

Differences in Adolescents' Dietary Behaviors at School by Gender and Obesity Status: a Cross-Sectional Study

Gülcan Arusoğlu¹, PhD; Pınar Sökülmez Kaya², PhD; Gökçe Ünal^{2*}, PhD; Şeyma Kalkuz¹, MSc

¹Department of Nutrition and Dietetics, Faculty of Health Sciences, Kırklareli University, Kırklareli, Turkey

²Department of Nutrition and Dietetics, Faculty of Health Sciences, Ondokuz Mayıs University, Samsun, Turkey

*Corresponding author: Gökçe Ünal, PhD; Kurupelit Campus, 55200, Atakum, Samsun, Turkey. Tel: +362 3121919/6392; Email: gokce.unal@omu.edu.tr, gokce_unal@yahoo.com.tr

Received January 22, 2022; Revised February 12, 2022; Accepted March 02, 2022

Abstract

Background: Unhealthy dietary behaviors are suggested among the factors leading to obesity in adolescents. Adolescents tend to consume unhealthy food at school. However, whether these habits differ by gender is not known. The present study aimed to evaluate gender differences in adolescents' dietary behaviors at school and to determine the relationship between these behaviors and abdominal obesity by gender.

Methods: This cross-sectional study was conducted on 1020 fifth-eighth grader students (502 boys and 518 girls) in Kırklareli, Turkey, between November 2019 and December 2019. Dietary behaviors and anthropometric measurements were obtained. Descriptive statistics were shown as numbers and percentages. Chi-Square test was used to compare the classified data. Statistical significance was evaluated at $P < 0.05$.

Results: Among these students, 40.8% of the boys and 22.0% of the girls had abdominal obesity ($P < 0.001$). The daily breakfast consumption of the boys was higher than that of the girls ($P = 0.038$). Snack consumption in school was higher in the girls ($P = 0.002$). Moreover, carrying a lunchbox to school ($P < 0.001$) and shopping from the school canteen ($P = 0.042$) were more frequent in the girls. Between meals, the consumption of bagel/pastry ($P = 0.031$), plain mineral water/light beverages ($P = 0.037$), and carbonated beverages ($P < 0.001$) was higher in the boys. Meanwhile nuts ($P = 0.022$) and fruit/fresh fruit juice consumption was higher in the girls ($P < 0.001$). The girls preferred biscuits/cakes ($P = 0.032$) and candy ($P = 0.001$), whereas the boys preferred sandwiches ($P = 0.008$) at a higher rate when shopping at the canteen. Consumption of the three main meals was lower in the boys with obesity ($P = 0.008$). Daily breakfast consumption was lower in the girls with obesity ($P = 0.015$).

Conclusions: This study suggested that girls tend to consume unhealthy foods in the canteen and boys tend to consume unhealthy beverages between meals. Furthermore, skipping meals was found to contribute to obesity in adolescents.

Keywords: Adolescent, Diet, Gender, Obesity, Schools

How to Cite: Arusoğlu G, Sökülmez Kaya P, Ünal G, Kalkuz Ş. Differences in Adolescents' Dietary Behaviors at School by Gender and Obesity Status: a Cross-Sectional Study. Int. J. School. Health. 2022;9(2):123-131. doi: 10.30476/INTJSH.2022.95618.1235.

Introduction

The prevalence of obesity among children and adolescents over the recent years has significantly increased and turned into a health burden. Obesity at younger ages, which has been reported to likely continue in older ages and throughout life, necessitates preventive strategies in young people (1). Health-related behaviors, such as nutrition and physical activity, acquired in adolescence were shown to continue through adulthood; therefore, investigation of the factors related to health behaviors in this period is of great importance (2).

Individual and socioeconomic characteristics were suggested as multidimensional factors contributing to obesity in children and adolescents (3). Since adolescents have to be in many different places during a day, especially at school and home, it should be suggested that their diet could vary by location during

the day. It was also indicated that adolescents mostly preferred unhealthy foods during the time they spend outside home and consumed sugary and salty foods most frequently at school (4).

Consumption of unhealthy foods was reported to be high in adolescents. Additionally, healthy food consumption and diet quality were shown to be higher in boys than in girls (5, 6). Unhealthy dietary behaviors, such as skipping main meals, including breakfast, and frequent consumption of sugary foods and beverages were suggested among the factors leading to obesity in adolescents (7).

Abdominal obesity, an important clinical and public health problem, was strongly associated with metabolic risk factors (8). Insufficient consumption of milk, vegetables, and fruits, and skipping breakfast were considered to be dietary factors that increase the risk of abdominal obesity (9-11).

It would be useful to investigate the differences in dietary behaviors at school by gender to develop solutions for the target group. Accordingly, this study aimed to evaluate gender differences in adolescents' dietary behaviors at school. This work also sought to determine the relationship between these behaviors and abdominal obesity by gender.

