

Factors Associated with Tendency for Weight Loss in a Representative Sample of Children and Adolescents: The CASPIAN-V Study

Abstract

Background: This study aims to determine the factors affecting the tendency to lose weight (TLW) and its methods in Iranian children and adolescents. **Methods:** In this cross-sectional nationwide study 14800 students, aged 7–18 years, living in 30 provinces of Iran were selected via multistage cluster random sampling method. The dietary and physical activity habits and TLW as well as psychosocial health status, anxiety, self-satisfaction, and change in dietary behaviors were assessed by the global school-based student health survey (WHO-GSHS) questionnaire. Multivariate logistic regression model was used to identify factors influencing TLW. **Results:** Overall, 14274 students (participation rate of 99%), consisting of 51% boys and 71.4% urban residents, completed the study. Of them, 37.7% (51.4% Girls and 48.6% boys) tended to lose weight. In multivariate model, the odds for TLW was 12% higher in students aged 13–18 years than those aged 6–12 years (OR = 1.12, 95% CI: 1.02 to 1.23; $P < 0.001$). Students with high anxiety level were 43% more likely to have TLW (OR = 1.43, 95% CI: 1.28–1.59; $P < 0.001$). The odds of increasing physical activity for weight loss was 22% lower in obese than in normal weight students (OR = 0.78, 95% CI: 0.66 to 0.93; $P < 0.001$). **Conclusions:** TLW was significantly higher in girls, as well as in those with higher anxiety level. In addition to dietary change, increasing physical activity should be encouraged among children and adolescents with excess weight. Public education regarding proper lifestyle change for reaching healthy weight should be underscored.

Keyword: Adolescents, motivation, obesity, overweight, weight loss

Introduction

Prevalence of childhood obesity is amazingly rising all over the world; it is no more limited to developed countries.^[1,2] Therefore, it is necessary for childhood and adolescence to determine strategies and activities to help them reaching healthy weight.^[3]

Recently, different motivations of the individual for these behaviors have been studied. Brown *et al.* states that students who have family and social motivations have less weight loss than those who have personal motivations.^[4] Another study demonstrated that motivations have important role in choosing weight loss plan as well as the amount of compliance for continuation of treatment^[5]; from which it has been suggested that strategies to increase the motivation of individuals^[6–8] should be included in weight loss plans in order to get better results.^[9,10]

Plans people use for weight loss have a wide range from healthy weight loss methods such as dieting and exercising to

unhealthy ways such as eliminating all three or some of main meals, restriction on certain foods, or following very restricted diets.^[11] Factors influencing the choice of healthy or unhealthy weight reduction methods are often associated with factors affecting the tendency to change weight.^[4] Therefore, individual motivation for weight reduction, influence on the plan used for weight loss and its continuance, in addition to influence on the choice of weight loss method.

Childhood obesity has an increasing trend in Iran.^[12,13] Therefore, public education is provided for prevention and management of obesity, but there is no previous study on the motivation to change weight and its methods among Iranian children and adolescents. This study aims to determine the factors affecting the tendency to lose weight (TLW) and its usual methods in a national sample of Iranian children and adolescents.

Materials and Methods

This nationwide study was conducted in the framework of the fifth survey of the

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school-based surveillance system entitled “Childhood and Adolescence Surveillance and Prevention of Adult Non-communicable disease” (CASPIAN-V) study in 2015. Detailed methodology of this study is described before.^[14]

Study population and sampling framework

The study population consisted of students, aged 7–18 years, selected by using multi-stage cluster sampling method from urban and rural areas of 30 provinces in Iran. Sampling in each province was proportional to size with equal sex ratio. Maximum sample size for achieving to a good estimate of all risk factors of interest was 14400 students across country (A total of 48 clusters of 10 people in each province). Individuals following special diets, and those having a history of chronic diseases, use of medications were excluded from our analysis. Moreover, subjects with full missing data were excluded.

