








The incidence of obesity among children in Turkey – obesity awareness, physical activity and other associated factors

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ABSTRACT

Introduction and aim. Obesity is the leading one among the most common nutritional disorders seen during childhood period. We aimed to determine the incidence of obesity, obesity awareness, physical activity and associated factors in school-age children.

Material and methods. The sampling was composed of 725 students who were studying in secondary schools during the 2016–2017 academic year. Data were collected with “Personel Information Form”, “Obesity Awareness Scale” and “Physical Activity Questionnaire for Older Children”. The mean age was 12.30±1.32 (10–15), 53% of the students were females and 60.1% of students have a person with obesity in the family.

Results. We determined that 18.3% of the students were with obesity. The body mass index of students who have a balanced diet compared to those who have not is statistically significantly lower ($p<0.05$). There was a significant relationship between students’ body mass index and obesity awareness ($r=-0.084$, $p=0.024$).

Conclusion. Screening for obesity and related factors, such as obesity awareness, having a balanced diet should begin in school-aged children for childhood obesity prevention.

Keywords. awareness, children, obesity, pediatric obesity, physical exercise

Introduction

Obesity is the leading one among the most common nutritional disorders seen during childhood period. Obesity is one of the serious public health problems since impaired glucose tolerance and type 2 diabetes are frequently seen among children with obesity as in adults and many associated diseases that seriously threaten life such as hypertension, cardiovascular diseases, degenerative arthritis and thrombophlebitis occur commonly during childhood as well as adulthood period.¹

Various obesity prevalences have been reported from distinct regions of the world today; and accord-

ing to the statement of World Health Organization (WHO), 42 millions of overweight children below 5 years old have been living on earth since 2010, and almost 35 million of these children live in developing countries.² Obesity was most common in America, Caribbeans, Middle and North Africa by a rate of 20% and higher.³

Improper dietary habits, sedentary lifestyle, genetic and hormonal factors and lack of physical activity had roles in the emergence of childhood obesity. Prevention from obesity is based on changing unhealthy dietary and exercise habits into healthy behaviors on behalf of

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Received: 26.05.2022 / Revised: 1.07.2022 / Accepted: 19.07.2022 / Published: 30.09.2022

Topan A, Ocakcı AF, Ayyıldız TK, Kurt A, Ozdemir S. *The incidence of obesity among children in Turkey – obesity awareness, physical activity and other associated factors*. *Eur J Clin Exp Med*. 2022;20(3):336–341. doi: 10.15584/ejcem.2022.3.12.



childhood obesity.⁵ These principles are generally evaluated as part of obesity awareness. In recent years, studies examining the effect of obesity awareness on obesity have attracted attention.^{4,5}

Awareness about obesity has been reported to be an indicator for future increase in an individual's body weight management and their quality of life.⁶ Obesity awareness contains physical activity and nutrition beside obesity awareness. At this point, it is required to determine and improve obesity awareness and physical activity levels among the children and adolescents. Although there are studies in the literature that examine the obesity levels of students, studies examining the relationship between body mass index (BMI) and obesity awareness are quite limited.⁶⁻⁸

Aim

This study was carried out to determine relationship between obesity, obesity awareness, physical activity and other associated factors in school age children. The questions of this study: (1) What was the BMI levels of the students? (2) Is there a difference BMI levels of students according to personal characteristics (gender, having person with obesity in the family, having breakfast everyday, having dinner everyday and having balanced diet)? (3) Are there relationships between BMI levels, obesity awareness and physical activity of students?

Material and methods

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by Human Research the Ethics Committee of the Zonguldak Bülent Ecevit University (Date: 26.01.2017, No: 192). Data collection was performed based on the voluntary participation of the individuals and their parents enrolled in the study. We informed the students and their parents about the aim of the study and the confidentiality of all data, and they gave their written consents.