Methods

Design and Participants

This cross-sectional study was conducted in secondary schools (fifth-eighth grade) in the city center of Kırklareli, Turkey, between November 2019 and December 2019. The sample of the study consisted of fifth-eighth grade students in the secondary schools of middle and upper socioeconomic level located in the city center of Kırklareli. The participants of the study volunteered to take part. The sample size calculation of the study was made with the G-power 3.1 program. The sample size was calculated using the difference between the amounts (mean and standard deviation values) of the energy-dense snacks consumption by gender, which was found to be statistically significant in male and female adolescents, according to the data obtained from the study of Rathi and colleagues (12). In the sample size calculation, the mean values were taken as 5.68 and 7.31 for female and male adolescents, respectively, while the pooled standard deviation was 7.17. According to the power analysis using these values, the minimum sample size was determined as 842 (421 adolescents from both genders) with a power of 0.95 and a significance level of 0.05. However, a total of 1033 students were recruited, 13 of whom were excluded due to inaccurate and missing data. Eventually, 1020 students were included in the study. The Ethics Committee of the Non-Interventional Non-Pharmaceutical Clinical Research of the Institute of Health Sciences of Kırklareli University approved the present research in October 23th, 2019. The participants and their parents gave their informed written consent for the study and approved the protocol.

Procedure

Study data were collected via face-to-face questionnaire method. The students were asked about descriptive information, dietary behaviors were questioned, and anthropometric measurements were obtained.

Instruments

- Descriptive Information

In this section, gender, age, and presence of any disease prescribed by the doctor were questioned.

- Dietary Behaviors

The number of main meals, breakfast consumption, dietary behaviors at school (main meals and snacks, carrying a lunch box, shopping from the canteen), preferred foods/beverages between meals (bagel/pastry, cake/biscuit/cookie, candy/chocolate/wafer, fruit/fresh fruit juices, milk/yogurt/buttermilk, nuts, chips, instant soup, sandwich/toast/patty, plain mineral water/light beverages, herbal teas, carbonated beverages, ready-made juices, coffee), as well as the preferred food/beverages bought from the canteen (biscuit/cake, ready-made juices, candy, sandwich, buttermilk, chips) were asked in this section.

- Anthropometric Measurements

Anthropometric measurements (body weight, height, waist circumference) of the students were done. Body weight was measured using a weighing instrument sensitive to 0.1 kg. A stadiometer sensitive to 0.1 cm was used for the height measurement. BMI (Body Mass Index) was calculated utilizing body weight and height. Body mass index values were evaluated according to the BMI-for-age z-scores determined by the World Health Organization for the age range of 5-19. Accordingly; the values were classified as: $\leq +1SD$ "non-overweight/obese", $> +1SD - \leq +2SD$ "overweight", $> +2SD$ as "obese" (13).

Waist circumference was measured at the mid-axillary line parallel to the floor, at the midpoint between the upper part of the iliac bone and the lower edge of the last palpable rib, using a non-stretch measure (14). In the study, abdominal obesity was defined as a waist-to-height ratio of ≥ 0.50 (15). It was recommended by Ashwell and Hsieh to use the waist-to-height ratio to determine obesity and the associated risk factors in different populations (16).

Data Analysis

The analysis of the data was performed in the Statistical Package for the Social Sciences (SPSS) program. Descriptive statistics were shown as numbers and percentages. Chi-Square test was used to compare the classified data. Statistical significance was evaluated at $P < 0.05$.

Results

A total of 1020 students (502 boys, 518 girls) aged between 11-14 years participated in the study. The majority of them (86.7% of the boys and 88.2% of the girls) stated not having diseases. Among these students, 40.8% of the boys and 22.0% of the girls had abdominal obesity ($P<0.001$). Most of them (57.0% of the boys, 69.9% of the girls) were non-overweight/obese while 24.3% of the boys and 20.1% of the girls were overweight and 18.7% of the boys and 10.0% of the girls were obese according to the BMI classification ($P<0.001$; Table 1).

Table 2 represents the dietary behaviors by gender. The rate of eating three main meals a day was found to be similar for the boys and girls (82.1% and 83.4% respectively; $P=0.575$). Daily breakfast consumption among the boys (73.3%) was higher than that of the girls (67.4%) ($P=0.038$). While the rate of main meal consumption at school was similar (35.5% for the boys, 32.0% for the girls; $P=0.249$), it was observed that a bigger proportion of the girls consumed snacks at school (78.4%) compared with the boys (69.9%) ($P=0.002$). A statistical difference was found between the boy and girl students in terms of carrying a lunchbox to school (29.9% for the girls, 17.9% for the boys; $P<0.001$) and shopping from the school canteen (91.7% for the girls, 87.8% for the boys; $P=0.042$). The rate of these behaviors

was found to be higher in the girl students.

