Dietary Habits and Health Related Behaviors in Iranian Children and Adolescents: The CASPIAN- IV Study

Fatemeh Azizi-Soleiman [1], Mohammad Esmaeel Motlagh [2], *Mostafa Qorbani [3, 4], Ramin Heshmat [4], Gelayol Ardalan[1], Morteza Mansourian[5], *Roya Kelishadi[1]

[1]Pediatrics Department, Child Growth and Development Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. [2] Pediatrics Departments, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. [3]Dietary Supplements and Probiotics Research Center, Alborz University of Medical Sciences, Karaj, Iran. [4]Epidemiology Department, Chronic Diseases Research Center, Endocrinology and Metabolism Population Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran. [5]Department of Health Education and Promotion, School of health, Iran University of Medical Sciences, Tehran, Iran.

Abstract

Background: Obesity has a growing global epidemic with several risk factors including lifestyle habits, physical activity, and prolonged screen time. This study aimed to compare the dietary habits and self-reported health behaviors in a nationally representative sample of Iranian children and adolescents.

Materials and Methods: This cross sectional nationwide study was conducted in the framework of the fourth survey of a national school-based surveillance program, entitled Childhood and Adolescence Surveillance and Prevention of Adult Non-communicable disease (CASPIAN-IV) Study. Participants were 14,880 students aged 6-18 years from 30 provinces in Iran. The World Health Organization-Global Student Health Survey questionnaire was utilized to assess their relationship with peers, body image, dietary, life-style and smoking habits, physical activity, and violence behaviors. Apart from the questionnaire, additional information on dietary habits was obtained as well. The Chi-square test and the student t-test were used to compare the groups.

Results: Boys had higher proportions of obesity (P<0.05). The prevalence of overweight and obesity decreased with age. Intake of refined bread (NS), non-hydrogenated oils (P<0.001), and low fat dairies (P<0.05) predominated in all three BMI categories. Meal skipping was less prevalent compared to planned meals, but there was an increasing trend according to BMI. All three BMI categories, were watching TV more than 2 hours per day (P<0.05). Depression and fighting were more prevalent in overweight and obese individuals, respectively.

Conclusion: Unhealthy food intake and dietary habits were prevalent in all BMI categories, while poor health related behaviors were more seen in children with higher weight.

Key Words: Adolescent, Child, Food habits, Obesity, Overweight.

Corresponding Authors:

Mostafa Qorbani and Roya Kelishadi, School of Medicine, Alborz University of Medical Sciences, Baghestan Blvd, 31485/56, Karaj, Iran & Research Institute for Primordial Prevention of Non-communicable Disease, Isfahan University of Medical Sciences, Hezar-Jarib Ave, Isfahan, Iran.

Email: mqorbani1379@yahoo.com and kelishadi@med.mui.ac.ir

1- INTRODUCTION

Prevalence of childhood obesity has been growing universally and is considered a major pediatrics health problem in most countries (1). In 2013, it was estimated that over 42 million of children under the age of five are overweight, with 31 million of them being from developing countries (2). From 1990 to 2010, overweight in children had a 2.5% increase at a global level (3). Previous systematic review studies on prevalence of obesity in different parts of Iran showed that prevalence of obesity has been growing in Iran (4, 5).

Childhood obesity leads to a lot of health conditions, as in adults, which influence different body organs; moreover it increases the risk of obesity and mortality in adulthood (6-10). Lifestyle factors, notably dietary habits and physical activity, are the main determinants of obesity (11, 12). Skipping breakfast, physical inactivity, long hours of screen time are associated with obesity (13-15).

Nowadays, most children spend a large part of their leisure time on screen use, and consequently consume unhealthy junk foods (16). However, obese children are more likely to be non-snackers, and to have shorter sleep duration (17). It has been reported that dietary habits like meal frequency, consumption of sugar, French fries, and carbonated beverages are positively associated with percent body fat (18). Obesity seems to threaten health related quality of life. It not only increases the risk of chronic diseases like diabetes, cardiovascular diseases, and hyperlipidemia (10), but also has some adverse effects on self-esteem, self-confidence, and body image (19). People with higher adiposity express body size dissatisfaction (20); this feeling can result in eating disorders, depression, social anxiety, and poor self-esteem (21). Risk behaviors such as smoking, alcohol use, depressive symptoms, fighting, decreased levels of optimism, and spirituality may progress in obese children and adolescents (22). It has also shown that inappropriate body image is related to bullying victimization (23, 24). Similar to many other developing countries, Iran experienced an escalating trend of childhood obesity (25). As weight management in obese/overweight children and adolescents is dependent on efficient lifestyle modifications (26), focusing on dietary habits, social and emotional factors among children and adolescents based on body weight status is a key starting point. The present study designed to compare dietary habits and self-related quality of health in a nationally representative sample of Iranian children and adolescents in three BMI categories (normal, overweigh, and obese participants).

