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Evaluation of the Effectiveness of Nutritional Education based on Health Belief Model on Self-Esteem and BMI of Overweight and at Risk of Overweight Adolescent Girls

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Abstract

Background

Due to significant increases in the prevalence of overweight and obesity in adolescents in developed countries, much attention has been focused on this issue. This study aimed to determine the effectiveness of nutritional education based on Health Belief Model (HBM) on self-esteem and body mass index (BMI) of overweight and at risk of overweight adolescent girls.

Materials and Methods: The study subjects consist of 140 female students recruited from two high schools, who were randomly allocated to the intervention (n=70) and control (n=70) groups. The data collection instrument included sections on socio-demographic status, transportation method, physical status, and knowledge and attitudes of the students towards nutrition, which was designed according to HBM. As the intervention, model-based educational program was implemented through six 60-minute sessions, focusing on the overweight and at-risk students. Results were compared in the beginning, and three months after the intervention to find the possible impacts.

Results: Average score of model structures and self-esteem of students in both groups had no significant difference at baseline, but immediately after the intervention and 3 months after treatment, the mean component scores were significantly higher in intervention group than controls ($P<0.05$). There was no significant difference in the control group between the mean scores of model structures and self-esteem at different times. There was a significant difference at different times in component scores in the experimental group ($P<0.05$). The mean score of BMI in the control group had no significant difference in different time. Significant difference in BMI scores was seen at different times in experimental group ($P<0.05$).

Conclusion: The positive effect of this program was seen among the participants. Therefore such interventions in schools for developing effective long-term healthy behaviors have preventive and controlling effects on overweight.

Key Words: Adolescents, Body Mass Index, Health Belief Model, Nutritional Education, Overweigh.

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1- INTRODUCTION

Due to significant increases in overweight and obesity in children and adolescents in developed countries in recent decades, much attention has been focused on. Short-and long-term complications of overweight and obesity and its association with mortality has increased attention to this problem as one of the major health problems of children and adolescents (1). Estimated by the World Health Organization (WHO), in 2015 a total of 25 million people were affected by any type of non-communicable diseases (NCDs) in the Middle East region (2) . In the United States the prevalence of overweight in children and adolescents has tripled between 1980 and 2000 years.

It is estimated 80% of overweight adolescents as well as adults will have this problem (3, 4). The prevalence of overweight and obesity in Tehranian boys is 10.7 and 5.1% and in girls 18.4 and 2.8%, respectively. This report shows that the prevalence is similar to Americans (5).

Adolescence is an unique period of life (6-9) and changes in adolescence, puts young people at risk of developing health risk behaviors such as poor eating habits and inactivity (10). Understanding Obesity in Children's Health Draws is a misconception that still exists in our society (11). Obesity in children and adolescents is associated with negative physical and psychological dimensions. The physical aspect can be the metabolic syndrome, type II diabetes, cardiac diseases - cardiovascular and cancer. Obesity also causes a range of other conditions such as cerebrovascular diseases, osteoarthritis, gall bladder disease, dyslipidemia, sleep apnea, cataract, benign prostatic hypertrophy, menstrual disorders, pregnancy complications, depression and social discrimination. Also, obesity will affected negatively physical function, vitality and quality of life (12-18).

Obese and overweight adolescents may be exposed at the individual level and societal discrimination, rejection and low self-esteem. The results of a study conducted at the University of California found that obese teenagers will experience low self-esteem, social isolation, feelings of rejection and depression. Also, another study showed that low self-esteem, is associated with feelings of sadness, loneliness, anxiety, and tobacco and alcohol consumption (4, 19). The effect of lifestyle interventions to reduce obesity and its related health outcomes has been demonstrated. Changes in dietary fat intake with lower and smaller sized meals, increasing physical activity, reducing sedentary behaviors change behavior and engaging with parents are the elements of a lifestyle intervention (12, 16, 20, 21).