Setting

The study used a cross-sectional study design in which the data were collected via questionnaires during 2016–2017 academic year with 725 school-aged children and analyzed using descriptive statistics in Zonguldak, Turkey. This study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies.⁹

Participants

The total number of students in five secondary schools is 972. The sampling method was not used in this study and all students volunteering to participate in this study were included. A total of 725 (participation rate: 74.6%) students participated in the study. Criteria for inclusion in the study; being a student at 5, 6, 7 and 8th grades and volunteering to participate in the study. Exclusion Criteria: not volunteering to participate in the study.

Data collection

Data were collected face to face from students. Data were collected with “Personel Information Form”, “Obesity Awareness Scale” and “Physical Activity Questionnaire for Older Children”.

Personel information form

This form prepared by the researchers by scanning the literature.^{10,11} This form consists of questions related to the sociodemographic variables of students age, gender, height, weight and diet. The children's height and weight were measured by the researchers during 2016–2017 academic year.

Obesity awareness scale (OAS)

In order to determine of obesity awareness of the children “Obesity Awareness (OAS) Scale” were used. This scale was developed and validated for Turkey by Kafkas and Özen.¹² The validity and reliability value of the scale is 0.87. It consists of twenty items and questions assessing obesity awareness, nutrition and physical activity knowledge of the children. Each statement was scored from 0 to 4. Original form of the scale consisted of 23 items and three domains including obesity awareness (8 items) nutrition (7 items) and physical activity (8 items). The scores were added to give a final score (0–80). Higher scores indicate an increase in the awareness of obesity.¹³ Cronbach Alpha value was found to be 0.85 in this study.

Physical activity questionnaire for older children (PAQ-C 4-8)

This questionnaire was developed by Trocker, Bailey, Faulkner, Kowalski and McGrath; and its validity and reliability studies were performed by Tanır and Yoncalık.¹⁴ It gives an idea about the general physical activity habits of the participants (8–14 year old children who were studying at 4–8 grades.). The scale consists of 9 questions (Cronbach's alpha = 0.76) graded in 1–5 Likert type. In calculating the physical activity scores of the participants in the study, the average of all questions is taken. Five points for each question indicate the highest physical activity level and one point indicates the lowest physical activity level.¹⁴ Cronbach's Alpha value was found to be 0.89 in this study.

Table 1. Distribution of students' personal characteristics (n=725)

Personal characteristics	$\bar{X} \pm SD$ (Min – Max)	
Age	12.30 \pm 1.32 (10 – 15)	
	n	%
Gender		
Male	384	53
Female	341	47
BMI		
Thin (<18.9 kg/m ²)	195	26.9
Normal (19.0-24.9 kg/m ²)	305	42.1
Overweight (25.0-29.9 kg/m ²)	92	12.7
With obesity (>30 kg/m ²)	133	18.3
Person with obesity in the family		
Yes	283	39.9
No	436	60.1
Having breakfast everyday		
Yes	481	66.3
No	55	7.6
Sometimes	189	26.1
Having lunch everyday		
Yes	447	65.8
No	41	5.7
Sometimes	207	28.6
Having dinner everyday		
Yes	23	88.3
No	640	3.2
Sometimes	62	8.6
Having balanced diet		
Yes	401	55.3
No	74	10.2
Sometimes	250	34.5

Data analysis

Statistical Package for the Social Sciences (SPSS) 22.0 package program (IBM, Armonk, NY, USA) was used to analyze the data. Descriptive data are indicated by number, percentage, mean and standard deviation. Whether the data was normally distributed was checked with skewness and kurtosis, and parametric test were used. In comparison of quantitative data, one-way analysis of variance was used for more than two groups with the difference of student t test between two groups. Bonferroni post hoc test was used to determine where the significant difference originated. The extent of the relationship between BMI and obesity awareness was examined by simple linear re-

gression analysis. Analysis results were analyzed as $p < 0.05$ significant levels.

Results

The mean age was 12.30 \pm 1.32 (10-15), 53% of the students were females and 60.1% of students have a person with obesity in the family. Additionally, 66.3% of students have breakfast everyday, 65.8% of students have lunch everyday, 88.3% of students have dinner everyday and 55.3% have a balanced diet. Altogether, 12.7% were overweight and 18.3% were with obesity (Table 1).

A comparison of students according to personal characteristics in terms of BMI is given in Table 2.