Procedure and measurements

Two sets of questionnaires were considered for students and their parents. The student’s questionnaire was obtained from Persian version of World Health Organization–Global Student Health Survey (WHO-GSHS). Validity and reliability of both questionnaires has been assessed previously.^[15]

Characteristics of participant such as dietary habits, psychosocial health status (included worry, depression, confusion, insomnia, anxiety, and aggression, and feelings of being worthless were assessed by seven questions), and self-satisfaction were evaluated by relevant questions in students’ questionnaire. Anxiety in students was measured using the question “In the last 12 months, how many times were you so worried, you couldn’t sleep?”, anxiety level of students was divided into two categories of low (never, rarely) and high (sometimes, often, always). To assess dietary habits, food frequency questionnaire was applied and nine items include sweets, salty/fatty snacks, soda, fruits, dried fruit, vegetables, sugarsweetened drinks, milk, and fast food. Based on principle component analysis method, five groups of foods were considered as unhealthy foods, including sweets, salty/fatty snacks, soda, sugarsweetened drinks, and fast food and four groups of food including fruits, dried fruit, vegetables, and milk considered as healthy food. Unhealthy and healthy food intake was categorized into tertiles. The first tertile was defined as a low, second tertile as a moderate, and third tertile as a high. The self-reported questions were used to indicate the total amount of times and duration of daily (exercise and/or physically active play) on average, physical activity categorized into two levels: low (<2 times/week) and high (≥2 times/week). Students were asked about the daily time spent in front of screen such as television (TV) and/or videos, computer, or

electronic games, Total ST classified into two levels: low ST (<2 hour/day) and high ST (≥2 hour/day). The frequency of eating meal was investigated using the question “How often do you eat breakfast/lunch/dinner in weekdays/weekends?”, the responses about frequency of eating meal were divided into two categories of 5–7 days eating meal (No Skipper) and 4 days or less (Skipper).

To assess the family socio-economic status (SES), principle component analysis method was used on questions about parents’ education, employment, and home ownership status, type of school, car ownership and having a personal computer. After summarizing these questions in one component, it was categorized into three level of low, moderate and high SES.

Physical measurements

All measurements were conducted under standard protocol using calibrated instruments. Weight was measured to the nearest 0.1 kg (with light cloth) and height was measured without shoes to the nearest 0.1 cm.^[16] Body mass index (BMI) was calculated by dividing weight (kg) by square of height (m²). We used the WHO growth charts to categorize BMI.^[17]

The tendency to lose weight (TLW) and its methods

TLW was measured by response to the question “Do you already have a specific program for changing your body weight or do you have any specific plan?”. Responses were categorized in four forms including “yes”, “no, my weight is good”, “no, but I have to lower my weight” and “no, but I have to increase my weight”. Respectively, the first response represents the TLW while other responses indicate lack of TLW.

Weight loss method was assessed through a question asking participants about program(s) they used for weight loss. Participants responded with the propositions “I do not have any plan for weight loss”, “physical activity”, “diet”, “medications”, “combination of mentioned methods” and “others”.

Change in diet behaviors

Questions were asked about changes in diet behaviors in the year prior to the study; they included: Did you reduce the dietary fat intake?; Did you replace liquid oil instead of solid hydrogenated fat?; Did you increase dietary vegetables?; Did you reduce dietary sugar?; Did you reduce salt intake?; Did you reduce the frequency of fast food consumption?; and Did you increase the intake of fruits?

Statistical analysis

Data were analyzed using STATA package version 11.0 (Stata Statistical Software: Release 11. StataCorp LP. Package, College Station, TX, USA). Quantitative variables

are reported as mean (95% CI) and qualitative variables are reported as percentages (95% CI). Association between categorical variables with TLW was assessed using Chi-square. Multiple logistic regression (MLR) models using the Enter method were fitted to assess the factors that increased or decreased the risk of TLW. All variables having a *P* value of <0.2 in the univariate analysis were included in the MLR model. *P* <0.05 was considered as statistically significant.

Ethics approval and consent to participate

The Research and Ethics Council of Isfahan University of Medical Sciences approved the study (Project Number: 194049). After complete explanation of the study objectives and protocols, written informed consent and verbal consent were obtained from parents and students, respectively.

Results

Overall, 14274 students (participation rate 99%) were studied; they consisted of 51% boys and 71.4% urban residents. The mean age of participants was 12.28 (12.23, 12.33). According to the self-reports of the students, 37.7% of students was tended to lose weight.

Demographic characteristics of students according to TLW are presented in Table 1. Frequency of TLW was significantly higher in girls than in boys (39.5% in girls and 36.5% in boys, respectively, *P* < 0.001), also TLW was more frequent in students aged 13–18 years (40.4%) than students aged 6–12 years (35.8%). The frequency (95% CI) of TLW in students with high SES and was significantly higher than students with low SES (40.9% (39.5, 42.4) vs. 37.5% (36.1, 38.9), *P* < 0.001) [Table 1].

