, Iran
[7]Assistant Professor, Echocardiography Fellowship, Department of Cardiology, Shahrekord University of Medical Sciences, Shahrekord, Iran

Abstract: Background: The intake of fruit and vegetables is considered an important part of a healthy lifestyle. Considering the importance of nutrition education especially Consumption of fruits and vegetables this study was performed to determine effect of health Education Based on Health Belief Model on the improvement of Consumption of fruits and vegetables aimed at the prevention of obesity in girl students in Shahr-e-kord. **Methods:** Students aged 13-14 years (n 154) were recruited from four high schools in Shahr-e-kord city and randomly allocated to a control group or intervention group. The setting for the interventions was schools. The intervention lasted for 6 weeks. The instruments for data collecting were questionnaire health belief model based and FFQ questionnaire. The HBM questionnaire was completed 3 times (before, immediately and 2 months after education) and FFQ questionnaire was completed 2 times (before and 2 months after education) by students. After pre-test, 6 educational session classes in experimental group were performed. Finally data collected and analyzed by $SPSS_{16}$ computer software (T_ test, T-Paired, repeated measure ANOVA). **Results:** Two groups with no significant difference in terms of demographic variables. Before the intervention was not significant differences between the scores of different structures of this model in two groups (P>0/05), after the intervention was significant differences between experimental and control groups in the levels of knowledge, Perceived susceptibility, perceived severity, perceived benefits, perceived barriers and Consumption of fruits and vegetables (p<0.001). **Conclusion:** According to the results, intervention has positive impact on the improvement of Consumption of fruits and vegetables among students.

1. Introduction

Childhood obesity has become a global epidemic. Both developed and developing countries face the crisis of rising trends of overweight and obesity among children (1). Ten percent of school-children worldwide are overweight and in the United States alone, 25% of children are overweight while 11% of them are obese (2).

More than 70% of individuals with a history of childhood obesity grow up to become obese adults (1). In fact, childhood obesity is not just a disease in itself but in the long term it is responsible for social disabilities and the risk of adult diseases for an individual suffering from its (3).Various factors contribute to overweight and obesity in children. In a

literature review by Keller and Stevens (1996), obesity in children was linked to prenatal, genetic, familial and environmental influences. The intake of fruit and vegetables is considered an important part of a healthy lifestyle. An adequate intake of fruit and vegetables may reduce energy density, prolong satiety, increase fiber intake and decrease overall energy intake (4-6). 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 (7).

The health belief model (HBM) is presented as the organizing theoretical framework for this research, which is also one of the most widely used frameworks for trying to understand health behavior

(8). Despite the recommendation to provide education on prevention and training throughout the life span, many programs focus on individuals who considered being at higher risk for Obesity. 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.

This paper describes the results of a study that examines whether the application of the HBM can be used effectively to change the perception of high school girls about their risk for developing obesity diseases and lead to a change in behavior for prevention of this disease later in life.

2. Methods:

154 students (aged 13-14 years) from four high schools in Shahr-e-kord were targeted in 2014. The high schools were selected randomly: Shahr-e-kord city has two districts; the method of sampling was random sampling, as follows: four high schools were selected from two educational areas of Shahr-e-kord. The participants were recruited randomly from these high schools.

After obtaining permission from the shahid - Beheshti University of Medical Sciences and Presentation to the provincial education, the researcher entered the schools. The researcher presented information about the voluntary participation, the purpose of the study, the content of the questionnaire, and questionnaire data confidentiality. The students were permitted to leave if they were not interested in participating in this study.

The intervention lasted for 6 weeks .Students was randomly allocated to one of two groups: intervention groups or a control group. Each intervention group lesson was designed to last for a 45-60-min period, had an interactive approach and was behaviorally focused. The intervention program developed was based on Health Belief Model and incorporated the following elements:

➢ An individual's assessment of his or her chances of getting the disease
➢ An individual's judgment as to the severity of the disease
➢ An individual's conclusion as to whether the new behavior is better than what he or she is already doing
➢ An individual's opinion as to what will stop him or her from adopting the new behavior
➢ Personal belief in one's own ability to do something
➢ A brief outline of the program per intervention and control group is given below**.**

To students were taught that Low consumption of fruits and vegetables have been associated with poor diet quality and is considered one of the most common risk factors for the development of chronic diseases. Also to students were taught that:

➢ Identify four basic types of fruits.
➢ Identify five basic types of vegetables.
➢ Identify the amount of fruits and vegetables children should eat each day.
➢ Explain benefits of eating 5 servings of fruits and vegetables per day.
➢ Explain to parents and friends why eating 5 servings of fruits and vegetables per day is important.

