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Behavioral Determinants of Obesity among Adolescents: A Qualitative Study

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ABSTRACT

Background: Overweight and obesity are the most serious public health challenges of developed and developing countries. The prevalence of childhood obesity has increased worldwide. This study aims to identify the behavioral determinants of overweight and obesity among adolescents. **Methods:** This is a qualitative study with directed approach to content analysis of in-depth semi-structured interviews. A total of 27 obese and overweight students (11girls, 16 boys) were recruited in this study based on the PRECEDE model (predisposing factor). The participants were recruited using a purposive sampling method to reach the maximum variation sampling. This sampling took over 6 months in 2018 at the Ghaemshahr middle school. Content analysis approach (directed) was used to analyze the interview. **Results:** Five main themes and 20 sub-themes of behavioral determinant were emerged from the interview. The main themes included perceived benefit, perceived threaten, self-efficacy, cues to action, and locus of control. The subthemes included self-empowerment, motivation and diligence role, enough information and parent pressure, long term benefits, physical health, doing favorite sports, perceived susceptibility and perceived severity, and internal and external locus of control. **Conclusion:** Self-efficacy and perceived benefit are the most significant determinants of preventive behavior in obese and overweight students; therefore, considering these variables in students can be applied in designing an interventional program that affect obesity preventive behaviors, increase parents' awareness and school authorities.

Keywords: Overweight; Obese; Adolescents; PRECEDE model; Qualitative research

Introduction

Overweight and obesity are the most serious public health challenges of developed and developing countries, affecting approximately 500

million people worldwide, according to the report produced by the World Health Organization (WHO) (Ng *et al.*, 2014). Obesity is the second leading

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cause of death globally, killing 300,000 people annually (Popkin *et al.*, 2012). The prevalence of childhood obesity is increasing (Safavi *et al.*, 2012). Studies have shown that 10% of children and adolescents are overweight or obese worldwide (Djalalinia *et al.*, 2016). In CASPIAN study, the prevalence of overweight and obesity among Iranian children and adolescents aged 6–18 years was 11.3% and 2.9%, respectively (Kelishadi *et al.*, 2008). The prevalence of obesity and overweightness among children and adolescents in Mazandaran province reported 3.1% among 7-year-olds, 4% among 12-year-olds, and 2.9% among 15-year-olds (Abdollahi *et al.*, 2017). Obesity can lead to disabilities and decreased quality of life. People with obesity should pay for their higher medical care expenditures. Obesity is also a risk factor for insulin resistance, hypertension, atherosclerosis, some cancers, and gallbladder disease in children. It also contributes to many psychological and social problems, such as depression, low self-esteem, decreased life expectancy, and suicide. Childhood obesity leads to many health problems, persistence of obesity during adolescence, increased hospital costs, and etc. (Lobstein and Jackson-Leach, 2016). Given increased prevalence of obesity in children and its association with chronic conditions in childhood or adulthood, childhood obesity prevention can help prevent many diseases and will be effective in health promotion. Despite increasing awareness of the risk of cardiovascular disease, the prevalence of obesity among adolescents continues to increase due to decreased physical activity, unhealthy lifestyle, and poor dietary habits (Haghi *et al.*, 2018). Many studies have shown that for overweight and obesity prevention, people should modify their eating behaviors and dietary habits instead of having temporary diets. The best way to improve their quality of life is to change their health behaviors (Kalateh Sadati *et al.*, 2016, Schalkwijk *et al.*, 2015). In this regard, understanding predictors of behavior can facilitate the implementation of intervention. Given the importance of psychological factors, a qualitative study was used to gain a deeper understanding of the cultural and socio-economic factors that were effective in performing physical

activity and dietary behaviors (Farquhar *et al.*, 2006).