Despite the fact that access to low-fat foods has increased, but other reasons for the increase in obesity and energy intake are: higher calorie foods, increased consumption of foods and the increase in sweetened beverages, and larger meals sizes. In fact, one reason to support a healthy diet at an early age is that eating habits are formed early in life and continues into adulthood (12, 15). Fruits and vegetables have high nutritional value, and protect children against overweight. A study in the United States showed an inverse association between childhood (children 5-18 years) overweight and fruit consumption (22). Studies on the prevalence of school-based programs for promoting physical activity and diet have been done (11).

The value of health education programs depends on their effectiveness, and effectiveness of these programs greatly depends on the proper use of theories and models in health education. In other words, there are good theoretical supports which increase the effectiveness of health education programs (23). Health Belief Model is one of the oldest theories of

health behavior and the first model of behavioral science theories which is taken to solve health problems. This model is a comprehensive model which plays a role in disease prevention. According to this model, the decision and personal motivation to adopt a health behavior refer to three categories, self-perception, behavior modification and behavior, likely to do it. Personal understanding is the factors that effect on understanding of disease or illness and health behavior and its outcomes. Likely to perform an action are discussed regarding the factors affecting the likelihood of adopting appropriate behavior, and moderating or facilitating factors, including demographic variables, perceived threat and action, play their role after the emergence of interpersonal perception (23, 24). The results Studies showed that health education can be based on HBM model the behavior patterns associated with lifestyle affect students (25). So we conducted a study to evaluate the effects of nutrition education based on Health Belief Model and BMI among overweight or at risk for overweight adolescents.

2- MATERIALS AND METHODS

2-1. Study design and population

This study was an experimental study. According to the formula, the sample size of 63 patients in each group assigned to intervention (63 cases) and control (63 cases) groups.

2-2. Methods

Including the loss of 10% in the intervention process, the final sample size for each group was determined to be 70. The sample size was calculated using the following formula:

$$n = 2(z_1 + z_2)^2 \times s^2 / d^2$$

Where n = 63, the total population of elementary school-age children in Isfahan, Z1 = 1.96 for confidence level 95%, Z2= 0.84 and d = 0.05 the deviation. From the 5 regions of governmental high school in Isfahan, one selected randomly and 2 schools of this region were randomly assigned one as trail and the other as control. After weighing total of 140 second-grade girl students in groups, adolescents girls based on growth curves Center for Disease Control and Combat (CDC) growth curves that were in between 85 and 95% percentile were considered as samples. All the students (126 cases) completed the written consent form. This study was approved by the Isfahan University of Medical Sciences.

2-4. Measurements

Data collection included scales, tape measure and a questionnaire regarding personal background information and a questionnaire was designed based on the Health Belief Model, the form notes a week feed by teen.

2-3. Measuring tools: validity and reliability

To determine the reliability of the scales and tape measure standards weights and meter was used to measure the control accuracy of these tools. The questionnaire was designed based on the Health Belief Model contains six knowledge questions (α=0.78), 4 questions for perceived susceptibility (α=0.88), 4 questions for perceived intensity (α=0.80), 5 items perceived benefits by (α=0.79), 7- question about perceived barriers (α=0.72), and 6 questions to measure perceived self-efficacy (α=0.84), respectively.

Questions of susceptibility, severity, benefits and barriers perceived performance questionnaire options were designed as a Likert 5 (totally agree, agree, neutral, disagree, and completely disagree) and the score range was reported that the most desirable score of 4, and the worst case went to zero.

Educational intervention program was as follows: After coordination with the Director of School, a session with teachers, and a meeting to identify adolescents at risk for overweight and overweight, a coordination meeting with parents of adolescents were overweight or at risk of overweight. The six 60-minute sessions attended by teachers based on Health Belief Model and emphasizing diet to control weight in overweight and at-risk adolescents was used, 2 sessions for parents also to be considered.