Data gathering instrument was a 3-part questionnaire; the first part was used to obtain the demographic characteristics of the participants and the second one was a self-made questionnaire that included: knowledge ($\alpha=0/71$), perceived threat (perceived susceptibility ($\alpha=0/71$) and perceived severity ($\alpha=0/79$)), benefits of fruits & vegetables consumption ($\alpha=0/69$), and barriers of fruits & vegetables consumption ($\alpha=0/81$) and healthy behavior action for obesity prevention, three parts was FFQ questionnaire.

To ensure the clarity of questionnaire, pilot testing was also performed upon 30 students who were not included in the survey. Then, the questionnaire was modified based on their feedback. To evaluate the effectiveness of the educational interventional program, the data related to subjects' knowledge and attitudes (Health Belief Model structures) were collected by the same questionnaire immediately and 2 months after program. This was carried out just one time (2 months follow-up) for Consumption of fruits and vegetables. SPSS 16 software was used to analyze the data executing Repeated Measured ANOVA, Paired and Independent sample t-test (with the level of 95% confidence).

3. Results:

A total of 154 students were randomly allocated to one of two intervention groups or the control group. Table 1&2 compares two groups' mean scores of knowledge and HBM constructs of perceived susceptibility, severity, barriers and benefits, in three phases as before intervention, immediately and two months after program. For each of HBM constructs, R.M. ANOVA test indicated that the differences between groups were significant at before, immediately after and two months after intervention ($p<0.001$). Table 3&4 shows health behavior (Consumption of fruits and vegetables) of 2 groups before and two months after the intervention. As it presents, practice before education had no significant difference between groups, but this was significant 2 months after.

Table 1: Comparison of means scorers of the students' knowledge and Perceived Susceptibility and Perceived Severity about obesity in the 2 groups studied pre, post and follow up intervention.

Health Belief Model (HBM) Components Variables	Experimental group (N=77)			Control group (N=77)			R.M.ANOVA Test Results		
	Pre- test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test P=	Post- test P=	Follow up Test P=
Knowledge	32/98 (23/79)	86/23 (20/32)	85/92 (10/83)	30/13 (25/67)	32/72 (27/12)	32/13 (13/37)	0/245	0/000*	0/000*
Perceived Susceptibility	32/30 (15/78)	73/54 (10/20)	72/91 (13/60)	30/95 (18/18)	33/44 (19/77)	32/09 (16/39)	0/467	0/000*	0/000*
Perceived Severity	35/26 (19/81)	76/49 (16/60)	72/03 (15/60)	38/50 (18/48)	39/80 (18/90)	38/44 (17/50)	0/496	0/000*	0/000*

*= Repeated Measured ANOVA test result: significant difference between the groups.

Table 2: Comparison of means scorers of the students' perceived benefits and barriers about Fruits & vegetables consumption in the 2 groups studied pre, post and follow up intervention.

Health Belief Model (HBM) Components Variables	Experimental group (N=77)			Control group (N=77)			R.M.ANOVA Test Results		
	Pre- test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test P=	Post- test P=	Follow up Test P=
perceived benefits	45/06 (18/18)	80/00 (9/70)	79/92 (10/83)	43/11 (17/80)	44/61 (18/00)	43/13 (13/37)	0/345	0/000*	0/000*
perceived barriers	37/79 (18/75)	70/26 (14/55)	68/91 (13/60)	42/20 (18/77)	43/63 (18/22)	42/09 (18/39)	0/407	0/000*	0/000*

*= Repeated Measured ANOVA test result: significant difference between the groups.

Table 3: Comparison of the students' Fruits consumption for obesity prevention in the groups studied during pre and follow up intervention.

Time of measurement Mean (SD) Groups	Pre- test Mean (SD)	Follow up Test Mean (SD)	Paired t -test P-value
Experimental group (N=77)	1/37 (0/700)	1/70 (0/619)	0/000*
Control group (N=77)	1/40 (0/584)	1/41 (0/581)	0/282
T-test	0/766	0/008*	

*=significant difference between the groups

Table 4: Comparison of the students' vegetables consumption for obesity prevention in the groups studied during pre and follow up intervention.

Time of measurement Mean (SD) Groups	Pre- test Mean (SD)	Follow up Test Mean (SD)	Paired t -test P-value
Experimental group (N=77)	1/43 (0/755)	1/75 (0/659)	0/000*
Control group (N=77)	1/50 (0/836)	1/51 (0/837)	0/277
T-test	0/576	0/038*	

*=significant difference between the groups

4. Discussion

Increasing the consumption of fruit and vegetables is a practical strategy for consumers to optimize their health and to reduce the risk of chronic diseases.