Table 3 depicts the preferred foods and beverages between meals by gender. Fruit/fresh fruit juices (31.5% for the boys and 45.6% for the girls) were most frequently consumed followed by cake/biscuit/cookie (30.7%) and milk/yoghurt/buttermilk (30.1%) for the boys and milk/yoghurt/buttermilk (33.0%) and candy/chocolate/wafer (32.4%) for the girls. The ratio of the boys consuming bagel/pastry between meals (28.7%) was higher than that of the girls (22.8%) ($P=0.031$). On the contrary, consumption of nuts was higher in the girls (23.6%) than in boys (17.7%) ($P=0.022$). It was also found that the percentage of the boys (7.4%) who consumed instant soup between meals was higher than that of the girls (3.5%) ($P=0.006$). While consumption of fruit/fresh fruit juices between meals was higher in the girls than boys (45.6% and 31.5%, respectively; $P<0.001$), the proportion of those who consumed plain mineral water/light beverages (5.0% for the boys, 2.5% for the girls; $P=0.037$) and carbonated beverages were found to be higher in the boys than that of the girls (13.5% and 4.6%, respectively) ($P<0.001$).

Table 4 demonstrates the foods and beverages students preferred to buy from the canteen. While preferences for biscuits/cakes (27.9% vs. 34.2%; $P=0.032$) and candy (28.1% vs. 37.5%; $P=0.001$) were higher in

Table 1: Descriptive characteristics by gender

	Boy (n=502) n (%)	Girl (n=518) n (%)	X ²	P
Presence of disease				
No	435 (86.7%)	457 (88.2%)	0.537	0.449
Yes	67 (13.3%)	61 (11.8%)		
Abdominal obesity				
Obese (≥ 0.50)	205 (40.8%)	114 (22.0%)	42.051	<0.001
Non-obese (<0.50)	297 (59.2%)	404 (78.0%)		
BMI classification				
Non-overweight/obese	286 (57.0%)	362 (69.9%)		
Overweight	122 (24.3%)	104 (20.1%)	22.184	<0.001
Obese	94 (18.7%)	52 (10.0%)		

BMI: Body Mass Index

Table 2: Dietary behaviors by gender

	Boy (n=502) n (%)	Girl (n=518) n (%)	X ²	P
Eating three main meals a day	412 (82.1%)	432 (83.4%)	0.314	0.575
Daily breakfast consumption	368 (73.3%)	349 (67.4%)	4.296	0.038
Main meal consumption at school	178 (35.5%)	166 (32.0%)	1.328	0.249
Having snacks at school	351 (69.9%)	406 (78.4%)	9.531	0.002
Carrying a lunchbox to school	90 (17.9%)	155 (29.9%)	20.097	<0.001
Shopping from the school canteen	441 (87.8%)	475 (91.7%)	4.127	0.042

Table 3: Preferred foods and beverages between meals by gender

	Boy (n=502) n (%)	Girl (n=518) n (%)	X ²	P
Bagel/pastry	144 (28.7%)	118 (22.8%)	4.657	0.031
Cake/biscuit/cookie	154 (30.7%)	161 (31.1%)	0.019	0.889
Candy/chocolate/wafer	143 (28.5%)	168 (32.4%)	1.873	0.171
Fruit/fresh fruit juices	158 (31.5%)	236 (45.6%)	21.336	<0.001
Milk/yogurt/buttermilk	151 (30.1%)	171 (33.0%)	1.014	0.314
Nuts	89 (17.7%)	122 (23.6%)	5.269	0.022
Chips	65 (12.9%)	53 (10.2%)	1.839	0.175
Instant soup	37 (7.4%)	18 (3.5%)	7.584	0.006
Sandwich/toast/patty	125 (24.9%)	117 (22.6%)	0.754	0.385
Plain mineral water/light beverages	25 (5.0%)	13 (2.5%)	4.338	0.037
Herbal teas	48 (9.6%)	46 (8.9%)	0.141	0.707
Carbonated beverages (cola, soda)	68 (13.5%)	24 (4.6%)	24.678	<0.001
Ready-made juices	19 (3.8%)	28 (5.4%)	1.523	0.217
Coffee	33 (6.6%)	30 (5.8%)	0.269	0.604

Table 4: Preferred foods and beverages from the canteen by gender

	Boy (n=502) n (%)	Girl (n=518) n (%)	X ²	P
Biscuits/cakes	140 (27.9%)	177 (34.2%)	4.606	0.032
Ready-made juices	60 (12.0%)	47 (9.1%)	2.250	0.134
Candy	141 (28.1%)	194 (37.5%)	10.135	0.001
Sandwich	123 (24.5%)	92 (17.8%)	6.965	0.008
Buttermilk	107 (21.3%)	115 (22.2%)	0.118	0.732
Chips	28 (5.6%)	20 (3.9%)	1.675	0.196