Table 2. Comparisons of students' BMI based on their personal characteristics and (n=725)

Personal characteristics	BMI $\bar{X} \pm SD$	Statistical analysis	Significant difference (post hoc)*
Gender			
Male	19.54 \pm 4.25	t = -1.195	
Female	19.93 \pm 4.5	p = 0.232	
Person with obesity in the family			
Yes	19.20 \pm 3.89	t = -4.012	
No	20.52 \pm 4.91	p < 0.001	
Having breakfast everyday			
Yes	19.28 \pm 4.23		1-2
No	21.23 \pm 4.1	F = 8.429	(p = 0.005)
Sometimes	20.43 \pm 4.62	p < 0.001	1-3 (p = 0.006)
Having lunch everyday			
Yes	19.74 \pm 4.38		
No	19.64 \pm 3.86	F = 0.016	
Sometimes	19.70 \pm 4.47	p = 0.984	
Having dinner everyday			
Yes	19.51 \pm 4.21	F = 7.981	1-2
No	20.10 \pm 4.1	p < 0.001	(p < 0.001)
Sometimes	21.80 \pm 5.45		
Having balanced diet			
Yes	19.16 \pm 4.16	F = 13.529	1-2 (p < 0.001)
No	21.91 \pm 5.5	p < 0.001	1-3
Sometimes	19.99 \pm 4.1		(p = 0.002)

There was a statistically significant difference in terms of BMI according to having person with obesity in the family, having breakfast everyday, having dinner everyday and having balanced diet ($p < 0.05$). BMI of students who have a person with obesity in the family compared to who have not is statistically significantly higher ($p < 0.001$). BMI of students who have breakfast everyday compared to who have not ($p = 0.005$) and have sometimes ($p = 0.006$) are statistically significantly lower. BMI of students who have balanced diet compared to who have not ($p < 0.001$) and have sometimes ($p = 0.002$) is statistically significantly lower.

The total score average of the students' OAS was 57.70±8.7 (20-80) and the highest score among the sub-dimensions was obesity awareness 22.34±3.91 (8-42). The total score average of the students' PAQ-C was 22.34 ± 3.91 (8-42) (Table 3).

Table 3. Students' obesity awareness scale and physical activity questionnaire for older children total scores (n=725)

Scales	X̄ ± SD	Min-Max
Obesity awareness scale		
Awareness	22.34 ± 3.34	8 – 42
Nutrition	20.57 ± 3.48	7 – 28
Physical activity	14.78 ± 2.68	5 – 20
Total score	57.70 ± 8.7	20 – 80
Physical activity questionnaire for older children		
Total score	22.34 ± 3.91	8 – 42

There was a significant relationship between students' BMI and obesity awareness (r=-0.084, p=0.024). There was no significant relationship between students' BMI and physical activity (p<0.05) (Table 4).

Table 4. Correlations between students' BMI, obesity awareness scale and physical activity questionnaire for older children total scores (n=725) ^a

	Obesity awareness scale total score	Physical activity questionnaire for older children total score
BMI		
r*	-0.084	-0.034
p	0.024**	0.365

^a *Pearson correlation test, **p<0.05

According to the results of the regression analysis, when the significance level corresponding to the F value is examined, the model established is statistically significant (F=5.124; p<0.05). Looking at the beta coefficient value, t value and significance level of the independent variable; OAS has a statistically significant effect on BMI (t=2.264, p<0.05). In this study, 0.7% of the change on the BMI is explained (Regulated R²=0.007). One unit increase in the OAS variable causes a decrease of 0.084 on the BMI (β=0.084, p<0.05) (Table 5).

Discussion

This study was carried out to determine relationship between obesity, obesity awareness, physical activity and

and other associated factors in school age children. Although there are studies in the literature that examine the obesity levels of students, studies examining the relationship between BMI and obesity awareness are quite limited.⁶⁻⁸ In this study, 12.7 % students were overweight and 18.3% were with obesity. There was a statistically significant difference in terms of BMI according to having person with obesity in the family, having breakfast everyday, having dinner everyday and having balanced diet (p<0.05). There was a significant relationship between students' BMI and obesity awareness (r=0.084, p=0.024). One unit increase in the OAS variable causes a decrease of 0.084 on the BMI (β=-0.084, p<0.05). There was no significant relationship between students' BMI and physical activity (p<0.05).