2-4. Intervention

Education based program on Health Belief Model for improving nutritional status was: at first threat against overweight and obesity, and other diseases (perceived susceptibility), then understand the depth and seriousness of the risk of complications in the physical, psychological, social and economic aspects (perceived severity), believe usefulness and applicable of feeding behavior for weight loss (perceived benefits), they believe that their nutritional behavior prevention of diseases associated with obesity are well and truly done (perceived self-efficacy), finally decided to adopt preventive behavior. Training program was held by using a direct instruction through lectures and participate actively (Questions and Answers) with slide education and training indirectly through educational booklets and pamphlets.

2.5-Ethical consideration

Isfahan University of Medical Sciences Ethics Committee has approved the plan. Also, participating in the study was voluntary, at any moment they could study and tend to identify themselves and leave no response and their participation in the project after signing the consent form.

2-6. Data Analyses

After completion of the training, questionnaires were completed by two groups (intervention and control group). Then for the second time in three months after the training was completed questionnaires and adolescent weight and height were measured and BMI was calculated again and compared with the results of the two previous steps. Data analyzed with using statistical software SPSS version 18 by ANOVA with repeated measurement, t-test and nonparametric tests measurement.

3- RESULT

In this study, 15% (21 students) of the households dimension had three members, 47.9% (67 students) had four members, 34.4% (48 students) had five members, and 2.9% (4 students) had six members; 13.6% (n=19) followed a specific diet, and 86.4% (n=121) had no history of diet. Independent t-tests showed that before the intervention, the mean score of overweight students in both groups was not significantly different (P=0.093).

But immediately after the intervention (P<0.001) and 3 months after intervention, the mean score was significantly higher in intervention group than control group (P<0.001). ANOVA with repeated measurement also showed that there was no significant difference between the mean score at different times (before, immediately after, and 3 months after intervention), in the control group (P=0.44). However, using the same test, knowledge score in the control group showed a statistically significant difference at different times (P<0.001) (**Table.1**).

Independent t-tests showed that the average scores of perceived susceptibility on weight gain in both groups was not significantly different before the intervention (P=0.74). But immediately after the intervention (P=0.007) and 3 months after intervention (P=0.034), the mean score was significantly higher in the

intervention group than the control group (**Table.1**). According to ANOVA with repeated measurement, the mean score of perceived susceptibility at different times in the control group had no significant difference (P=0.95). While the ANOVA with repeated measurement, showed that the mean score of the perceived sensitivity of the test group were significantly different (P=0.003) (**Table.1**).

The t-test showed that the perceived severity of weight gain in both groups showed no significant difference before intervention (P=0.60). But immediately after the intervention (P=0.023) and 2 months after training (P=0.016) mean scores in the experimental group was significantly higher than the control group. ANOVA with repeated measurement, showed that the mean score of perceived susceptibility at different times in the control group had no significant difference (P=0.99). While the ANOVA with repeated measurement showed that the mean score of the perceived sensitivity of the test group were significantly different (P=0.027) (**Table.1**).

In relation to the perceived benefits, independent t-test showed that the average scores of perceived benefits of nutrition education in the two groups before the intervention was not significantly different (P=0.63). But immediately after the intervention (P=0.013) and 3 months after intervention (P=0.022), the mean score was significantly higher in the intervention group than the control group.

According to ANOVA with repeated measurement, the mean score of the perceived benefits of the control group had no significant difference (P=0.82). While the ANOVA with repeated measurement showed, at different times, significant differences between the mean scores of perceived benefits in the intervention group, (P =0.006) (**Table.2**). T-test showed the mean score on perceived barriers to nutrition education in the two groups before the intervention was not significantly different (P=0.74). But immediately after the intervention (P<0.001) and 3 months after intervention (P=0.021), the mean score was significantly higher in the intervention group than the control group. According to ANOVA with repeated measurement, the mean score of perceived barriers at different times in the control group had no significant difference (P=0.51), while the average score of perceived barriers in the intervention group were significantly different (P<0.001) (**Table.2**).