The PRECEDE model has been used for health education and promotion. This model is a logical model that illustrates the causes of health problems. Based on the study by Green, the determinants are classified into three factors, including predisposing, enabling, and reinforcing. These factors work as determinants for healthy behavior (Green and Kreuter, 2005). Previous studies have found that adolescents' beliefs affect their behaviors, for example in obese students, self-efficacy and perceived benefit were important determinants of preventive behaviors (Bani-Issa *et al.*, 2019, Haghi *et al.*, 2018, Kadir *et al.*, 2019).

In addition, the results of a qualitative study in designing a successful intervention program may increase the efficacy of both obesity prevention programs and the adolescent empowerment programs. Therefore, this study aims to identify the behavioral determinants of overweight and obesity among adolescents.

Materials and Methods

Study design and participants: This study was part of an Exploratory Mixed method research study attempting to explain Behavioral determinant related to obesity among adolescent students (12-16 years). A qualitative study (directed content analysis approach) was conducted based on PRECEDE model. In this approach, the frame work was validated conceptually or extended. This theory can help to focus the research questions; also it can help researchers begin by identifying key concepts as initial coding categories. This approach was used by Hsieh and Shanon 2005 (Hsieh and Shannon, 2005).

Data collection: The data were collected through semi structured in-depth interviews from April to June 2018 on Qaemshahr students (12-16years). Twenty seven interviews were conducted with the students (11 girls and 16 boys). Each interview was done in a private room at the school and lasted approximately 30-45 minutes. The interview included open ended questions based on subcategory of PRECEDE model (predisposing, enabling and reinforcing factors). This study

explains the predisposing factor that express perception and experience of behavioral determinant in obese and overweight students. The interview questions were prepared by 3 researchers (Chaleshgar-Kordasiabi M, Ramezani A and Naghibi SA) and 3 students. The interview guide included 8 questions (See **Table 1** for interview guide).

Setting and participation: The participants were selected from overweight and obese students in 6 junior high schools aged 12-16 years. The inclusion criteria were body mass index (BMI) between 85th and 95th percentile, having signed consent form (Kuczmarski *et al.*, 2000). The exclusion criteria included metabolic disease, the history of using mood stabilizer and corticosteroid and physical and mental disorder. Participation in this study was voluntary and written consent was obtain from each student. Furthermore, confidentiality and anonymity were reassured.

The participants were selected through purposive sampling method to consider the maximum variation sampling based on sex, age, socio economic status from 6 junior high schools (government and nonprofit) in Qaemshahr, Mazandaran, Iran. Sampling was continued until data saturation was reached, which occurred after 22-27 interview sessions (11 girls and 16 boys).

Ethical considerations: The research was approved by the human research ethic committee of Mazandaran University of Medical Sciences (IR.MAZUMS.REC.95.2918). The interview was continued until data saturation was reached and no new information was produced.

Data analysis: Directed content analysis approach was used to analyze the interview. All interviews were recorded and transferred into Microsoft word; then MAXQDA10 software was used to analyze the data.

According to directed content analysis, interviews were read 3 or more by the authors to provide suggestion for theme, subtheme and code. During group meeting with all authors, we agreed the final theme and subtheme based on PRECEDE model (Green and Kreuter, 2005).

Consideration of rigor: the prolong involvement in data collection from April to June 2018 helped to give trust and rapport with the participants. To ensure that analysis reflects the patient's perception, member checking was conducted during data collection. To confirm dependability and conformability of the data, premier code and subtheme of PRECEDE model were checked by authors who are experts in health education, nutrition, and qualitative research. Purposeful sampling and in-depth interview in 6 schools among different socio economic regions confirmed controllability and credibility.

Results

In total, 27 students (16 boys, 11 girls) entered the study. **Tables 2** and **Table 3** show the demographic characteristics of the participants. In this study, based on PRECEDE model, 5 main themes and 20 subthemes of behavioral determinant were emerged. The main themes include perceived benefit, perceived threaten, self-efficacy, cues to action, and locus of control. **Table 4** summaries the themes and subthemes.

First theme; Self-efficacy: Self-efficacy includes sense of empowerment, motivation and diligence role, enough information, and parent pressure.