Table 5: Dietary behaviors of obese and non-obese students by gender

	Boy (n=502)				Girl (n=518)			
	Obese (n=205) n (%)	Non-obese (n=297) n (%)	X ²	P	Obese (n=114) n (%)	Non-obese (n=404) n (%)	X ²	P
Eating three main meals a day	157 (76.6%)	255 (85.9%)	7.088	0.008	89 (78.1%)	343 (84.9%)	2.996	0.083
Daily breakfast consumption	148 (72.2%)	220 (74.1%)	0.219	0.640	66 (57.9%)	283 (70.0%)	5.976	0.015
Main meal consumption at school	68 (33.2%)	110 (37.0%)	0.792	0.373	40 (35.1%)	126 (31.2%)	0.621	0.431
Having snacks at school	141 (68.8%)	210 (70.7%)	0.214	0.644	86 (75.4%)	320 (79.2%)	0.745	0.388
Carrying a lunchbox to school	34 (16.6%)	56 (18.9%)	0.425	0.515	34 (29.8%)	121 (30.0%)	0.001	0.979
Shoppers from the school canteen	178 (86.8%)	263 (88.6%)	0.337	0.561	102 (89.5%)	373 (92.3%)	0.951	0.330

the girls, the percentage of sandwich consumption was higher in the boys (24.5%) than that in the girls (17.8%) (P=0.008).

The evaluation of dietary behaviors of obese and non-obese students by gender is summarized in Table 5. Based on the results, the percentage of eating three main meals a day in the boys with obesity (76.6%) was lower than that in the non-obese ones (85.9%) (P=0.008). There was no significant relationship between the main meal consumption and obesity in the girls (P=0.08). In the girls with obesity, the rate of

daily breakfast consumption (57.9%) was found to be lower than that in the non-obese girls (70.0%), where difference was statistically significant (P=0.015).

Discussion

The results of this study revealed that compared to adolescent boys, adolescent girls had a higher rate of carrying a lunchbox to school, buying food from the canteen, and consuming snacks at school. Higher awareness of healthy nutrition among girls might be the possible reason behind the higher rate

of carrying a healthy homemade lunchbox to school (17). Furthermore, the higher rate of skipping breakfast in girls may have pushed them to consume snacks more frequently and to shop more at the canteen. Concerning the food bought at the canteen, the girls preferred biscuits/cakes and candy more than the boys whereas the boys preferred sandwiches. Consumption of the three main meals was lower in the boys with obesity and daily breakfast consumption was lower in the girls with obesity. Similarly, studies have addressed the meal skipping habit as a factor increasing the risk of overweight and obesity in adolescents (18, 19).

The prevalence of obesity among adolescents has increased all over the world recently, the trend is still going on (20). In different studies, the prevalence of abdominal obesity among adolescents was found between 9.1% and 11.9% (21-23). In studies conducted in Turkey, the prevalence of overweight was found between 10.4% and 26.1%, and that of obesity was between 7.7% and 12.8% in adolescents (24-26). General obesity and abdominal obesity in adolescents have been compared by gender in numerous papers worldwide. The prevalence of abdominal obesity was found to be 10.5% in boys and 10.8% in girls in a study conducted in Brazil, 8.9% in boys and 9.2% in girls in a paper in Greece, and 20.4% in boys and 17.8% in girls in a study conducted in Iran (21-23). In the study in Iran, the general prevalence of obesity was determined as 13.6% in boys and 10.2% in girls (23). In Turkey, the prevalence of general obesity was reported as 16.4% in boys and 9.8% in girls (24). In the present research, the frequency of abdominal obesity was found to be 40.8% in boys and 22.0% in girls while the prevalence of obesity was 18.7% in boys and 10.0% in girls.

Adolescence, a transition stage from childhood to adulthood, has been shown to be accompanied by changes in nutritional habits; adolescents start to make their own choices regarding food (27). Unhealthy dietary behaviors in adolescents were reported to continue in adulthood, which might be associated with negative health consequences in later years (2, 28). In this period, where physical characteristics and body image gain further importance, dietary behaviors were also thought to be of differences between genders (29, 30). Herein, the percentage of daily breakfast consumption of the boys (73.3%) was higher than that in the girls (67.4%). In a similar study on breakfast consumption in adolescents, the percentage of breakfast consumption was lower in the boys (51.6%) and girls (48.4%) in comparison with that in the current work. However, the results of studies investigating