2- MATERIALS AND METHODS

2-1. Design and population

This nationwide cross-sectional study was conducted in the framework of the fourth survey of a national school-based surveillance program entitled Childhood and Adolescence Surveillance and PreventIon of Adult Non-communicable disease (CASPIAN-IV) Study.

2-2. Methods

This survey was conducted in 2011-2012 among 14,880 students aged 6-18 years and one of their parents living in urban and rural areas of 30 provinces in Iran. Detailed methodology of the study has been reported elsewhere (27), and herein we describe it in brief.

Multistage cluster sampling method was used for sample selection. Stratification was performed in each province based on the residence area (urban/rural) and school grade (elementary/ intermediate/high school). The sampling was proportional to size with equal sex ratio. Clusters were determined at the level of schools, including 10 sample units in each cluster.

The overall number of students was 14,880 (480 subjects in each province).

2-3. Measuring tools

A questionnaire, which included questions about the relationship with peers (5-question), body image (1- question), and psychosocial environment of school (5-question), dietary habits (including questions about meals intake and type of selected foods,14- question), lifestyle habits (5- question), physical activity pattern (4- question), as well as psychosocial relations with family 4-question), was obtained from the global school-based health survey (GSHS) and translated to Persian (28). Additional dietary information was collected using another questionnaire consisted of a list of selected food items to evaluate frequency of consumption. The validity and reliability of questionnaires has been assessed previously (29). By virtue of face validity, questions got a score of more than 0.75. Cronbach's alpha coefficient of the whole questionnaires was 0.97 and the Pearson correlation coefficient of the test-retest phase was 0.94, which confirmed the reliability of questionnaires. Weight was measured to the nearest 0.1 with light clothing and height was measured without shoes to the nearest 0.1 cm (30). Waist circumference was measured using a non-elastic tape at a point midway between the lower border of the rib cage and the iliac crest at the end of normal expiration to the nearest 0.1 cm. Hip circumference was measured at the widest part of the hip at the level of the greater trochanter to the nearest 0.1 cm (31). Abdominal obesity was defined as waist-to-height ratio of more than 0.5 (32). Blood pressure was measured in the sitting position on the right arm using a mercury sphygmomanometer with an appropriate cuff size. It was measured two times at 5-min intervals and the average was registered (33). All measurements were performed by expert and trained health care providers. We considered international cut off points of Body mass index (BMI) for adolescents. Overweight subjects were classified as BMI between 85th and 95th percentiles, and obesity was considered as BMI greater than the 95th percentile for age and gender. (34, 35).

2-4. Ethical considerations

Study protocols were approved by ethical committee of Isfahan and Tehran University of Medical Sciences and other relevant national regulatory organizations and written informed consent and verbal consent was obtained from participants

2-5. Statistical analysis

Data were analyzed by using survey data analysis methods in the StataCorp. 2011 (Stata Statistical Software: Release 12. College Station, TX: StataCorp LP). The mean and 95% Confidence Intervals (CI) of age and anthropometric measures and percent and 95% CI of health behaviors, and lifestyle and dietary factors were calculated based on the BMI categories. Differences across the BMI categories were assessed using Chi- square test and Student t-test for categorical and continuous data, respectively. P-value less than 0.05 were considered to be statistically significant.

3- RESULTS

3-1. Baseline characteristics

The population of this survey consisted of 11,701 children and adolescents out of 14,880 invited students (participation rate of 90.6%) and one of their parents. Students consisted of 5,823 (49.76%) girls and 5,878 (50.24%) boys; 76.5% from urban and 23.5% from rural areas. They had a mean age of 12.5 years (95% CI: 12.3 - 12.6).

Table.1, presents the characteristics of the participants, including their anthropometric measures and blood pressure according to BMI categories.

Boys had higher proportions of obesity (P<0.001). The prevalence of overweight and obesity decreased with age. Overweight was more frequent in urban than in rural inhabitants. Mean values of waist circumference (WC), hip circumference (HC), waist to hip ratio (WHR), systolic blood pressure (SBP) and diastolic blood pressure (DBP) increased with increasing weight.

3-2. Dietary intake

Dietary habits of participants with different weight status are presented in **Table.2**. Intake of refined bread (NS), non-hydrogenated oils (P<0.001), and low fat dairies (P=0.002) predominated in all three BMI categories. Non-daily intake of all selected food items was seen more than daily intake in all groups, except for fruits (sweets, fruits, and vegetables consumption were the only significant items, P=0.032, P=<0.001, and P=<0.001, respectively).