1. Sense of empowerment: Some students in the interview have usually undergone a loss weight program over the past 2-3 years. The results the study showed that most students had a sense of temptation and lack of control over their behavior in controlling nutritional behaviors and the diet when they see delicious food (fried, greasy, pasta, snack, and sweetener) in the surroundings (home, schools or television) and did not follow nutritional recommendations for obesity control.

“If I see a delicious food I cannot control myself, like fast food (lasagna, sandwich)” (P4)

In contrary, a few of students had a sense of control and ability to control temptations and conduct proper behaviors (nutrition and exercise).

“I am walking every day, but when I do not have time, like a quiz or party, I choose a shorter route to walk.” (P7)

“As far as I can, I do not eat harmful food. For

example, last weekend in my grandmother's house, I tried to farther away from the place where there was food, and I took a piece of bread and yogurt, and went to the other room.” (P16)

2. Motivation and diligence role: In this study, students considered the role of motivation and diligence in conducting the preventive behavior. Most of students asserted they did not have motivation and diligence in continuing these behaviors due to low self-confidence and negative experiences.

“I tried to go on a diet and I lost 4 kg in the first week, but in the next weeks, I did not lose weight.” (P1)

“I went on a diet for a long time, and lost 10 kg, but then I gained 10 kg of weight.” (P8)

“I'm tired, because I cannot eat the food I like for a while.” (P25)

Few students stated that they had a strong will to behave in exercise and diet properly.

“I have a strong will, when I make a decision I will definitely do it and nothing is tempting.” (p18)

3. Parent pressure: Some students expressed that parents have a supporter and limiter role in doing preventive behaviors. For example giving a feeling of confidence, preparing healthy food, pressure to eat or not eat certain food, encourage and accompaniment in diet and sport.

“My mother always says I know you and you cannot go on a diet, which makes me feel like I cannot.” (P10)

“When I go on a diet, my family will follow me, so most of the foods are healthy. We do not eat fried food at all.” (P26)

4. Enough skills or information: Having adequate skills or information in exercise and nutrition plays an important role in preventative behaviors. Some students had enough knowledge about preventive behaviors. Few of them had poor knowledge about these behaviors, such as using diet of family members or friends.

“To prevent obesity, you should have adequate nutrition, physical activity, and exercise.” (P27)

“My mother visited a nutritionist and I use my mother's diet and eat less than her diet.” (P18)

Second theme; Perceived benefit: Perceived benefit includes long term benefits, physical health, doing favorite sports.

1. Long term benefits: Students believed that the long-term benefits of preventive behaviors include fitness, attractiveness, appearance, choose and buy clothes, get a boyfriend, save food money, increased self-confidence, better future, and communication with the community. These benefits were considered as the main incentives for behaviors, such as losing weight and physical activity.

“Being lean will increase my confidence.” (P22)

“Be good shape and be dressed like my friend who wears beautiful clothes.” (P5)

“I would like to buy any clothes.” (P11)

“I like to be skinny, so that my friends do not mock me.” (P13)

“I would like to be skinny to have a good future, when I became an important person, no one laughs me.” (P16)

2. Physical health: some students believed that preventive behaviors, such as exercise and having a diet improve physical health like joint disease (leg and lower back pain), cardiovascular, and diabetes.

“The advantage of slimming is that I will not have leg pain again and will be comfortable doing something.” (P7)

3. Do favorite sports: Some of the boys expressed that the benefit of losing weight behavior was doing favorite sports, such as basketball, football, school volleyball team, and participating in competition and championships in Olympic.

“Sometimes I think of sports that I like and cannot do, like basketball or parkour.” (P10)

“One of my goals to lose weight is to be the best soccer player.” (P11)

Third theme; Perceived threaten: It includes perceived susceptibility and perceived severity.

1. Perceived susceptibility: Few students with an overweight believed that they would be at risk of complications of obesity in the future, also in the family of these students; there were people who suffered from obesity.

