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PSYCHOSOCIAL AND BEHAVIORAL PREDICTORS FOR PREVENTION OF OBESITY AMONG ADOLESCENTS: A TRANSTHEORETICAL MODEL PERSPECTIVE

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Abstract: *To predict demographic, psychosocial, and behavioral variables specific to each stage by determining the stages of change of dietary behaviors of adolescents within the framework of Transtheoretical Model (TTM) and thus to guide for interventions make adolescents ready for next stage of change. A descriptive, cross-sectional design was used in the study. The students aged between 10-12 and selected indicators. Separate multivariate logistic regression models were created to determine the readiness of adolescents to make changes in dietary behaviors. Of the adolescences, 89.5% were in the Preparation, Action and Maintenance stages. In the Contemplation stage, father education and mother Body Mass Index (BMI); In Preparation, mother BMI, dietary knowledge and dietary self-efficacy; In Action, adolescent BMI, dietary knowledge and stress management were able to predict the later stage of promoting behavior change. In the Maintenance stage the sex, adolescent BMI, dietary knowledge, dietary behavior, dietary self-efficacy, stress management and social support were able to predict the maintenance of promoting health. TTM was useful to evaluate and predict health behaviors of adolescents. Except for exercise behavior, all of the determinants predicted the later stage for promoting behaviors. Female adolescents were more likely to be ready to make changes.*

Keywords: *adolescents, obesity, nutrition, predictors, school nursing, transtheoretical model.*

1. INTRODUCTION

Over the last 30 years, the prevalence of obesity has increased two times among children and three times among adolescents in the world [1]. In developed countries, 1% of children become overweight every year [2]. In Turkey, 14.3% are overweight and 8.2% are obese among 6 and 18 year-old children and adolescents [3]. Obesity is a predictor of chronic diseases like diabetes, cardiovascular disorders, ischemic heart disease, and cancer for adolescents who will suffer from these diseases in their adulthood period [2-4]. Therefore, early diagnosis and prevention of obesity take a high priority, which keeps the search for the most effective interventions which will enable adolescents to acquire the habits of healthy life.

Numerous factors may influence the dietary behaviors of adolescents. On the other hand, biochemical, genetic, socio-cultural, and psychological factors affect the prevalence of obesity [5-6]. CDC (2014) points out that poor dietary behaviors such as eating of low-quality foods containing significant amount of salt, sugar, and fat and consumption of soft and carbonated drinks, as well as insufficient levels of exercise and stress are among the most important causes of obesity at younger ages [2]. On the other hand, fruit and vegetables (FV) help to reduce the risks for many illnesses such as cardiovascular diseases, diabetes, obesity, and some types of cancers [5-7]. Adolescents with high dietary self-efficacy perception levels consume lower fat and less sugary foods, as well as foods that are good for health promotion [8-9].

It is recommended to consume five servings of vegetables and fruit a day to maintain a healthy diet and ideal weight [2]. Acquiring the habit of eating vegetables and fruits in early life is an important indicator of the consumption of vegetables and fruits in adulthood. Vegetables and fruits contain antioxidants, folate, fiber, potassium, which help protect against cardiovascular diseases. They are rich in fiber and water, help reduce appetite, lower calories. For these reasons, especially for obesity prevention and healthy nutrition, the group of vegetables and fruits should be handled separately and emphasized [5-7].

Insufficient exercise behaviors are the fourth most common of global deaths [2]. According to the WHO (2014)'s report, it is necessary for healthy development of adolescents to perform minimum 60 minutes of moderate- or high-intensity physical activities for five days a week [4]. It is also reported that such exercise contributes to physical, mental, and social development of adolescents. Previous studies revealed that TTM stage-based interviews conducted with adolescents increased their exercise behaviors and were effective on their weight control [1].

Psychosocial problems prevent the development of good dietary behaviors. The studies have revealed that obesity is higher among adolescents experiencing psychosocial and behavioral problems [10]. A stressful life may lead to impaired quality of life and nutrition among adolescents. In general, stress management skills and a social support system help them to adopt positive health behaviors more easily [11]. Moreover, the level of perceived social support is a powerful source to prevent and solve social and psychological problems and cope with stressful situations [12]. In this regard, nursing interventions concerning dietary knowledge and behaviors, dietary self-efficacy, exercise behaviors, stress management, social support, and background characteristics may provide benefits for school-age children to develop food habits.