Association between independent variable and TLW using multivariate logistic regression is presented in Table 2. The odds of TLW in children aged 6-12 years was 12% higher than those aged 13-18 years (OR = 1.12, 95% CI: 1.02 to 1.23) (*P* < 0.001). Students with low level of physical activity were 50% less likely to be tended to lose weight than those with high physical activity. The odds of TLW in students with high anxiety level was 43% higher than others (OR = 1.43, 95% CI: 1.28 to 1.59; *P* < 0.001). Overweight students and obese students respectively had 27% and 55% higher TLW than their normal weight peers (*P* < 0.05). TLW in students who intake their meal regularly, was 26% lower than others (OR = 0.74, 95% CI: 0.67 to 0.83; *P* < 0.001) [Table 2].

Results of multivariate logistic regression analysis on the association between BMI and weight loss behaviors are represented in Table 3. The odds of physical activity for weight loss were 22% lower in obese than in normal weight students (OR = 0.78, 95% CI: 0.66 to 0.93; *P* < 0.001). Obese students were 32% more likely to change their diet for losing weight than normal weight students did (OR = 1.32, 95% CI: 1.10 to 1.59; *P* < 0.05). Weight loss behaviors had no significant difference between overweight and normal weight students.

The odds ratio of reducing fat consumption, replacing liquid oil instead of solid hydrogenated fat, increasing vegetables consumption, reducing sugar consumption, reducing the consumption frequency of fast food and junk food, as well as increasing fruit consumption was significantly higher in obese than in normal weight students (*P* < 0.05). There was no significant difference between obese and normal weight students in reducing salt intake (*P* > 0.05). In overweight students, the odds ratio

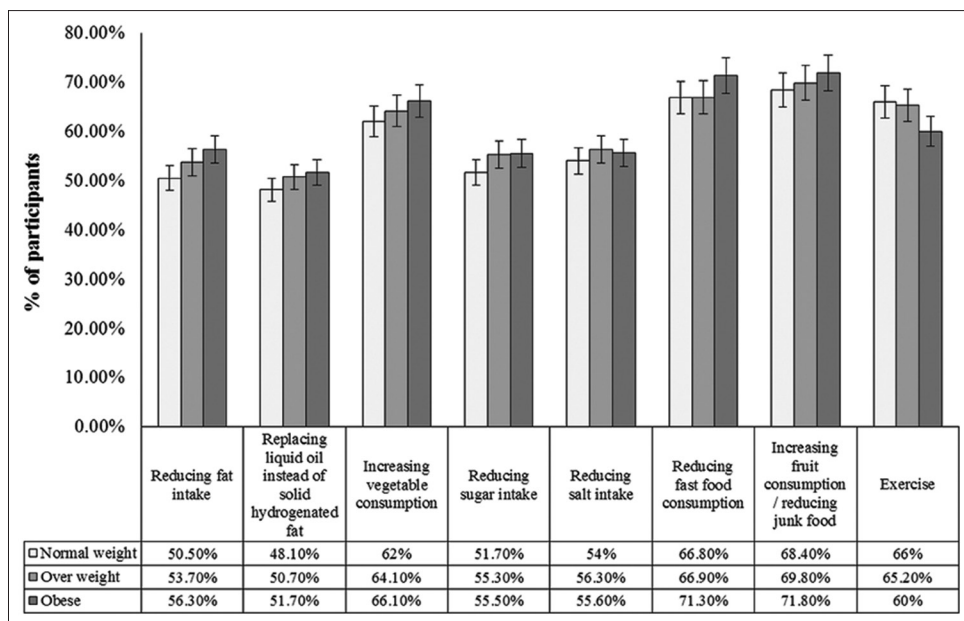


Figure 1: Frequency of changes in dietary behaviors according to weight status of participants: the CASPIAN-V study

Table 1: Association between independent variable and tendency to lose weight in the univariate model: the CASPIAN-V Study