The results of present study showed that prior to intervention; all elements of HBM (perceived susceptibility, perceived severity, perceived benefits and perceived barriers) were below average in two groups. After intervention, participants in experimental group had significant improvement for behavior assessed; while students of control group showed a slight change, this supports our hypothesis that a health education program based on HBM can be effective in promoting the adoption of behaviors by girls to prevent obesity.

Studies have identified several basic educational needs in participants, which increase their knowledge and change their intention to promoting preventive behaviors about obesity. Knowledge of individuals about obesity significantly increased after intervention in experimental group. The findings of this study are consistent with the researches ' results of Warren (9), Mauriello (10), Annesi (11), Bran scum &

Kaye (12), Frenn (13), Wang (14), Ruyter (15), Kipping (16), Horne (17) and Simon (18).

Given the prevalence of obesity and the associated morbidity and mortality, it is important to increase Knowledge of obesity and encourage adoption of behaviors that help to prevent this condition, as opposed to waiting until the onset of the disease. The results of the study showed educational intervention focused on obesity prevention is ideally suited to reach these goals of increased Knowledge, perceived susceptibility, severity, barriers, and benefits and adoption of prevention-oriented behavior.

Mean scores on Consumption of fruits and vegetables of experiment group were significant before and after intervention (p< 0.001). The increase in performance of students in this study is also consistent with the findings of Amodeo et al (19), Abood et al (20), Kipping et al (16), Wilson et al (21), Foster et al (22), Wang et al (14), Baranowski (23), Niklas (24) and Reynolds (25) researches who reported the change and improvement in behavior of girl students.

The results of this study showed that applying constructs of the health belief model can be valuable to enhance the effectiveness of an obesity education program, It is paradoxical that, as health researchers and educators become increasingly aware of the importance of good habits in nutrition in the prevention of a variety of chronic diseases, children and adolescents are adopting lifestyles that act counter to these. With regard to the important role of girls and women in foundation of families and the cost effectiveness of educational programs compared to treatment services (26), utilizing health education theories and models by the experts in schools is highly recommended to promote public health and well-being.

Fruit and vegetables are important elements of a healthy, balanced diet, be it as part of a main meal or as a snack. They bring us vitamins, minerals and fiber, some energy (mainly in the form of sugar), as well as certain minor components - often referred to as phytochemicals or secondary plant products - which are potentially beneficial for our health. Epidemiological studies have shown that high intakes of fruit and vegetables are associated with a lower risk of chronic diseases (27-29), also type 2 diabetes (30), and certain cancers i.e. of the mouth, pharynx, larynx, esophageal, stomach and lungs (31).

Considering the poor knowledge, attitude and performance of students regarding the Fruit and vegetables intake and the positive effect of education on the above mentioned construct, it seems that education as one of the most important influencing factors can supply necessary grounds for increasing the knowledge, attitude and performance of the students and so the society. Besides, considering the

important role of girls as the future mothers and low cost of preventive activities like nutrient education as compared with the treatment activities, it seems necessary to generalize such educational programs to all other related groups and populations.

Acknowledgment

Corresponding Author

Elahe Tavassoli
PhD Candidate in Health Education & Health promotion,
Department of Public Health,
Faculty of Health,
Shahid Beheshti University of Medical Sciences, Tehran, Iran

References

[1] Al Marzooqi MA and Christine Nagy M. Childhood Obesity Intervention Programs: A Systematic Review. Life Science Journal 2011; 8(4): 45-60.

2. Sharma M. International school-based interventions for preventing obesity in children. Obesity Reviews 2007; 8(2):155-167.

[3] Flodmark C, Lissau I, Pietrobelli A. Child and adolescent obesity: Why we need to fight!. Acta Paediatrica 2005; 94: 4-7.

[4] 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.

[5] Andersen LF, Overby N, Lillegaard IT: Intake of fruit and vegetables among Norwegian children and adolescents [in Norwegian]. Tidsskr Nor Laegeforen 2004; 124:1396–1398.

[6] Newby PK: Plant foods and plant-based diets: protective against childhood obesity? Am J Clin Nutr 2009; 89(suppl 1):1572–1587.

[7] Blomhoff R, Lande B, Ose T: Recommendations for increased intake of fruit and vegetables [in Norwegian]. Oslo: National Nutrition Council; 1996.

[8] Ghaffari M, Tavassoli E, Esmaillzadeh A, Hassanzadeh A. Effect of health belief model-based intervention on promoting nutritional behaviors about osteoporosis prevention among students of female middle schools in Isfahan, Iran. Journal of Education and Health Promotion 2012; 1: 1-4.

[9] Warren J M, Henry C J K, Lightowler H J, Bradshaw S M, Perwaiz S. Evaluation of a pilot school program aimed at the prevention of obesity in children. Health Promotion International 2003; 18(4): 287-296.