The TTM offers a conceptual explanation about the processes experienced when individuals alter a problematic behavior or get a positive behavior. Its structure consists of three stages: "stages of change", "process of change", and "level of change" [13]. In this study, the stages of change of TTM were employed as a theoretical scope. The structure of the stages of change includes 5 stages: pre-contemplation, contemplation, preparation, action, and maintenance. These stages explain a process which takes place starting from the moment when a problematic health behavior is discovered and continues with the change of this behavior up to the point where this behavior is exhibited positively [13]. The studies have reported that stage-based multiple interventions affect behavioral change that prevents and reduces obesity among adolescents [13-14-15-16].

This study was conducted primarily to predict demographic, psychosocial, and behavioral variables specific to each stage by determining the stages of change of dietary behaviors of

adolescents within the framework of TTM and thus to guide for interventions make adolescents ready for next stage of change.

2. MATERIAL AND METHOD

2.1 Participants

The study was conducted with the descriptive and cross-sectional research design. This school-based study included 530 fifth-grade students (260 females and 270 males) aged between 10 and 12 years in five secondary schools located in Uşak, Turkey as well as their parents. The sample of the study consisted of the fifth-grade students (*n*=2993), who did not have any chronic disease and agreed to participate in the study, selected by using the stratified random method. The sample size was calculated with the power analysis (α: 0.05, 1-β = 0.80). According to stratum weight, the sample included 380, 115, and 35 students from a state school, a religion-affiliated school and a private school, respectively. A random number table was used to select the students from the strata. The study was conducted between January and December 2014. The Transteoretic Model suggests that the behavior change process consists of five distinct and sequential stages [13]. It provides a framework for evaluating the beliefs (self-efficacy) of individuals when they are ready for change (change stages), how they perceive the positive and negative effects of change of behavior (decision making), and their behavior. One of the basic components of the transtheoretical model is the change phases, which represent the time dimension of the model and consist of five steps. The change phases that make up the core structure of the TTM consist of a single question with five options. The amount of time consumed by those who consume 5 servings of fruit and vegetable per day (one month or six months), and those who do not consume the intent and time to start in this regard.

The students filled the measurement tools independently and could ask questions. The height and weight measurements of the students were performed. A Family Information Questionnaire was sent in a closed envelope to the parents.

2.2. Questionnaire Forms

2.3. Family Information Questionnaire

This questionnaire was prepared by the researchers upon the literature review. It included the adolescents' age, gender and BMI values and parents' educational status, income status, and BMI values. In terms of age and gender, the children were categorized as underweight (<5 p.), normal (5-85 p.), overweight (85-95 p.), and obesity or obese (>95 p.) based on BMI (kg/m2) reference values published by Bundak et al. (2006) for Turkish children [15]. BMI values of the parents were calculated based on weight and height values reported by them. Their educational status was specified as (1) low (≤5 years), (2) moderate (6–11 years), and (3) high (≥12 years), and their income status was graded as (1) high, (2) middle, and (3) low.

2.4. Stages of Change for Fruit and Vegetable Intake

This questionnaire was prepared based on five stages of change included in the Transtheoretical Model. Its aim is to measure the fruit and vegetable intake behaviors of adolescents. These five stages are (1) Precontemplation, in which an individual may or may not be aware that a behavioral change is warranted and has no intention of changing own behaviors within the next 6 months; (2) Contemplation, in which an individual is aware that a change is warranted and is intending to change own behaviors within the next 6 months; (3) Preparation, in which an individual is planning to change own behaviors within the next 4 weeks; (4) Action, which begins the day an individual

makes the behavioral change and lasts until he or she has maintained the change for 6 months; and (5) Maintenance, which begins after an individual has successfully maintained a behavioral change for 6 months.

2.5. Nutrition Knowledge Scale

This scale was developed to find out the dietary knowledge level of adolescents [17]. It is a three-point Likert-type scale with twenty items. A total score between 1 and 60 points is obtained in the scale. The Turkish validity and reliability study of the scale was conducted by Ardıç and Erdogan (2016); The Cronbach's alpha coefficient of the scale was 0.84 [18]. Its Cronbach's alpha coefficient was determined as 0.70 in this study.