		Tendency to lose weight		P
		Yes	No	
Age	7-12 years	35.8 (34.7, 36.8)	64.2 (63.1, 65.3)	<0.001*
	13-18 years	40.4 (39.2, 41.6)	59.6 (58.4, 60.8)	
Gender	Boys	36.5 (35.3, 37.6)	63.5 (62.4, 64.6)	<0.001*
	Girls	39.5 (38.3, 40.6)	60.5 (59.4, 61.7)	
Socio-economic status	Low	37.5 (36.1, 38.9)	62.6 (61.1, 63.9)	0.001*
	Moderate	35.4 (34.0, 36.8)	64.6 (63.2, 66.0)	
	High	40.9 (39.5, 42.4)	59.1 (57.6, 60.5)	
Physical activity	Low	32.1 (31.1, 33.1)	67.9 (66.9, 68.9)	0.001*
	High	46.6 (45.3, 47.9)	53.4 (52.1, 54.7)	
Screen time	< 2 h/day	37.6 (36.7, 38.4)	62.4 (61.6, 63.3)	0.002*
	≥ 2 h day	41.1 (39.0, 43.1)	58.9 (56.9, 61.0)	
Healthy diet	Low	37.8 (36.2, 39.3)	62.2 (60.7, 63.8)	<0.001*
	Moderate	51.5 (49.9, 53.1)	48.5 (46.9, 50.1)	
	High	32.4 (30.9, 34.0)	67.6 (66.0, 69.1)	
Unhealthy diet	Low	54.6 (53.0, 56.2)	45.4 (43.8, 47.0)	0.002*
	Moderate	31.8 (30.4, 33.3)	68.2 (66.7, 69.6)	
	High	35.8 (34.3, 37.4)	64.2 (65.7, 62.6)	
Skipped Breakfast	Non skipper	37.1 (36.3, 37.9)	62.9 (62.1, 63.7)	<0.001*
	Skipper	49.7 (46.5, 52.8)	50.3 (47.2, 53.5)	
Skipped Lunch	Non skipper	37.3 (36.5, 38.2)	62.7 (61.8, 63.5)	<0.001*
	Skipper	44.6 (41.3, 47.8)	55.4 (52.2, 58.7)	
Skipped Dinner	Non skipper	35.2 (34.4, 36.0)	64.8 (64.0, 65.6)	<0.001*
	Skipper	74.3 (71.7, 76.9)	25.7 (23.1, 28.3)	
Regular meal intake	Regular	27.9 (26.7, 29.0)	72.1 (71.0, 73.3)	<0.001*
	No regular	45.8 (44.7, 46.9)	54.2 (53.1, 55.3)	
Anxiety	Low	33.8 (32.8, 34.7)	66.2 (65.3, 67.2)	<0.001*
	High	49.2 (47.6, 50.7)	50.8 (49.3, 52.4)	
Psychosomatic health	Low	56.5 (55.0, 57.9)	43.5 (42.1, 45.0)	0.002*
	Moderate	35.3 (33.9, 36.7)	64.7 (63.3, 66.1)	
	High	23.2 (22.0, 24.2)	76.8 (75.6, 78.0)	
Weight status	Underweight	34.8 (32.8, 36.8)	65.2 (63.2, 67.2)	0.001*
	Normal weight	36.3 (35.3, 37.3)	63.7 (62.7, 64.7)	
	Overweight	43.4 (40.7, 46.0)	56.6 (54.0, 59.3)	
	Obese	47.4 (45.0, 49.9)	52.6 (50.1, 55.0)	

Data are presented as percent (95% CI). * $P < 0.05$ considered as statistically significant

of reducing dietary sugar was significantly higher than normal weight students (OR = 1.13, 95% CI: 1.005 to 1.27; $P < 0.05$). Other changes in dietary behaviors were not significantly different between overweight and normal weight students [Table 3].

Frequency of changes in diet behaviors according to the BMI of students is demonstrated in Figure 1. It shows that increasing physical activity for weight loss was significantly more frequent in normal weight than in obese students ($P < 0.05$). Except than reducing salt intake, all other changes in diet behaviors were significantly more frequent in obese than in normal weight students ($P < 0.05$). Reducing the frequency of fast food consumption for weight loss was significantly higher in obese than in overweight students (71.3% vs. 66.9%, respectively, $P < 0.05$) [Figure 1].

Discussion

This study shows that TLW was significantly higher in participants aged 13–18 years, and those with higher SES and higher anxiety level. Overweight and obese participants followed dietary changes more than attempts to increase their physical activity.

TLW was more frequent in overweight and obese students; this finding is in line with some previous studies.^[4,18,19]

We found that TLW was higher in girls than boys; it is consistent with some previous studies.^[18,20] It is shown that girls overestimate their weight more than boys,^[21,22] and most of adolescent girls felt that they should lose weight. On the other hand, some overweight boys reported

Table 2: Association between independent variable and tendency to lose weight in the multivariate logistic regression model: the CASPIAN-V Study