3-3. Health-related behaviors

Table.3 presents the differences in health-related factors among participants with different BMI status. 44.77% of overweight children and adolescents considered themselves normal. Meal skipping was less prevalent compared to planned meals, but there was an increasing trend according to BMI. All BMI groups watched TV more than 2 hours per day (P<0.001). Depression and fighting were more prevalent in overweight and obese individuals, respectively. No significant difference was observed in other health-related behaviors such as smoking, number of close friends, bullying, victimization, and anxiety.

Table-1: Baseline characteristics of participants by BMI status: the CASPIAN-IV Study				
	Normal weight (N = 8830)	Overweight (N = 1287)	Obese (N = 1587)	P-value
Gender				
Boys	4333 (49.07)	627 (48.72)	918 (57.95)	0.001
Girls	4497 (50.93)	660 (51.28)	666 (42.05)	
Age				
6-10 y	2940 (33.3)	322 (25.02)	495 (31.25)	0.001
11-14.9y	2836 (32.12)	487 (37.84)	637 (40.21)	
15-18y	3054 (34.59)	478 (37.14)	452 (28.54)	
Residency				
Urban	6542 (74.09)	1078 (83.76)	1331 (84.03)	0.001
Rural	2288 (25.91)	209 (16.24)	253 (15.97)	
Weight (kg)	39.96(39.22-40.70)	52.89(51.72-54.07)	59.66(58.09-61.23)	0.001
Height (cm)	146.77(145.82-147.72)	151.12(149.95-152.29)	148.0(146.41-149.60)	0.001
BMI (kg/m^2)	17.82(17.70-17.94)	22.42(22.22-22.63)	26.40(26.08-26.73)	0.001
WC (cm)	64.91(64.4-65.33)	74.60(73.87-75.32)	80.55(79.39-81.71)	0.001
HC (cm)	79.13(78.47-79.79)	88.55(87.62-89.48)	92.37(91.10-93.64)	0.001
WHtR	0.187(0.185-0.188)	0.180(0.178-0.182)	0.180(0.178-0.182)	0.001
WHR	0.82(0.825-0.834)	0.84(0.842-0.854)	0.87(0.872-0.886)	0.001
SBP (mmHg)	100.83(100.30-101.35)	104.95(104.10-105.81)	106.70(105.75-107.66)	0.001
DBP (mmHg)	64.41(63.97-64.85)	67.12(66.39-67.84)	67.93(67.13-68.72)	0.001
Data are expressed as n (%) or as the mean and 95% confidence intervals.				

Table- 2: Differences in dietary habits among participants with different weight status: the CASPIAN-IV Study

	Normal weight (N = 8830)	Overweight (N = 1287)	Obese (N = 1587)	P-value
Bread				
Whole grain	36.68(35.07-38.32)	38.68 (35.81-41.63)	37.17 (34.31,40.13)	0.423
Refined	63.32 (61.68-64.93)	61.32 (58.37-64.19)	62.83 (59.87-65.69)	
Oils				
Non-hydrogenated	56.7 (55.23-58.15)	63.71(60.84-66.49)	66.62(64.05-69.11)	0.001
Hydrogenated	43.3 (41.85-44.77)	36.29 (33.51-39.16)	33.38 (30.89-35.95)	
Dairy				
Low fat	72.69 (71.34-74)	76.25 (73.76-78.58)	75.91 (73.59-78.09)	0.002
Full fat	27.31 (26-28.66)	23.75 (21.42-26.24)	24.09 (21.91-26.41)	
Potato				
Daily	19.15 (18.08-20.26)	18.52 (16.3-20.95)	17.32 (15.37-19.46)	0.25
Non-daily	80.85 (79.74-81.92)	81.48 (79.05-83.7)	82.68 (80.54-84.63)	
Sweets				
Daily	41.69 (40.31-43.09)	40.67 (37.87-43.54)	38.05 (35.47-40.69)	0.032
Non-daily	58.31 (56.91-59.69)	59.33 (56.46-62.13)	61.95 (59.31-64.53)	
Salty snacks				
Daily	15.76 (14.82-16.75)	13.38 (11.56-15.44)	14.55 (12.72-16.6)	0.07
Non-daily	84.24 (83.25-85.18)	86.62 (84.56-88.44)	85.45 (83.4-87.28)	
Sweetened beverages				
Daily	7.72 (7.12-8.37)	6.43 (5.2-7.93)	7.73 (6.42-9.28)	0.263
Non-daily	92.27 (91.62-92.88)	93.57 (92.07-94.8)	92.27 (90.72-93.58)	
Fast food				
Daily	2.20 (1.89-2.57)	2.58 (1.82-3.65)	1.97 (1.35-2.87)	0.555
Non-daily	97.79 (97.42-98.11)	97.41 (96.34-98.17)	98.02 [97.13-98.65]	
Fruits				
Daily	54.62 (53.2-56.04)	57.97 (55.05-60.83)	61.53 (58.93-64.07)	0.001
Non-daily	45.38 (43.96-46.8)	42.03 (39.17-44.95)	38.47 (35.93-41.07)	
Vegetables				
Daily	44.65 (43.3-46.01)	47.5 (44.6-50.43)	49.52 (46.94-52.11)	0.001
Non-daily	55.35 (53.99-56.7)	52.5 (49.57-55.4)	50.48 (47.89-53.06)	
Fried foods				
Daily	19.49 (18.52-20.51)	19.13 (16.96-21.5)	20.23 (18.14-22.49)	0.748
Non-daily	80.51 (79.49-81.48)	80.87 (78.5-83.04)	79.77 (77.51-81.86)	
Data are expressed as percent and 95% confidence intervals.				