“My father has diabetes, and I am obese and at

risk of diabetes. I decided to reduce my weight.” (P24)

2. Perceived severity: Most of the students stated that obesity is the cause of physical, mental and social complication. Physical complications include diabetes, cardiovascular disease, joint problems, fatty liver, cancer, and infertility. A few of them believed that depression and self-esteem is mental problems and also they pointed that being humiliated and mocked by people in the future (at university and workplace, by friends, and after marriage) is a social complication.

The complications of obesity were heart attacks and diabetes mellitus and mental disorders, such as depression, being mocked by people. " (P15)

“My cousin could not get married, because she was obese. I am worried about the future.” (P9)

"Obesity causes lipid profile, kidney problems, and fatty liver.” (P23)

“Obesity causes cancer and dyspnea and makes it difficult for me.” (P17)

Locus of control: There are internal and external loci of control.

1. Internal locus of control: Few of students indicated that they had control over their food and exercise to internal forces. They believed that factors, such as lack of planning, laziness, temptation, lack of will, tiredness from exercise, and diet were the reasons for doing or not doing the behavior.

“I decide, but it is hard to do, because I do not have any exact planning.” (P10)

"The main cause of my lack of exercise is laziness. " (P19)

“For example, you leave the sport for a short time, because you are invited to a party, at lunch or dinner time, I said, I disregard the diet, and I will leave the diet and exercise.” (P27)

2. External locus of control: Most of the students mentioned that external forces can affect weight and are not under one’s control. They reported that external forces, including the role of parent in diet, exercise, travel, increased appetite after gym and walking, being with friends, final exam, stress, nervousness, going to party, genetics, and damaged sport equipment, were factors that can prevent weight loss behavior.

“When we eat with our friends, we use sauce on the food and this made me gain fat.” (P9)

“In our family, obesity is hereditary.” (P22)

“I eat more during exams.” (P1)

“When I went to the gym my stomach was empty, after the gym I started eating again, and I gained weight.” (P12)

Cues to action: The students mentioned that cues to action, including self-advice and incentive from parents, media, teachers, nutritionist and physician advice, peers and relative, can help to lose weight. Few students said that after gaining weight, they decided to plan for weight loss.

“I felt that I gained weight, and then I decided to lose weight.” (P18)

Parents and peers’ encouragement was a kind of facilitating factor in students. Some of them said that weight loss program was recommended by sport coach, teachers, relatives, and peers.

“Parents also repeatedly mentioned me about overweight and obesity problem. For example, they remind me while serving meals.” (P15)

“My coach told me to eat more boiled food and eat less fast food.” (P24)

“My father told me that he had had these problems and he does not want me to be bothered. My grandfather and uncle tell me about obesity problems.” (P23)

Table 1. Interview question.

1	Can you tell me what you know about obesity and prevention?
2	What do you do to prevent obesity and weight gain?
3	What have you said about the effect of preventing obesity and weight gain?
4	What factors prevent this from happening?
5	How much do you have to do with weight loss?
6	What are obesity and overweight problems?
7	How has obesity affected school, home, and community activities?
8	Where did you get this information?

Table 2. Demographic characteristics of the participants.