2.6. Diet Behavior Scale:

This scale was developed to explore the usual food consumption of adolescents [19]. It includes 14 pictorial items using a forced-choice format indicating a higher fat or sodium food versus a lower fat or sodium food. The total score of the scale ranges from -14 to +14. The total score obtained from the scale is shown as a percentage indicating that 0% is unhealthy food consumption and 100% is healthy food consumption. The Turkish validity and reliability study of the scale was conducted by Haney and Erdoğan (2013). Its test-retest reliability was 0.74. Its Cronbach's alpha coefficient was 0.68 [8]. This coefficient was determined as 0.63 in the present study.

2.7. Children's Dietary Self-Efficacy Scale

This scale measures the self-confidence of adolescents, which helps them choose less fatty and salty foods [19]. It is a three-point Likert-type scale with 15 items. The total score is between -15 and +15. A higher score indicates a higher self-efficacy. The Turkish validity and reliability study of the scale was conducted by Haney and Erdoğan (2013) [8]. Its reliability coefficient was 0.79, the test-retest reliability was 0.68; it was found to be 0.77 in the present study.

2.8. Exercise Behavior Scale

This scale assesses the exercise behaviors of adolescents. It is one of seven subscales of the Adolescent Lifestyle Profile (ALP) Scale [20]. It is a four-point Likert-type scale with 6 items. The total score is between 6 and 24 points. The Turkish validity and reliability study of the scale was conducted by Ardıç and Esin (2015). Its test-retest reliability was 0.84 and its Cronbach's alpha coefficient was 0.80. Its Cronbach's alpha coefficient was determined as 0.76 in this study.

2.9. Stress Management Scale

This scale identifies the stress management behaviors of adolescents. It is one of seven subscales of the Adolescent Lifestyle Profile (ALP) Scale [20]. It is a four-point Likert-type scale with 5 items. The total score is between 7 and 20 points. The Turkish validity and reliability study of the scale was conducted by Ardıç and Esin (2015)[21]. Its test-retest reliability was 0.61 and its Cronbach's alpha coefficient was 0.61. Its Cronbach's alpha coefficient was determined as 0.59 in this study.

2.10. Child-Adolescent Social Support Scale

It assesses adolescents' perceptions on social support received from their "mothers", "fathers", "classmates", and "close friends" [22]. This Likert-type self-report scale measures the social support perception at "frequency" and "importance" levels. The scoring ranges from 12 to 72 for frequency and from 12 to 36 for importance. The total score is between 12 and 72 points. The Turkish validity and reliability study of the scale was conducted by Yardımcı & Başbakkal (2009). Its test-retest coefficients were 0.80 and 0.72 and its Cronbach's alpha coefficients were 0.96 and 0.95 for frequency

and importance sections of the scale, respectively[12]. In the present study, its Cronbach's alpha coefficient was found to be 0.95 and 0.94 for frequency and importance sections, respectively.

2.11.Ethical Considerations

Before conducting the study, an ethical approval was obtained from the Ethics Committee of Usak University (No: 54749836-050-01-03/11). Uşak Provincial Directorate of National Education for the implementation of the school will be maintained and institutional permission from school administrations. Permission was received from the families to use the "Family Information Questionnaire" which they would fill out. Verbal consents of the children and written consents of their families were received. They were informed that their identities and answers would be kept confidential.

2.12. Statistical Analysis

The data were analyzed by using SPSS for Windows 17.0 (SPSS Inc., Chicago, IL, USA) and the level of significance was accepted as $p<0.05$. Descriptive statistical methods were used to assess the data of the study (mean, median, number, and percentage). The ANOVA test was perform to reveal the relationships of (ordinal) stage of behavioral change with the independent variables. Moreover, Tukey's HSD test was used to analyze the differences among the sub-variables. The multinomial logistic regression (MLR) analysis was employed to determine demographic (adolescent's age, gender, BMI, income of family, education of parents, and BMI), behavioral (dietary knowledge, dietary behaviors, diet self-efficacy, exercise behaviors), and psychosocial (stress management, social support) data.

3. RESULTS

The average age of the adolescents was 10.85±0.53. Of the adolescents 50.9% were male and 30% were overweight and obese. The educational levels of the parents were found to be 57.2 % and 39.2% and their income status was found 67.5%. The rates of overweight and obese mothers and fathers were found to be 44.2% and 68.5%, respectively (Table 1).