Table-3: Differences in health-related behaviors among the participants with different weight status: the CASPIAN-IV Study

	Normal weight (N = 8830)	Overweight (N = 1287)	Obese (N = 1587)	P-value
Number of close friends				
≤2	59.34 (58.06-60.61)	60.99 (58.18-63.72)	58.35 (55.67-60.98)	0.38
≥3	40.66 (39.39-41.94)	39.01 (36.28-41.82)	41.65 (39.02-44.33)	
Body image				
Thin	36.17 (34.97-37.38)	11.25 (9.49-13.28)	7.995 (6.50-9.79)	
Normal	53.53 (52.31-54.75)	44.77 (42.02-47.54)	26.02 (23.8-28.36)	0.001
Fat	10.31 (9.61-11.04)	43.98 (41.08-46.93)	65.99 (63.19-68.68)	
Breakfast consumers	68.62 (67.34-69.87)	64.53 (61.68-67.27)	62.11 (59.53-64.63)	0.001
Breakfast skippers	31.38 (30.13-32.66)	35.47 (32.73-38.32)	37.89 (35.37-40.47)	
Lunch consumers	91.45 (90.65-92.19)	90.59 (88.79-92.13)	89.22 (87.39-90.81)	0.017
Lunch skippers	8.55 (7.80-9.35)	9.407 (7.86-11.21)	10.78 (9.18-12.61)	
Dinner consumers	90.59 (89.79-91.33)	84.87 (82.66-86.84)	80.74 (78.46-82.83)	0.001
Dinner skippers	9.412 (8.67-10.21)	15.13 (13.16-17.34)	19.26 (17.17-21.54)	
Physical activity				
Mild	34.06 (32.48-35.68)	34.15 (31.24,37.18)	35.23 (32.53-38.03)	
Moderate	36.6 (35.31-37.9)	38 (35.23-40.85)	36.25 (33.76-38.82)	0.724
Severe	29.34 (27.86-30.87)	27.85 (25.15-30.72)	28.52 (26.04-31.13)	
Watching TV				
≤2 h	49.95 (48.62-51.28)	46.11 (43.25-48.98)	44.36 (41.52-47.23)	
>2 h	50.05 (48.72-51.38)	53.89 (51.02-56.75)	55.64 (52.77-58.48)	
Smoking				
Yes	2.61 (2.21,3.09)	2.56 (1.80-3.63)	2.652 (1.88-3.72)	0.99
No	97.38 (96.91-97.79)	97.44 (96.37-98.2)	97.35 (96.28-98.12)	
Fighting				
Yes	39.37 (37.98-40.77)	39.09 (36.25-42)	43.2 (40.51-45.93)	0.016
No	60.63 (59.23-62.02)	60.91 (58-63.75)	56.8 (54.07-59.49)	
Bullying				
Yes	17.43 (16.48-18.43)	17.7 (15.64-19.97)	19.73 (17.72-21.91)	0.096
No	82.57 (81.57-83.52)	82.3 (80.03-84.36)	80.27 (78.09-82.28)	
Victimization				
Yes	27.38 (26.2-28.6)	25.72 (23.26-28.35)	29.6 (27.14-32.18)	0.078
No	72.62 (71.4-73.8)	74.28 (71.65-76.74)	70.4 (67.82-72.86)	
Depression				
Yes	20.47 (19.36-21.61)	23.33 (21-25.83)	22.32 (20.16-24.64)	0.031
No	79.53 (78.39-80.64)	76.67 (74.17-79)	77.68 (75.36-79.84)	
Anxiety				
Yes	25.24 (23.99-26.52)	26.75(24.27-29.37)	26.57 (24.29-28.99)	0.339
No	74.76 (73.48-76.01)	73.25 (70.63-75.73)	73.43 (71.01-75.71)	
Data are expressed as percent and 95% confidence intervals.				