no	Gender	Height (cm)	Weight (kg)	BMI (kg/m ²)	Father' Job	Mother' Job
1	M	176	96	31.0	Employee	Employee
2	M	170	100	34.6	Self-employment	Housewife
3	F	155	80	33.3	Employee	Retired
4	M	173	90	30.1	Self-employment	Employee
5	F	163	90	33.9	Employee	Teacher
6	F	160	85	33.2	Employee	Housewife
7	M	159	76	30.1	Teacher	Housewife
8	F	175	98	32	Self-employment	Housewife
9	F	170	79	27.3	Employee	Employee
10	M	164	95	35.3	Teacher	Physician
11	M	170	99	34.3	Employee	Employee
12	M	167	95	34.1	Employee	Housewife
13	M	176	120	38.7	Employee	Teacher
14	M	175	85	27.8	Self-employment	Employee
15	M	170	82	28.4	Self-employment	Housewife
16	M	170	85	29.4	Self-employment	Housewife
17	M	176	100	32.3	Self-employment	Housewife
18	F	164	83	30.9	Employee	Shop-keeper
19	M	183	101	30.2	Employee	Employee
20	M	172	100	33.8	Self-employment	Employee
21	M	172	85	28.7	Self-employment	Housewife
22	F	170	105	36.3	Retired	Housewife
23	M	170	108	37.4	Self-employment	Housewife
24	M	168	85	30.1	Self-employment	Tailor
25	F	158	74	29.6	Self-employment	Housewife
26	F	158	74	29.6	Physiotherapist	Physiotherapist
27	F	175	90	29.4	Self-employment	Housewife

BMI: body mass index; M: Male; F: Female

Table 3. Socio demographic characteristics of the participants (n = 27).

Variables	Mean ± SD
Age (y)	14.33 ± 0.90
Height (cm)	169.18 ± 6.45
Weight (kg)	91.48±10.72
Weight status	N (%)
Obese	21 (77.8)
Overweight	6 (22.2)

Table 3. Socio demographic characteristics of the participants (n = 27).

Variables	Mean ± SD
Father's education	
Under diploma and diploma	13 (44.4)
College degree	15 (55.5)
Mother's education	
Under diploma and diploma	13 (48.1)
College degree	14 (51.9)
Father's job	
Employed	15 (55.6)
Self-employed	12 (44.4)
Mother's job	
Housewife	14 (46.2)
Employed	13 (53.8)

Table 4. Main themes from semi structured in-depth interviews.

Key theme	Themes	Subthemes
Behavioral determinant	Self-efficacy	Self of empowerment Motivation and diligence role Enough information Parent pressure
	Perceived benefit	Long term benefit Physical health Doing favorite sports
	Perceived threaten	Perceived susceptibility Perceived severity (physical, mental and social complication)
	Locus of control	Internal locus of control external locus of control
	Cues to action	Self-advice and incentive from parent, media, teachers, coach, nutritionist, physician, peers, and relatives

Discussion

The study findings showed that behavioral predisposing factors have an important role in weight management (diet and exercise) in obese and overweight students. This factor contains perceived benefit, perceived threaten, self-efficacy, cues to action, and locus of control.

Locus of control: It is an important factor associated with obesity, since it reflects the beliefs of individuals in selecting the environments, whether or not under their control. Based on the findings of the study, locus of control of weight loss behaviors in adolescents includes both internal and external locus of control. A small number of students had a plan to perform behaviors related to healthy eating and exercising regularly, and they could control their behaviors. They considered

temptation, laziness, lack of planning, lack of willpower, and fatigue as reasons for failure to perform weight loss behaviors.

Recent studies have identified the role of the personal responsibility in preventing obesity (Braun *et al.*, 2014). Furthermore, several studies have shown that individuals with internal locus of control follow the physician-prescribed regimens (such as medication, diet, and exercise). People having a low BMI had a higher locus of control (Neymotin and Nemzer, 2014, Simper and Keeble, 2018).

Locus of control includes outside forces that prevent the certain behaviors from occurring in individuals. Students pointed out the role of the external locus of control in helping to control the behaviors targeted in behavioral weight-loss