With regard to efficacy, independent t-test showed that before the intervention there was no significant difference in the average score on the efficacy of nutrition education in the two groups (P=0.77), but immediately (P=0.001) and 3 months after intervention (P=0.006), the average score in the experimental group was significantly more in the control group. According to ANOVA with repeated measurement, the mean self-efficacy scores at different times in the control group had no significant difference (P=0.92). While the average self-efficacy score in the experimental group were significantly different (P=0.002) (**Table.2**).

Also, in relation to student BMI t-test showed that the average BMI score of students in the two groups before the intervention was not significantly different (P=0.82). But two months after the intervention (P=0.17) and 3 months after intervention (P=0.09), mean BMI scores in the intervention group decreased, but this reduction did not show significant differences from controls. According to ANOVA with repeated measurement, the average BMI score of the control group had no significant difference (P=0.74). While based on the same test, the mean BMI scores in the experimental group were significantly different (P<0.001) (**Table.3**).

Table-1: Comparison of mean HBM models structures contains of knowledge, perceived susceptibility and severity of overweight before, immediately after, and two months after the intervention and control groups

Variables	Time	Intervention group	Control group	P-value
		Mean (SD)	Mean (SD)	
Knowledge	Before intervention	45.90 (11.07)	45.71 (12.53)	0.93
	Immediately after intervention	77.78 (15.88)	44.19 (11.71)	<0.001
	Two months after intervention	70.94 (13.36)	46.81 (11.48)	<0.001
	ANOVA with repeated observations	<0.001	0.44	
Perceived susceptibility	Before intervention	39.73 (17.09)	40.80 (20.48)	0.74
	Immediately after intervention	50.48 (18.04)	41.41 (19.45)	0.007
	Two months after intervention	47.81 (19.22)	40.53 (19.37)	0.034
	ANOVA with repeated observations	0.003	0.95	
Perceived severity	Before intervention	42.77 (16.33)	41.33 (15.61)	0.6
	Immediately after intervention	49.12 (19.18)	41.88 (16.89)	0.023
	Two months after intervention	48.71 (16.15)	41.85 (15.69)	0.016
	ANOVA with repeated observations	0.027	0.99	

SD: Standard deviation.

Table-2: Comparison of mean HBM models structures contains of perceived benefits, perceived barriers and perceived self-efficacy in the nutrition education before, immediately after, and 2 months after the intervention and control groups

Variables	Time	Intervention group	Control group	P-value
		Mean (SD)	Mean (SD)	
Perceived benefits	Before intervention	63.71 (18.76)	62.28 (18.23)	0.63
	After intervention	71.79 (16.55	64.40 (17.20)	0.013
	Two months after intervention	70.63 (15.22)	63.86 (17.66)	0.022
	ANOVA with repeated observations	0.006	0.82	
Perceived barrier	Before intervention	37.75 (13.23	38.52 (13.86)	0.74
	After intervention	56.13 (14.76)	41.36 (13.93)	<0.001
	Two months after intervention	46.82 (15.39)	30.80 (13.95)	0.021
	ANOVA with repeated observations	0.001<	0.51	
Self-Efficacy	Before intervention	44.28 (10.40)	43.75 (12.05	0.77
	After intervention	52.60 (16.65)	43.71 (13.50)	0.001
	Two months after intervention	48.80 (15.36)	42.80 (12.48)	0.006
	ANOVA with repeated observations	0.002	0.92	

SD: Standard deviation.

Table-3: Comparison of mean BMI of nutrition education and physical activity before, 2 months and 3 months after the intervention and control groups

Time		Before intervention	2 Months after intervention	3 Months after intervention	P-value
Index		Mean (SD)	Mean (SD)	Mean (SD)	
Groups	Intervention	27.15 (1.21)	26.82 (1.42)	26.70 (1.38)	0.001
	Control	27.11 (1.27)	27.19 (1.55)	27.13 (1.56)	0.74
	ANOVA with repeated observations	0.82	0.17	0.09	

SD: Standard deviation.