4- DISCUSSION

The present study showed some differences in dietary habits and health-related behaviors among children and adolescents aged 6-18 years in different BMI categories. Non-daily intake of healthy and junk foods was prevalent in all participants, regardless of BMI class. Overweight and obesity were more likely to be related to meal skipping and spending more time on watching TV.

In the present study, we interestingly found that overweight and obese children consumed more non-hydrogenated oils and low fat dairies compared to the normal-weight ones. It has shown that overfat adolescent boys had lower intake of fast food, soft drinks, and chocolate (36). This can be related to reverse causation as overweight/obese children may adopt healthy food habits to prevent gaining more weight.

In our study, even irregular intake of junk foods was associated with a higher probability of being overweight or obese. This finding is in line with some other studies demonstrated that overweight/obese children were more likely to consume unhealthy snacks (37, 38). Hunger, temptation, and emotional eating are reported among the main reasons of eating unhealthy snacks (39).

Overweight/obese children's daily fruits intake was more than their normal weight counterparts. In the case of vegetables, it was lower. Usually, normal weight children eat more vegetables and fruits (40) and the consumption of vegetables has negative relationship with body weight (41). A systematic review showed that increased fruits/vegetables intake along with other behaviors resulted in reduced adiposity in overweight/obese adults (42). Since our overweight and obese participants typically ate fewer vegetables than fruits, this may be interpreted as their preferences for fruits.

The current study showed that meal skipping as a risk factor for higher BMI. Increased meal frequency has an inverse association with childhood obesity (43, 44), and is related to improved body weight, BMI, and WC in healthy weight children and adolescents. The most important meal, which is skipped by overweight/obese children, is breakfast (45-47). Dubois found that diet quality of preschool children who skipped breakfast, was lower compared to non-skippers (48). Breakfast skipping is more prevalent in overweight and obese adults and is associated with a lower dietary quality score (49). Lacks of inclination or time for eating breakfast are mentioned as main reasons. Snacking and weight control may also prevent children from eating lunch and dinner, respectively (50).

The American Academy of Pediatrics has recommended two hours limit of screen time (51), because long screen time has many adverse health effects such as higher blood pressure and psychological distress in children and adolescents (52, 53). The adverse effects of watching TV is attributed to inactivity and snacking on empty calorie foods because of commercials. In our study, all children watched television more than two hours per day, which is consistent with some others studies (46). A cohort study demonstrated this sedentary behavior can result in overweight, poor cardiopulmonary fitness, hypercholesterolemia, and cigarette smoking in early adulthood (54).

We previously showed that bodyweight had no relationship with anxiety and depression in adolescents (55); however, in the present study, only depression was prevalent in overweight/obese children. The relationship between obesity and depression in childhood and adolescence was revealed in a recent systematic review (56). The authors mentioned perceived stigmatization, bullying and victimization,

and reduced self-esteem as effective mediators. Unfortunately, we failed to show any significant differences in bullying and victimization among three BMI classes. We only found higher frequency of fighting in overweight and obese participants. A previous study documented a significant relationship between adiposity and weapon carrying in male children and adolescents. As these children face more physical and relational bullying, they may involve in violence as a coping strategy (57) or it can be described by the feeling of strength and attractiveness (58). On the other side, other researchers have found a relationship between being bullied and weight-related victimization and adiposity (59, 60). Obese children are mostly victimized verbally because of their low self-esteem and physical appearance (17, 61).

4-1. Limitations of the study

This study has some limitations. The cross-sectional nature of the data makes it difficult to show sequence of causal relationship between adiposity, dietary intake, and health-related behaviors. Self-report of data by parents raises the probability of under-reporting. The strengths of the present study are its nationwide coverage with large sample size providing a nationally representative sample of the general pediatric population in Iran, high participation rate, and novelty in the Middle Eastern region.

5. CONCLUSION

In this cross-sectional study on 13,325 children and adolescents, differences in dietary habits and health-related behaviors among different BMI categories were observed. Overweight and obese children and adolescents were more likely to show meal skipping and spending more time on watching TV. Our findings highlight a considerable need to address nutrition and lifestyle related factors in children and

adolescents to improve control overweight and obesity.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGEMENT

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