Table 1. Main characteristics of adolescents and family (N: 530)

Category	Number	Percent
Adolescents		
Age (Mean±SD= 0.85±0.53)		
10	120	22.6
11	369	69.6
12	41	7.7
Gender		
Female	260	49.1
Male	270	50.9

BMI(Mean±SD= 18.84±3.55)

Underweight	25	4.7
Normal	346	65.3
Overweight and obese	159	30.0
Family		

Education-Mother		
Primary	303	57.2
High	110	20.8
College	117	22.1
Education-Father		
Primary	208	39.2
High	163	30.8
College	159	30.0
BMI-Mother (Mean±SD= 26.10±4.33)		
Normal	244	46.0
Overweight and obese	286	54.0
BMI-Father (Mean±SD=27.05±3.62)		
Normal	167	31.5
Overweight and obese	363	68.5
Income		
Low	122	23.0
Moderate	358	67.5
High	50	9.4

It was found that 4.5% (*n*=24) of the adolescents were in the Precontemplation stage, 6% (*n*=32) were in the Contemplation stage, 23% (*n*=122) were in the Preparation stage, 22.5% (*n*=119) were in the Action and 44% (n=233) were in the Maintenance stage. The mean score of all independent variables increased significantly in the Maintenance stage than the other stages (<0.001). It was determined that the Dietary Self-efficacy in all the stages except for the Maintenance stage; the Dietary Knowledge in the Preparation stage; the Diet Behaviors in the stages of Precontemplation, Contemplation, and Preparation; and the Exercise Behaviors, Stress Coping Behaviors, and Social Support in the Preparation and Action stages compared to the Maintenance stage were significantly lower.

The researcher conducted a Multinomial Logistic Regression (MLR) analysis in order to determine the prediction of stages of behavioral change in terms of the independent variables (Table 2). In the MLR analysis, each of the five stages was accepted as a reference group and they were compared with the non-reference groups.

In this analysis, the father's education (OR 2.6) and the adolescents' gender (OR 1.7) were the two strongest variables in terms of differentiating the stages. While the father's education predicted the Contemplation stage, adolescents' gender predicted the Maintenance stage compared to the others. Specifically, the female adolescents probably maintained fruit and vegetable intake more compared to the male ones. Mother's BMI became highly predictive once in the Contemplation (OR: 1.2) and Preparation (OR: 1.2) stages; whereas, adolescent BMI could also be predictive three times in the Action (OR: 1.1 and OR 1.1) and Maintenance (OR:1.1) stages. Higher self-efficacy was predictive in the Preparation (OR: 1.1) and Maintenance (OR: 1.1) stages compared to all of the other stages. Although dietary knowledge was predictive in the Preparation (OR: 1.1), Action (OR: 1.0) and Maintenance (OR: 1.0) stages, diet behavior was the only variable in the Maintenance (OR: 1.0) stage among the remaining stages. While Stress Management (OR: 1.0) could predict the Action (OR: 1.0) and Maintenance stages; Social Support (OR: 1.0) could predict the the Maintenance (OR: 1.0) stage. Exercise Behaviors were not a predictive factor for adolescents in any stage (Table 2).

Table 2. Multinomial Logistic Regression (MLR) analysis in order to determine the prediction of stages of behavioral change in terms of the independent variables

Reference category: **Precontemplation** (n:24, 4,5%, n^boys:12)			
Contemplation (n:32, 6%, n^boys:21)	Preparation (n:122, 23%, n^boys:65)	Action (n:119,22,5%, n^boys:68)	Maintenance (n:233, 44%, n^boys:104)
Father education (p:0.047; OR:2.561; 95%CI: 1,014–6,469) Mother BMI (p:0.010; OR:1.219; 95%CI:1.048–1.419)	Mother BMI (p:0.042; OR:1.219; 95%CI:1.005–1.309) Dietary Self-Efficacy (p:0.020; OR:1.100; 95%CI:1.010–1.118)	Adolescent BMI (p:0.047; OR:1.152; 95%CI:1.002–1.324)	Dietary Self- Efficacy (p:0.013; OR:1.100; 95%CI:1.0130–1.116)
Reference category: **Contemplation**			
	Preparation Diet Knowledge (p:0.013; OR:1.100; 95%CI:1.013–1.114)	Action	Maintenance
Reference category: **Preparation**			
		Action Adolescent BMI (p:0.012; OR:1.111; 95%CI:1.024–1.209) Stress Management (p:0.010; OR:1.047; 95%CI:1.011–1.084) Diet Knowledge (p:0.008; OR:1.043; 95%CI:1.011–1.1076)	Maintenance Adolescent BMI: (p:0.034; OR:1.100; 95%CI:1.006–1,158) Stress Management (p:0.004; OR:1.047;95%CI:1.014–1.081) Diet Behaviors (p:0.011; OR:1.035; 95%CI:1.008–1.063) Diet Knowledge (p:0.003; OR:1.043; 95%CI:1.015–1.1072)
Reference category: **Action**			