		Tendency to lose weight (No)/Yes	
		OR (95% CI)	P
Age	6-12 years	1	-
	13-18 years	1.12 (1.02, 1.23)	0.016*
Gender	Boys	1	-
	Girls	1.10 (1.00, 1.20)	0.057
Socio-economic status	Low	1	-
	Moderate	0.88 (0.79, 0.99)	0.05
	High	1.17 (1.04, 1.31)	0.007*
Physical activity	High	1	-
	Low	0.50 (0.45, 0.55)	<0.001*
Screen time	<2 h/day	1	-
	≥2 h day	1.09 (0.95, 1.26)	-
Healthy diet	Low	1	-
	Moderate	2.20 (1.95, 2.46)	<0.001*
	High	0.61 (0.54, 0.69)	<0.001*
Unhealthy diet	Low	1	-
	Moderate	0.35 (0.31, 0.40)	<0.001*
	High	0.39 (0.34, 0.44)	<0.001*
Skip Breakfast	Non skipper	1	-
	Skipper	1.39 (1.09, 1.77)	0.01*
Skip Lunch	Non skipper	1	-
	Skipper	0.68 (0.54, 0.86)	<0.001*
Skip Dinner	Non skipper	1	-
	Skipper	10.23 (8.10, 12.9)	<0.001*
Regular meal intake	No regular	1	-
	Regular	0.74 (0.67, 0.83)	<0.001*
Anxiety	Low	1	-
	High	1.43 (1.28, 1.59)	<0.001*
Psychosomatic health	Low	1	-
	Moderate	0.43 (0.39, 0.49)	<0.001*
	High	0.26 (0.23, 0.30)	<0.001*
Self-satisfaction	Yes	1	-
	No	1.21 (1.06, 1.38)	0.004*
Weight status	Normal weight	1	-
	Underweight	0.88 (0.77, 1.00)	0.06
	Overweight	1.27 (1.08, 1.50)	0.004*
	Obese	1.55 (1.33, 1.80)	<0.001*

*P<0.05 considered as statistically significant

tendency to gain weight, probably as a suggestion for increasing their strength.^[18]

In our study, older students had higher TLW; this finding is in line with some previous studies, which showed that TLW was more frequent in adolescents than in children because of higher exposure to obesity messages.^[4,21] One possible explanation for this finding might be the greater impact of social influence, cultural pressure about obesity, and more understanding and accountability of these adolescents. However, some studies revealed more complex association of TLW with age.^[4,21,23] For instance, the study by Al Sabbah *et al.* revealed that older

adolescences showed lower TLW in comparison to their younger counterparts.^[23]

In the current study, TLW was significantly more frequent in students with high SES status. Similarly, the study of Drewnowski *et al.* revealed that dieting, bingeing and vigorous exercise are less frequent in low SES families.^[24] This finding suggests the considerable effects of lifestyle habits on TLW. The reason for this finding could be higher awareness, more access to health facilities and the media, more health advices, as well as higher influence of their peers and families.

We found that students who were not satisfied with themselves showed more TLW than other students; also students with proper psychological health status had lower TLW than students with low psychological health status. These findings are consistent with some previous studies that reported lower self-satisfaction and self-esteem scores in adolescents thinking that they need to lose weight.^[25,26] Self-satisfaction along with body image are of the most important factors affecting TLW so that students who consider themselves as overweight and are not satisfied with their body shape, regardless of actual weight, have shown greater TLW.^[27,28] However, many studies showed that actual weight of individuals are associated with their weight loss behaviors, but their perception of their weight and themselves is the important predictor of weight control behaviors.^[21,29] Therefore, we have some overweight persons who perceive themselves as normal weight and do not try to take part in any weight control behaviors and in the other hand we have some normal weight individuals who perceive themselves as overweight and therefore perform weight loss behaviors, mostly in unhealthy ways such as strict diets and skipping meals.^[4] It seems that increasing awareness about medical definitions of being overweight could lead to higher accuracy of weight perceptions and therefore results in healthier lifestyle and weight-related behaviors.^[30]

In our study, TLW was not frequent in students with healthy diet. This can be because of their healthy lifestyle and appropriate weight status. Conversely, in those with unhealthy diet or irregular meals intake or those who skipped breakfast and dinner, TLW was more frequent. It could be due to their unhealthy lifestyle and habits, resulting in higher weights.^[31]

In the present study, using diet for weight loss was more common among obese students than their normal weight peers, and increasing physical activity was less common. Similarly, a study on 8,330 school students revealed that overweight adolescents were less likely to use healthy weight management strategies and were more likely to be on dieting and using unhealthy weight control behaviors than their counterparts.^[32] Moreover, it is reported that some adolescents, especially obese girls, follow improper ways for weight reduction including severe diet restriction; using food substitutes; skipping meals; using laxatives, diuretics,