4- DISCUSSION

Our findings indicate that there are a significant difference between the mean score of the intervention group in knowledge, perceived susceptibility, perceived severity, perceived benefits and, ultimately, self-esteem and BMI before and immediately after the intervention (P<0.001). Amedeo et al. in their studies that was conducted in 2,009 on 201 patients (346 females and 171 males) with aged 37-89 years, indicated that the knowledge of participants had risen from 44 percent to 88 percent (26). The results of the present study were consistent with other studies that used HBM in the field of diabetes, self-care and increasing in knowledge after the intervention (27).

Mosayebi et al. studies were performed using the Health Belief Model, showed the effectiveness of this model in increasing awareness of the target group (28). Significant differences between the two groups after the intervention in perceived susceptibility, is a good evidence of the effectiveness of educational intervention on promotion of the students perceived susceptibility in test group. Most of the students in the experimental group after the intervention, believed that they may have been at risk of obesity. These findings is consistent with the research associated with increased perceived susceptibility of non-smoking students, osteoporosis prevention, self- care diet and foot care in diabetic patients (23, 27, 29-31). Perceived severity scores in the intervention group after the intervention showed significant differences in the perceived severity between the two groups. This increased understanding has also been made in other studies (23, 27, 30, 32).

In the present study, the expression of serious complications resulting from overweight and obesity, loss of health, and the high cost of treatment is an important factor for improving the perceived level of the samples.

Before the intervention, the students' understanding of weight loss in both groups was moderate. This amount will increase further after the intervention in the experimental group. After the intervention, results showed significant differences between the two groups. It seems that students' attention to the fact that weight loss reduces complications and faster recovery from illness or injury of overweight, can be effective to promote the perceived benefits of students. Sharifirad et al. study also showed that there is a positive relationship between perceived benefits and avoidance of smoking among adolescents (32). In both studies, the most common perceived benefits, was the feeling of healthy living. Amodeo et al. in their study showed that the Health Belief Model is able to effectively increase the perceived benefits of the control group (33).

The students' perceptions of barriers to weight loss in both groups before the intervention was in the same situation and results did not show a significant difference between the mean scores of perceived barriers in the two groups. However, significant differences in perceived barriers between the two groups after the intervention, suggesting the effect of an educational intervention on the perceived barriers to weight loss in the intervention group. Students believed that the lack of mobility and lack of desire to do physical activities regularly and consistently are the most common barriers to weight loss. Sharifirad et al. in their study showed that the reduction of perceived barriers, the lower smoking rates in adolescents (32). Hazavehei et al. showed that by removing perceived barriers, diabetic patients were much more likely to walk (34). After intervention, the mean self-efficacy score in the experimental group than the control group, significantly increased. This can be attributed to the positive effect of

education and is consistent with Sullivan et al and Guilford et al research (35, 36). The present study was carried out school-based model for the impact of nutrition education on weight management in overweight and at risk of overweight students and the role of parents and teachers in this study is important. In a study by Veugelers et al. (2005) aimed on the impact of school feeding programs in preventing weight gain. Nutrient intake, physical activity and sitting activities were collected through questionnaires.

Body weight, diet and physical activity in the school feeding program compared to schools without such programs, were compared by using multiple regression method with regard to gender, parental socioeconomic characteristics and living conditions. The results showed that the rate of overweight and obesity in schools food program, which educate the principles of healthy eating to the students, was significantly less than schools without food program. It was also reported healthier diet and more physical activity by the students of these schools (37).

The present study shows similar results and showed that education has a significant role in reducing the weight of students. The results of Yahyavi et al. study showed that school can be a good place to promote healthy lifestyles in children; and recommended that future studies should be long-term, involve all students and focuses on behavior change, and they all contain the child's living environment. The ultimate goal of such programs makes positive changes in behavior that will have many long term health benefits (10).