[10] Mauriello L M, Ciavatta M M H, Paiva A L, Sherman K J, Castle P H, Johnson J L and et al. Results of a multi-media multiple behavior obesity

prevention program for adolescents. Preventive Medicine 2010; 51: 451–456.

[11] Annesi J J, Tennant G, Westcott W L, Faigenbaum A D. Effects of the Youth Fit For Life protocol on physiological, psychological, and behavioral factors at YMCA Calgary after-school care sites. Psychological Reports 2009; 104(3): 879-895.

[12] Branscum P, Kaye G. An evaluation of a theory based childhood overweight prevention curriculum. Californian Journal of Health Promotion 2009; 7: 33-38.

[13] Frenn M, Malin S, Bansal N. Stage-based interventions for low-fat with middle school students. Journal of Pediatric Nursing 2003; 18:36-45.

14. Wang M C, Rauzon Suzanne, Studer Natalie, Martin Anna C., Craig Launa, Merlo Caitlin and et al. Exposure to a Comprehensive School Intervention Increases Vegetable Consumption. Journal of Adolescent Health 2010; 47: 74–82.

[15] Ruyter JC, Olthof MR, Seidell JC, Katan MB.A trial of sugar-free or sugar-sweetened beverages and body weight in children.N Engl J Med. 2012; 367(15):1397-406.

[16] Kipping Ruth R, Russell Jago b, Debbie A. Lawlor. Diet outcomes of a pilot school-based randomised controlled obesity prevention study with 9–10 year olds in England. Preventive Medicine 2010; 51: 56–62.

[17] Horne PJ, Hardman CA, Lowe CF. Increasing parental provision and children's consumption of lunchbox fruit and vegetables in Ireland: the Food Dudes intervention. Eur. J. Clin. Nutr 2009; 63: 613–618.

[18] Simon C, Schweitzer B, Oujaa M, Wagner A, Arveiler D, Triby E and et al. Successful overweight prevention in adolescents by increasing physical activity: a 4-year randomized controlled intervention. International Journal of Obesity 2008; 32: 1489–1498.

[19] Amodeo R, De Ponti A, Sorbara L, Avanzini F, Di Giulio P, De Martini M. How to increase patient knowledge of their coronary heart disease: impact of an educational meeting led by nurses. G Ital Cardiol 2009; 10(4): 256.258.

[20] Abood D, Black DR, Feral D. Nutrition education worksite intervention for university staff: application of the health belief model. Nutr Educ Behav 2003; 35(5):260-267.

[21] Wilson Diane Baer, Jones Resa M , McClish Donna , Westerberg Alice L, Danish Steven. Fruit and vegetable intake among rural youth following a school-based randomized controlled trial. Preventive Medicine 2012; 54: 150–156.

[22] Foster Gary D, Sherman Sandy, Borradaile Kelley E, Grundy Karen M, Stephanie S, Veur Vander and et al. A Policy-Based School Intervention to Prevent Overweight and Obesity .Pediatrics 2008; 121 (4): e794 -e802.

[23] Baranowski T, Davis M, Resnicow K. Gimme 5 fruit, juice and vegetables for fun and health. HealthEducation and Behaviour 2000; 27: 96–111.

[24] Niklas T A , Johnson C C, Myers L. Outcomes of a high school program to increase fruit and vegetable consumption. Journal of School Health 1998; 68: 248–253.

[25] Reynolds K D, Franklin F A, Binkley D, Raczynski J M, Harrington K F, Kirk K A and et al. Increasing the fruit and vegetable consumption of fourthgraders: results from the High 5 project. Preventive Medicine 2000; 30: 309–319.

[26] Tavassoli E, Hasanzadeh A, Ghiasvand R, Tol A, Shojaezadeh D. Effect of health education based on the Health Belief Model on improving nutritional behavior aiming at preventing cardiovascular disease among housewives in Isfahan. Journal of School of Public Health and Institute of Public Health Research 1389; 8(3):11-23.

[27] Mirmiran P. Fruit and vegetable consumption and risk factors for cardiovascular disease. Metabolism 2009; 58(4):460-468.

[28] Hung HC. Fruit and vegetable intake and risk of major chronic disease. Journal of the National Cancer Institute 2004; 96 (21):1577-1584.

[29] Rissanen TH. Low intake of fruits, berries and vegetables is associated with excess mortality in men: the Kuopio Ischaemic Heart Disease Risk Factor (KIHD) Study. Journal of Nutrition 2003; 133(1):199-204.

[30] Harding AH. 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. Archives of Internal Medicine 2008; 168(14):1493-1499.

[31] World Cancer Research Fund (WCRF) Panel. Food, Nutrition, Physical Activity, and the Prevention of Cancer: A Global Perspective. World Cancer Research Fund: Washington, DC.2007.

5/27/2014