Maintenance	Social Support (p:0.011; OR:1.038; 95%CI:1.009–1.068)	
	Sex (p:0,042; OR:1.692;95%CI:1.019–2.808)	

MLR: Multinomial Logistic Regression; **OR:** Odds Ratio; **CI:** Confidence Interval

4. DISCUSSION

The present study examined the efficacy of demographic, psychosocial, and behavioral variables for fruit and vegetable intake of adolescents to be predicted in the next stage under the guidance of the stages of change of TTM. The results supported the predictive power of some variables, which prevented obesity, on behavioral change and helped to understand this change better. The TTM also enabled to understand the differences in behavioral change to develop the stage-based interventions focused on the related predictors of each stage.

In this study, adolescents' nutritional behavior and nutrition self-efficacy perceptions differed according to gender and parental educational levels. Female adolescents and parents with higher educational levels had higher nutritional behavior and self-efficacy perceptions. These results supported the results of previous studies indicating that female adolescents chose healthier foods than male adolescents [8-9].

The adolescents in the Contemplation and Preparation stages were affected by their overweight or obese mothers; whereas, they were affected by their own weights in the Action and Maintenance stages. The relationship between adolescents' BMI and family eating habits has been well established in the literature. The studies have revealed that dietary habits of the parents influence the dietary habits of their children (23) and the most important factor in the increase of BMI among children is the BMI of their parents [8-24]. Another study by Rhee, De Lago, Arscott-Mills, Mehta, & Davis (2005) indicated that the children of parents who did not make any change in their lifestyles and home environment were not ready to participate in a weight control program[24].

The present study revealed that dietary knowledge, dietary behaviors, and the perception of dietary self-efficacy were the major predictors for progress to the Maintenance stage. The results supported the results reporting that there was a strong correlation among these three variables in school-age children and children with a high level of self-efficacy perception were adaptable and willing to change [14-25].Furthermore, the previous studies indicated that the dietary self-efficacy of children with a higher level of dietary knowledge increased [26-27-28]. In this respect, the results emphasized that the perception of self-efficacy should be strengthened in all stages, particularly for progress to the Preparation and Maintenance stages, and also the dietary knowledge should be supported more with respect to Preparation, Action and Maintenance stages.

The results of the study also revealed that Stress Management behavior and Social Support predicted adolescents' healthy eating behaviors. It is stated in the literature that stress affects the maintenance of positive behavioral change [11-29]. Furthermore, the most important strategy for stress management is the perception of social support [13-22]. The results suggested that adolescents needed more social support to overcome stress through Preparation, Action, and Maintenance stages.

Despite the difference between stages of exercise behavioral change, these variables did not predict the other later stages of behavioral change. Previous studies showed that one of the most effective exercise strategies was social support [26] Furthermore, physical activities performed with parents were found to positively affect the obesity of adolescents. The results suggested that with motivation from others (e.g., group exercise) and activities especially performed with parents, it may be more likely to initiate and maintain physical activity at adequate levels [8-18].

In conclusion, the results have emphasized that it is important to investigate simultaneously multiple variables in order to determine the contributing factors which affect health promoting behaviors.

5. CONCLUSION

In this study, the stages of change of TTM provided useful information about the predictors of health-promoting behaviors for the next stage. This information was focused on the behaviors of the adolescents in the Preparation, Action and Maintenance stages who constituted a great majority of the sample. The results set a framework for stage-based multiple interventions for healthy food consumption and obesity prevention. Action-oriented individuals should be paid attention and support because initiating actual behavior is an important step and the risk of relapse is high.

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