breakfast consumption by gender are in line with ours; accordingly, the percentage of breakfast consumption was higher in boys and girls skipped breakfast more often (31, 32). Concerns about body weight and body shape might be one of the reasons behind the low rate of breakfast consumption among girls (33). Due to an increase in the time spent at school, the diet of students at school is also suggested to gain importance in this period. It has been shown that the tendency towards unhealthy foods increased in students who did not benefit from school lunch service (34). This study was conducted in a school where school lunch service was not provided, where a significant majority of the students stated to have the main meals at school (35.5% for the boys and 32.0% for the girls). In an investigation on the attitudes towards healthy lifestyle behaviors in adolescents, the awareness of healthy eating was shown to be higher in girls than in boys (17). Herein, the ratio of carrying a lunchbox to school was 17.9% for the boys and 29.9% for the girls. It was thought that the higher rate of carrying a lunchbox to school might be owing to the higher awareness of healthy nutrition in girls. In cases where school lunch was not provided, it might be a healthier choice to make homemade food as the main meal instead of unhealthy foods from places, such as canteens. In the current research, the consumption of snacks at school by the girls (78.4%) was higher than that by the boys (69.9%). The high consumption of snacks among girls was similar to the results obtained in another study conducted on adolescents (35). The tendency of adolescent girls to skip the main meals for reasons related to body weight might lead them to consume more snacks between meals. In this study, it was determined that the consumption of snacks at school and the rate of shopping from the school canteen were higher in the girls than that in the boys. Food/beverage preferences between meals also differ between the two groups. Bagel/pastry consumption rate was higher in the boys (28.7%) than that in the girls (22.8%) whereas nuts were more frequently consumed by the girls (23.6%) than the boys (17.7%). While the consumption of fruit/fresh fruit juices was higher in the girls (45.6% vs. 31.5%), the proportion of the boys consuming plain mineral water/light beverages and carbonated beverages (5.0% and 13.5%, respectively) was higher than that of the girls (2.5% and 4.6%, respectively). In line with the current study, previous works have shown that consumption of soft drinks in adolescent boys was higher than in girls (36), and healthy food preferences were higher in adolescent girls than in boys (37). In this study, the ratio of shopping from the school canteen was high (87.8% for the boys and 91.7% for the girls; $P=0.042$) and a difference was

found between the boy and girl students in terms of preferred foods/beverages bought from the canteen. Thus, while consumption of biscuits/cakes and candy in the girls (34.2% and 37.5%, respectively) was higher than that in the boys (27.9% and 28.1%, respectively), the rate of sandwich consumption in the boys (24.5%) was higher than that in the girls (17.8%). A similar paper indicated that sugary food consumption is higher in girl adolescents (31). The consumption of irregular meals was reported to be high in overweight adolescents, among whom regular breakfast consumption was low (38, 39). In this study, the rate of consuming the three main meals a day was found to be lower in the boys with obesity than the non-obese ones, and the rate of daily breakfast consumption was found to be higher in the non-obese girls compared to the obese ones. The common unhealthy foods available around the school prevent students from making healthy choices. It has been reported that providing opportunities, such as school lunch, a school environment that supports healthy nutrition where adolescents can consume at least one main meal healthily, might be an important factor for preventing obesity by contributing to a healthy diet in school-age adolescents (40-43).

The present research had certain limitations. Primarily, dietary records were not taken. Dietary records could have provided a clearer representation of food intake and dietary behavior. Secondly, the foods available in the canteen and around the school were not investigated. Thus, an important factor that may affect students' nutritional behavior at school was ignored.

Conclusion

In this study, nutritional behaviors of school-age children and adolescents were different to an extent between the genders. While the percentage of daily breakfast consumption was high in the boys, the percentage of consuming snacks at school, carrying a lunchbox to school, and shopping from the school canteen was found to be high in the girls. While the girls consumed nuts and fruit/fresh fruit juices at a higher rate than the boys, the boys had a higher rate of consuming bagel/pastry, plain mineral water/light beverages, and carbonated beverages than the girls. Preferred foods bought at the canteen also differed between the two groups. The girls preferred foods such as biscuits/cakes and candy at a higher rate whereas sandwich consumption was higher in the boys. Skipping meals, especially breakfast, may contribute to obesity in adolescents. While the rate of consuming the three main meals was low among the boys with obesity,

the rate of daily breakfast consumption was low among girls with obesity compared to their non-obese peers.

It is thought that considering gender differences in nutritional interventions for adolescents, encouraging regular meal consumption, and increasing the availability of healthy foods to be consumed as the main meals in and around the school would be an important intervention for the prevention of obesity in adolescents.

Acknowledgments

We would like to thank Nutrition and Dietetics students in the third year of Kırklareli University Faculty of Health Sciences for their assistance in collecting the study data.

Ethical Approval

The Ethics Committee of the Non-Interventional Non-Pharmaceutical Clinical Research of the Institute of Health Sciences of Kırklareli University approved the present research in October 23th, 2019. The participants and their parents gave their informed written consent for the study and approved the protocol.

Conflict of interest: None declared.