programs, including the role of parents in regular exercise and a healthy diet, travel, increased appetite after the physical activity and walking, going out and partying with friends, school tests, stress, nervousness, going to parties, genetics, and the breakdown of school sports equipment which are considered as the school's locus of control. Most of the girls pointed out the role of genetics and going out and partying with friends and also boys pointed out the role of going to parties, school tests, and increasing appetite after physical activity and all of these were considered as external locus of control. These findings are consistent with the results of a study conducted by Persky et al. (Persky *et al.*, 2017). Peer groups can have a great influence on the adolescents' healthy behaviors and bad habits by focusing on the external locus of control. Persky et al., demonstrated that genetic attributions for eating behaviors were related to lower confidence in ability to control eating and weight (Persky *et al.*, 2017). A meta-analysis study found that adolescents have difficulty in understanding the causes of obesity (Barnard and McHugh, 2006). In addition to their interactions with health-care providers, relationships with peers, and parents in the case of children, can also be responsible for the association between locus of control and obesity. Moreover, parents can affect more externally focused children by discouraging sedentary behaviors or making them less available, which is consistent with the results of study of neymotin et al. (Neymotin and Nemzer, 2014).

Perceived benefits: The students considered long-term benefits of obesity preventing behaviors as follows: the fitness, physical attractiveness, ease of choosing and buying clothes, making friends, performing favorite sports, increased self-confidence, the future of work, and better communication with the community, which is consistent with the study by Kadir et al. (Kadir *et al.*, 2019). Other studies have also pointed to the benefits of walking and physical activity, such as physical fitness, health, and wellness (Kadir *et al.*, 2019, McArthur *et al.*, 2017, Park, 2011). In the present study, students considered the health,

fitness, and increased self-confidence as the most important benefits of obesity and overweight prevention behaviors. However, male students described the fitness as having muscles and participating in sports and physical activity, and female students also described it as physical attractiveness. Several male students described the benefits of weight loss as participating in favorite sports, such as wrestling and soccer, and their motivation for diet or exercise plan was the participation in school sports and activities. In a review study, adolescents considered weight loss as the key to social desirability (Rees *et al.*, 2014). In the present study, some students believed that weight loss resulted in less bullying and humiliation by others, which in turn could lead to a normal and happy life.

In this study, perceived threat included perceived sensitivity and perceived severity. Our results showed that students who had a family history of obesity-related chronic diseases considered themselves prone to obesity-related problems. This finding is in line with the study by Kaveh et al. (Kaveh *et al.*, 2020b). The higher perceived threat yields, the higher motivation to engage in health behaviors (Kaveh *et al.*, 2020a). Niswah's showed the direct and indirect relationships between overweight and the perceived threat of obesity (Niswah *et al.*, 2017). Adolescents who reported more perceived threat than overweight easily felt their overweight and were more likely to engage in healthy eating and regular physical activity. Arthur et al. reported that there was a negative association between perceived severity and BMI among overweight and obese children and adolescents. It was due to the fact that students who were well aware of the consequences of obesity and overweight were trying to lose weight (McArthur *et al.*, 2017). The present study results reveal that students described perceived threats of the obesity as physical, psychological, social, educational, and economic problems, which are consistent with previous studies (Chao *et al.*, 2019, Kaveh *et al.*, 2020b, Niswah *et al.*, 2017, Okop *et al.*, 2016). Students pointed to the risks of obesity as future physical illnesses, including

cardiovascular disease, pulmonary disease, fatty liver disease, cancers, musculoskeletal disorders, and infertility. This finding is consistent with previous studies conducted on women and adolescents (Okop *et al.*, 2016, Park, 2011). The social problems mentioned by the students included humiliation, ridicule, harassment by others and classmates, and feelings of shame and embarrassment. In other studies, adolescents and adults also pointed to these social problems in school and life (Amini *et al.*, 2014, Kalateh Sadati *et al.*, 2016). In studies conducted on adults, obese people also considered physical problems, psychological and economic pressures as threats to obesity (Yazdani *et al.*, 2018). Seeing a sick person increases the perceived severity, which in turn can increase the intention of health-related behaviors (Okop *et al.*, 2016). It seems that the perceived threat increases when seeing overweight and obese people and can affect weight-loss intention. It can be concluded that subjective norms and cues to action may affect people's attitudes about specific health behaviors. In the present study, some students reported that despite performing exercise and following a healthy diet, they were overweight and obese, which in turn could lead to a lack of motivation to prevent overweight and obesity. Some students had no incentive to prevent overweight and obesity due to failure on diets in the past and socio-cultural conditions of the society. The results of this study are consistent with previous studies conducted on the adolescents (Amiri *et al.*, 2011, Kadir *et al.*, 2019, Persky *et al.*, 2017, Smith *et al.*, 2014).