Table 3: Association of weight status with weight loss behaviors and change in diet behaviors: the CASPIAN-V study

	Total %	Normal	Overweight		Obese	
			Crude OR (95% CI)	Adjusted OR (95% CI)	Crude OR (95% CI)	Adjusted OR (95% CI)
Weight loss behaviors						
Physical activity	64.7%	1	0.97 (0.81, 1.17)	0.99 (0.81, 1.20)	0.78 (0.66, 0.92)*	0.78 (0.66, 0.93)*
Diet	24.2%	1	1.16 (0.95, 1.43)	1.12 (0.90, 1.39)	1.36 (1.13, 1.62)*	1.32 (1.10, 1.59)*
Medications/supplements	4.4%	1	0.65 (0.39, 1.07)	0.69 (0.41, 1.18)	0.86 (0.57, 1.28)	0.85 (0.55, 1.32)
Others	6.8%	1	0.91 (0.61, 1.33)	0.91 (0.62, 1.35)	1.09 (0.80, 1.50)	1.15 (0.83, 1.60)
Changes in diet behaviors						
Reducing fat intake	51.3%	1	1.14 (1.01, 1.28)*	1.12 (1.00, 1.27)	1.26 (1.14, 1.41)*	1.31 (1.17, 1.46)*
Replacing liquid oil instead of solid hydrogenated fat	48.7%	1	1.11 (0.99, 1.25)	1.10 (0.98, 1.24)	1.16 (1.04, 1.29)*	1.16 (1.04, 1.30)*
Increasing vegetable consumption	62.7%	1	1.10 (0.97, 1.24)	1.07 (0.95, 1.22)	1.20 (1.07, 1.34)*	1.21 (1.08, 1.36)*
Reducing sugar intake	52.7%	1	1.15 (1.03, 1.30)*	1.13 (1.005, 1.27)*	1.17 (1.05, 1.30)*	1.17 (1.05, 1.31)*
Reducing salt intake	54.6%	1	1.10 (0.98, 1.23)	1.09 (0.95, 1.23)	1.07 (0.96, 1.19)	1.08 (0.97, 1.21)
Reducing fast food consumption	67.2%	1	1.01 (0.89, 1.14)	0.99 (0.88, 1.13)	1.23 (1.10, 1.39)*	1.25 (1.11, 1.42)*
Increasing fruit consumption/ reducing junk food	68.7%	1	1.07 (0.94, 1.21)	1.06 (0.93, 1.21)	1.17 (1.04, 1.32)*	1.20 (1.06, 1.35)*

Model adjusted for gender, age, living area, SES, and mothers' education. *Odds ratio (OR) are statically significant

or weight loss medication; or inducing vomiting.^[33] It is shown that obese individuals believe in lower effectiveness of physical activity in comparison to non-obese persons.^[34] One possible explanation for these findings might be their high based expectations and low self-efficacy, which are two important factors for interpreting the effectiveness of weight reduction plans.^[35] Moreover, it is shown that children and adolescents who decide to lose weight because of teasing and mockery are more likely to use unhealthy ways such as dieting, which are associated with future eating disorders.^[4,36] Because of increasing prevalence of obesity, more and more children and adolescents would engage in unhealthy behaviors, in struggle to achieve a healthy weight. Thus, directing them toward reducing sedentary behaviors and promoting more active lifestyle becomes necessary.^[37]

We found that reduced dietary fat/fast food and increased dietary vegetable and fruits for weight loss were more common in families with obese children compare to the families with normal weight children. However, no differences were observed between overweight and normal weight students. One possible cause could be the parents' perception of their children weight. Studies reported that parents usually underestimate their child weight.^[38,39] At this age, parents' perception of their child is one of the most important factors for implementing weight loss behaviors, because they can provide opportunities for their child to lose weight.^[19,40] Moreover, parents can provide encouragement/punishment system for reinforcing healthy weight change behaviors.^[41,42]

Study limitations and strengths: The cross-sectional design of this study is its major limitation. The main strengths are its novelty in the region and studying a large national sample of pediatric population.

Conclusions

Some factors such as gender, age, lifestyle habits, anxiety, and psychological health were associated with tendency to lose weight. Using diet for lose weight was more common among obese children and adolescents. Obese students were less likely to increase physical activity for weight loss. Lifestyle change in terms of healthy eating and increasing physical activity should be encouraged in children and adolescents with excess weight.

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Conflicts of interest

There are no conflicts of interest.

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