References

1. Rouse H, Goudie A, Rettiganti M, Leath K, Riser Q, Thompson J. Prevalence, patterns, and predictors: A statewide longitudinal study of childhood obesity. *J Sch Health.* 2019;89(4):237-245. doi: 10.1111/josh.12741. PubMed PMID: 30740717.
2. Winpenny EM, van Sluijs EMF, White M, Klepp K-I, Wold B, Lien N. Changes in diet through adolescence and early adulthood: longitudinal trajectories and association with key life transitions. *Int J Behav Nutr Phys Act.* 2018;15(1):86. doi: 10.1186/s12966-018-0719-8. PubMed PMID: 30200990; PubMed Central PMCID: PMC6131755.
3. Kansra AR, Lakkunarajah S, Jay MS. Childhood and Adolescent Obesity: A Review. *Front Pediatr.* 2020;8:581461. doi: 10.3389/fped.2020.581461. PubMed PMID: 33511092; PubMed Central PMCID: PMC7835259.
4. Ortega A, Bejarano CM, Cushing CC, Staggs VS, Papa AE, Steel C, et al. Differences in adolescent activity and dietary behaviors across home, school, and other locations warrant location-specific intervention approaches. *Int J Behav Nutr Phys Act.* 2020;17(1):123.

- doi: 10.1186/s12966-020-01027-1. PubMed PMID: 32993715; PubMed Central PMCID: PMC7526379.
5. Sarsour A, Turban M, Al Wahaidi A, Abed Y, Alkahlout H. Does gender influence food intake and physical activity pattern among Palestinian adolescents in the Gaza Strip? *East Mediterr Health J.* 2019;25(10):722-727. doi: 10.26719/emhj.19.073. PubMed PMID: 31774138.
 6. Otsuka Y, Kaneita Y, Itani O, Jike M, Osaki Y, Higuchi S, et al. Gender differences in dietary behaviors among Japanese adolescents. *Prev Med Rep.* 2020;20:101203. doi: 10.1016/j.pmedr.2020.101203. PubMed PMID: 32995146; PubMed Central PMCID: PMC7509230.
 7. Zalewska M, Maciorkowska E. Selected nutritional habits of teenagers associated with overweight and obesity. *PeerJ.* 2017;5:e3681. doi: 10.7717/peerj.3681. PubMed PMID: 28951812; PubMed Central PMCID: PMC5611898.
 8. Freedman DS, Kahn HS, Mei Z, Grummer-Strawn LM, Dietz WH, Srinivasan SR, et al. Relation of body mass index and waist-to-height ratio to cardiovascular disease risk factors in children and adolescents: the Bogalusa Heart Study. *Am J Clin Nutr.* 2007;86(1):33-40. doi: 10.1093/ajcn/86.1.33. PubMed PMID: 17616760.
 9. Abreu S, Santos R, Moreira C, Santos PC, Vale S, Soares-Miranda L, et al. Relationship of milk intake and physical activity to abdominal obesity among adolescents. *Pediatr Obes.* 2014;9(1):71-80. doi: 10.1111/j.2047-6310.2012.00130.x. PubMed PMID: 23325606.
 10. Mogre V, Nyaba R, Aleyira S, Sam NB. Demographic, dietary and physical activity predictors of general and abdominal obesity among university students: a cross-sectional study. *Springerplus.* 2015;4:226. doi: 10.1186/s40064-015-0999-2. PubMed PMID: 26140255. PubMed Central PMCID: PMC4480231.
 11. Deshmukh-Taskar P, Nicklas TA, Radcliffe JD, O'Neil CE, Liu Y. The relationship of breakfast skipping and type of breakfast consumed with overweight/obesity, abdominal obesity, other cardiometabolic risk factors and the metabolic syndrome in young adults. *The National Health and Nutrition Examination Survey (NHANES): 1999–2006. Public Health Nutr.* 2013;16(11):2073-82. doi: 10.1017/S1368980012004296. PubMed PMID: 23031568.