Caballero et al. (2003) in a school-based randomized study aimed at reducing body fat percentage, were examined 1,704 Child in 41 schools for three consecutive years. The intervention had four components: changes in nutrient intake, increasing physical activity, class program focused on healthy eating and lifestyle, and family-oriented programs. The results showed no significant decrease in the percentage of body mass. However, reducing the amount of energy derived from fat and total energy intake in the intervention group schools was significantly different. Intervention and control groups had similar levels of physical activity in schools. Various components of the knowledge, attitudes and behaviors in a positive and meaningful manner have been changed in the intervention group (38). The results of our study are similar. Despite the changing food pattern and decrease the amount of fats and carbohydrates, the body mass index was not significantly reduced.

The results of this study showed that, despite its relatively long intervention, BMI is significantly reduced. Although energy intake and levels of knowledge and performance of students in the intervention group, had a significant decreased. In the study of Lowry et al., the aim of the study was to determine the effect of the intervention program on self-esteem, and weight loss of child who were obese. Data analysis showed that there are significant differences between the weights of the two groups one month after the end of the program. The self-esteem of both groups at the end and one month after the end of the program showed significant difference between Intervention group and control group which was consistent with the present study (39).

Newmark et al. (2003) investigated the effects of physical activity, dietary patterns, self-perception and body mass index of 89 girls in the intervention group and 112 girls were selected as controls. Data at first, after and eight months after the intervention were collected. The evaluation includes interviews with school staff, parents and the samples. The evaluation also includes interviews with school staff, parents and the samples. Samples express positive effects of the

program on physical activity, dietary patterns and self -concept. In this study, the BMI of the students after the intervention compared with the control group was significant. But, the decrease in BMI in the intervention group after 3 times of measurement was significant (40). In this study, after 3 times to measure BMI, previous 2 months and 3 months after treatment, there was no significant decrease in BMI results.

Also, in relation to fruit and vegetable consumption among students study showed that consumption of fruits and vegetables had increased after the intervention groups, which is consistent with results Azadbakht et al. study. It is important to note that students arrive on university in the coming years. Azadbakht et al. has recounted study and show that students have bad eating habits and consumption of high-fat and low intake of fruits and vegetables. Student diet in the university is high fat and low nutrients, including vitamins, minerals and fiber. Therefore, from high school and even before that, we have to think about diet and weight control of students (41, 42).

The results of primary prevention interventions that include at least one component of physical activity and nutrition, suggests that interventions with varying degrees of reduction in fat intake, increasing physical activity in schools, increase fruit and vegetable consumption and reducing television viewing have been effective. Although some studies have pointed to improvements in body weight and obesity, but in fact none of them significantly reduced the body weight or obesity (38).

4-1. Limitations of the study

One limitation of this study is its short duration. According to a little time, we could not use the program for a longer time. In order to accurately assess the implementation of such programs, it is require to take a longer time for allocating the implementation of these programs; because changes in the habits and behaviors associated with feeding requires more time. Furthermore, assessment of nutritional status, especially in adolescents is difficult and few standard tools are available. In a general procedure, according to results, significant change in mean BMI in adolescents in the intervention group compared with controls has not been reached. This result was not unexpected due to time constraints. Noteworthy in this study is a very good turnout of families, teachers and students, which could be indicative of consent and support interventions.

5- CONCLUSION

The findings of this study showed that positive effect of educational school-based program on knowledge, perceived susceptibility, perceived severity and perceived benefits increased self-esteem is noticeable. Therefore we can conclude that such interventions in schools are probably have long -term effectiveness in creating healthy behaviors and preventing and controlling obesity.

It is suggested that the study be carried out in other age groups of students. Also, it can be found that overweight students with more awareness related to nutritional status and its changing procedures could have a good collaboration with health team as well as more interested desire for joining the life style plan; which in turn will lead to achievement to the suitable behavior based on HBM. Therefore, it is highly recommended to conduct different educational plans in high schools due to their very important roles for improving the ability of following healthy life style. In fact, the students with the awareness of the healthy life style can enhancement the knowledge and ability of parents as well as high-risk students to prevent obesity and its complications.

6- CONFLICT OF INTEREST: None.

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