Self-efficacy: The results of the present study indicate that most of obese and overweight students had low self-efficacy to control their weight and did not have the motivation to prevent overweight (Ghanbari *et al.*, 2018, Woolford *et al.*, 2012). In the study by Woolfore and ghanbari, obese and overweight students reported significantly lower levels of self-efficacy (Ghanbari *et al.*, 2018, Woolford *et al.*, 2012). It might be due to lack of motivation and encouragement in the school, home or community,

which could affect their self-efficacy and empowerment. According to the results, most students reported that they were tempted by the delicious-looking food at parties, school, home, buffet, and school and resisting food temptations was hard for them, which is consistent with the study by Amini *et al.* (Amini *et al.*, 2014). In the present study, students considered the family as both reinforcement and barrier to obesity prevention. Several studies pointed out the role of parents and teachers in fostering self-efficacy in adolescents and developing life skills and lifestyle choices in the future (such as diet and physical activity) (Bani-Issa *et al.*, 2019, Pajares and Urdan, 2006). In their study, Bani-Issa *et al.* showed that both age and school location were the two most important determinants of the dietary self-efficacy. Awareness of the importance of their health, self-esteem, body image, and appearance can improve the dietary self-efficacy (Bani-Issa *et al.*, 2019). Kololo *et al.* demonstrated that the attitude of older students towards their own bodies and body image was an important factor in increasing their exercise self-efficacy (Kololo *et al.*, 2012). School, family, and healthcare providers can play an important role in improving self-efficacy of both parents and students and promoting the obesity preventing behaviors. In the present study, considering that all children were obese or overweight, their awareness of the food nutritive value and energy consumption in foods and activities indicated the gap between their knowledge and performance.

In other words, they understood about obesity and the behaviors related to it, and despite having sufficient information about healthy diet, they followed sedentary behaviors and unhealthy diet, which was consistent with the results of previous studies (Amini *et al.*, 2014).

Cues to action: According to our results, the students believed that friends, peers, family, physician and nutritionist, sports coach, teacher, parents, and school authorities could play an important role in encouraging them to promote the behaviors preventing obesity, which is consistent with previous studies. It suggests the role of

parents and their interaction with children in promoting these behaviors (Amiri *et al.*, 2011, Jones *et al.*, 2019, Saez *et al.*, 2018). In their study, Saez *et al.* found that the social support from peer participation resulted in weight loss (Saez *et al.*, 2018, Schalkwijk *et al.*, 2015).

In Park *et al.*'s study, variable of cue to action was an important factor affecting the weight loss in adolescents with overweight (Park, 2011). One of the limitations of this study was the lack of both quiet time and a quiet place to conduct interviews with students, which prolonged the implementation of the study.

Conclusion

In the present study, adolescents reported that the most important factors affecting the obesity preventing behaviors included perceived benefits, self-efficacy, perceived threat, locus of control, and cues to action. Given the increase rate of obesity among adolescents, the results of the study can be applied in designing an educational program (intervention) with the emphasis on factors affecting obesity, such as preventive behavior, parents, schools authorities, and peers. It is also recommended that other studies be conducted to increase the adolescents' motivation to engage in the prevention behaviors in schools.

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Conflict of interest

There is no conflict of interest.

Authors' contributions

Chaleshgar Kordasiabi M, Ramezani A, Naghibi SA, Yazdani Cherati J, khazaei pool M, and Abbasi shavazai M designed the study, administered, collected the questionnaires, analyzed the data. Chaleshgar kordasiabi M and Abbasi shavazi M wrote the manuscript. All authors read and approved the final manuscript.

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