 12. Rathi N, Riddell L, Worsley A. Food consumption patterns of adolescents aged 14–16 years in Kolkata, India. *Nutr J.* 2017;16(1):50. doi: 10.1186/s12937-017-0272-3. PubMed PMID: 28836982; PubMed Central PMCID: PMC5571590.
 13. World Health Organization. Growth Reference Data for 5-19 years; 2007. Available from: <https://www.who.int/tools/growth-reference-data-for-5to19-years/indicators/bmi-for-age>.
 14. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8-11 December 2008; 2011. Available from: <https://www.who.int/publications/item/9789241501491>.
 15. McCarthy HD, Ashwell M. A study of central fatness using waist-to-height ratios in UK children and adolescents over two decades supports the simple message—'keep your waist circumference to less than half your height'. *Int J Obes.* 2006;30(6):988-92. doi: 10.1038/sj.ijo.0803226. PubMed PMID: 16432546.
 16. Ashwell M, Hsieh SD. Six reasons why the waist-to-height ratio is a rapid and effective global indicator for health risks of obesity and how its use could simplify the international public health message on obesity. *Int J Food Sci Nutr.* 2005;56(5):303-7. doi: 10.1080/09637480500195066. PubMed PMID: 16236591.
 17. Al-Sheyab NA, Alomari MA, Hayajneh AA, Shah S. Attitudes and perceived barriers toward healthy lifestyle behaviors in Jordanian adolescents: a developing country perspective. *Adolesc Health Med Ther.* 2019;10:39-47. doi: 10.2147/AHMT.S181001. PubMed PMID: 30992686; PubMed Central PMCID: PMC6445189.
 18. Macwana JI, Mehta KG, Baxi RK. Predictors of overweight and obesity among school going adolescents of Vadodara city in Western India. *Int J Adolesc Med Health.* 2017;29(3):/j/ijamh.2017.29.issue-3/ijamh-2015-0078/ijamh-2015-0078.xml. doi: 10.1515/ijamh-2015-0078. PubMed PMID: 26812764.
 19. Agustina R, Nadiya K, Andini EA, Setianingsih AA, Sadariskar AA, Prafiantini E, et al. Associations of meal patterning, dietary quality and diversity with anemia and overweight-obesity among Indonesian school-going adolescent girls in West Java. *PLoS One.* 2020;15(4):e0231519. doi: 10.1371/journal.pone.0231519. PubMed PMID: 32324775; PubMed Central PMCID: PMC7179884.
 20. Lobstein T, Jackson-Leach R, Moodie ML, Hall KD, Gortmaker SL, Swinburn BA, et al. Child and adolescent obesity: part of a bigger picture. *Lancet.* 2015;385(9986):2510-20. doi: 10.1016/S0140-6736(14)61746-3. PubMed PMID: 25703114; PubMed Central PMCID: PMC4594797.
 21. Castro JAC, Nunes HEG, Silva DAS. Prevalence of abdominal obesity in adolescents: association between sociodemographic factors and lifestyle. *Rev Paul Pediatr.* 2016;34(3):343-51. doi: 10.1016/j.rpped.2016.01.003. PubMed PMID: 26993748; PubMed Central PMCID: PMC5178121.
 22. Grammatikopoulou M, Poulimeneas D, Gounitsioti I, Gerothanasi K, Tsigga M, Kiranas E, et al. Prevalence of simple and abdominal obesity in Greek adolescents:

- the ADONUT study. *Clin Obes*. 2014;4(6):303-8. doi: 10.1111/cob.12070. PubMed PMID: 25826159.
23. Esmaili H, Bahreynian M, Qorbani M, Motlagh ME, Ardalan G, Heshmat R, et al. Prevalence of general and abdominal obesity in a nationally representative sample of Iranian children and adolescents: the CASPIAN-IV study. *Iran J Pediatr*. 2015;25(3):e401. doi: 10.5812/ijp.25(3)2015.401. PubMed PMID: 26199707; PubMed Central PMCID: PMC4505989.
 24. Çam HH, Top FÜ. Overweight, obesity, weight-related behaviors, and health-related quality of life among high-school students in Turkey. *Eat Weight Disord*. 2019;25(5):1295-1302. doi: 10.1007/s40519-019-00762-0. PubMed PMID: 31463887.
 25. Gökler ME, Buğrül N, Metintaş S, Kalyoncu C. Adolescent obesity and associated cardiovascular risk factors of rural and urban life (Eskisehir, Turkey). *Cent Eur J Public Health*. 2015;23(1):20-5. doi: 10.21101/cejph.a3958. PubMed PMID: 26036094.
 26. Ercan S, Dallar YB, Önen S, Engiz Ö. Prevalence of obesity and associated risk factors among adolescents in Ankara, Turkey. *J Clin Res Pediatr Endocrinol*. 2012;4(4):204-7. doi: 10.4274/jcrpe.714. PubMed PMID: 23149433; PubMed Central PMCID: PMC3537287.
 27. Birch L, Savage JS, Ventura A. Influences on the development of children's eating behaviours: from infancy to adolescence. *Can J Diet Pract Res*. 2007;68(1):s1-s56. PubMed PMID: 19430591; PubMed Central PMCID: PMC2678872.
 28. Farvid MS, Chen WY, Michels KB, Cho E, Willett WC, Eliassen AH. Fruit and vegetable consumption in adolescence and early adulthood and risk of breast cancer: population based cohort study. *BMJ*. 2016;353:i2343. doi: 10.1136/bmj.i2343. PubMed PMID: 27170029; PubMed Central PMCID: PMC5068921.
 29. Wawrzyniak A, Myszkowska-Ryciak J, Harton A, Lange E, Laskowski W, Hamulka J, et al. Dissatisfaction with Body Weight among Polish Adolescents Is Related to Unhealthy Dietary Behaviors. *Nutrients*. 2020;12(9):2658. doi: 10.3390/nu12092658. PubMed PMID: 32878216; PubMed Central PMCID: PMC7551787.
 30. Bartkowicz J, Mironiuk K. Assessment of selected nutritional behaviours among college adolescents from Pomerania province. *Rocz Panstw Zakl Hig*. 2018;69(4):387-395. doi: 10.32394/rpzh.2018.0045. PubMed PMID: 30525330.
 31. Okeyo AP, Seekoe E, de Villiers A, Faber M, Nel JH, Steyn NP. Dietary Practices and Adolescent Obesity in Secondary School Learners at Disadvantaged Schools in South Africa: Urban-Rural and Gender Differences. *Int J Environ Res Public Health*. 2020;17(16):5864. doi: 10.3390/ijerph17165864. PubMed PMID: 32823510; PubMed Central PMCID: PMC7460370.
 32. Lee JY, Ban D, Kim H, Kim SY, Kim JM, Shin IS, et al. Sociodemographic and clinical factors associated with breakfast skipping among high school students. *Nutr Diet*. 2021;78(4):442-448. doi: 10.1111/1747-0080.12642. PubMed PMID: 33047479.
 33. Som N, Mukhopadhyay S. Body weight and body shape concerns and related behaviours among Indian urban adolescent girls. *Public Health Nutr*. 2015;18(6):1075-83. doi: 10.1017/S1368980014001451. PubMed PMID: 25079706.
 34. Rocha LL, Gratao LHA, do Carmo AS, Costa ABP, de Freitas Cunha C, de Oliveira TRPR, et al. School Type, Eating Habits, and Screen Time are Associated With Ultra-Processed Food Consumption Among Brazilian Adolescents. *J Acad Nutr Diet*. 2021;121(6):1136-1142. doi: 10.1016/j.jand.2020.12.010. PubMed PMID: 33516640.
 35. Gage R, Girling-Butcher M, Joe E, Smith M, Ni Mhurchu C, McKerchar C, et al. The Frequency and Context of Snacking among Children: An Objective Analysis Using Wearable Cameras. *Nutrients*. 2020;13(1):103. doi: 10.3390/nu13010103. PubMed PMID: 33396846; PubMed Central PMCID: PMC7824478.
 36. Makansi N, Allison P, Awad M, Bedos C. Fruit and vegetable intake among Emirati adolescents: a mixed methods study. *East Mediterr Health J*. 2018;24(7):653-663. doi: 10.26719/2018.24.7.653. PubMed PMID: 30215475.
 37. Gaylis JB, Levy SS, Kviatkovsky S, DeHamer R, Hong MY. Relationships between physical activity, food choices, gender and BMI in Southern Californian teenagers. *Int J Adolesc Med Health*. 2017;31(5):/j/ijamh.2019.31.issue-5/ijamh-2017-0067/ijamh-2017-0067.xml. doi: 10.1515/ijamh-2017-0067. PubMed PMID: 29168958.
 38. Jodkowska M, Oblacińska A, Tabak I, Radiukiewicz K. Differences in dietary patterns between overweight and normal-weight adolescents. *Med Wieku Rozwoj*. 2011;15(3):266-73. PubMed PMID: 22006481.
 39. Garcia-Contiente X, Allué N, Pérez-Giménez A, Ariza C, Sánchez-Martínez F, López M, et al. Eating habits, sedentary behaviours and overweight and obesity among adolescents in Barcelona (Spain). *An Pediatr (Barc)*. 2015;83(1):3-10. doi: 10.1016/j.anpedi.2014.07.006. PubMed PMID: 25475904.
 40. Garden EM, Pallan M, Clarke J, Griffin T, Hurley K, Lancashire E, et al. Relationship between primary school healthy eating and physical activity promoting environments and children's dietary intake, physical activity and weight status: a longitudinal study in the West Midlands, UK. *BMJ Open*. 2020;10(12):e040833. doi: 10.1136/bmjopen-2020-040833. PubMed PMID: 33371029; PubMed Central PMCID: PMC7757477.

41. Gearan EC, Monzella K, Jennings L, Fox MK. Differences in Diet Quality between School Lunch Participants and Nonparticipants in the United States by Income and Race. *Nutrients*. 2020;12(12):3891. doi: 10.3390/nu12123891. PubMed PMID: 33352695; PubMed Central PMCID: PMC7765856.
42. Albayrak S, Ergün A. The Effect of a School-Based Nutritional Program on the Anthropometric Measurements, Blood Test Results and Eating Habits of Adolescents. *Clinical and Experimental Health Sciences*. 2018;8(3):217-23. doi: 10.5152/clinexphealthsci.2018.720.
43. Knight KB, Cole JW, Dodd LM, Oakley CB. Eating good and moving like we should: a consideration for registered dietitians in schools. *Int J School Health*. 2017;4(2):e43043. doi: 10.17795/intjsh-43043.