In this study, 12.7 % students in this study were overweight and 18.3% were with obesity. In a meta analysis which was carried out among the children in Turkey between 1990-2015, prevalence of excess weight has increased from 0.6% to 7.3% by a 11.6-fold increase during 1990-1995 and 2011-2015.¹⁴ This result appears to be an estimated outcome according to the previous literature. Obesity is increasing in Turkey as well as in whole world.

Obesity awareness of the students was found to be at a moderate level [57.70±8.7 (20-80)] in this study. In the study by examining knowledge levels and awareness about obesity, it was reported that only 25.4% of the children had awareness among 528 school-aged children.⁴

There was a relationship between BMI and obesity awareness. A negative correlation was determined between students' BMI and obesity awareness (r=-0.084, p=0.024). A negative correlation was reported between BMI and obesity awareness in an study conducted with overweight children aged 10-14 years (r=-0.180, p=0.001).⁶ As awareness increases, BMI decreases in this study. Children pay attention to their nutrition or physical activity level.

As a result of this study, there was no significant relationship between students' BMI and physical activity. As awareness increases, children pay attention to their nutrition in this study. However, Wang et al. have reported a negative correlation between physical activity level and BMI among 742 children between 8-13 years old.¹⁵ One of the issues addressed in the scope of obesity awareness is physical activity in the literature.^{16,17} One of the factors that can be evaluated in the scope of obesity awareness is physical activity.¹⁸

Table 5. Associations between students' BMI and obesity awareness scale total scores of the students* (n=725) ^a

Dependent variables	Independent variables	β	SD	Beta	t	p	F	Model (p)	R ²	Durbin Watson
BMI	Constant	17.298	1.087	-	15.915	0.000	5.124	0.024**	0.007	1.762
	Obesity Awareness	0.042	0.019	-0.084	2.264	0.024				

^a * Simple linear regression analysis, ** p<0.05

As a result of this study, BMI of students who have a person with obesity in the family compared to who have not is statistically significantly higher ($p < 0.001$). Families and consumption are at the nexus of the problem, as childhood weight issues depend significantly on family-related influences (genetic predispositions, physical activities, and household food consumption practices).^{19,20} Some children with obesity can show higher number of nuclear abnormalities compared with children with normal weight.²¹

In this study, BMI of students who have breakfast everyday compared to who have not are lower. Also, BMI of students who have balanced diet compared to who have not are lower. One of the significant factors increasing the risk of obesity is dietary habits. Most children tend to skip meals.²² Especially balanced diet should be frequently evaluated in order to identify and improve dietary habits.²³

Conclusion

In conclusion, 12.7% were overweight and 18.3% were with obesity. There was a statistically significant difference in terms of body mass index according to having person with obesity in the family, having breakfast everyday, having dinner everyday and having balanced diet. There was a significant relationship between students' BMI and obesity awareness.

Obesity awareness and having a balanced diet are crucial in childhood obesity prevention. Screening for obesity and related factors, such as obesity awareness, having a balanced diet should begin in school-aged children for childhood obesity prevention and health promotion and disease prevention. Also, trainings which were given by health care providers and school health nurses for the prevention of childhood obesity would be effective in increasing obesity awareness. To prevent the obesity and improve obesity awareness in children, it is important to direct and inform the children about nutrition and having a balanced diet. Efforts are needed to develop and implement interventions and policies that may promote school nurse active engagement in related factors (such as balanced diet and obesity awareness) in childhood obesity prevention practices. In addition, studies examining the interventions and programs to prevent the childhood obesity should be conducted.

Declarations

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Author contributions

Conceptualization, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Methodology, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Software, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Validation,

A.T., A.F.O., T.K.A., A.K. and S.Ö.; Formal Analysis, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Investigation, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Resources, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Data Curation, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Writing – Original Draft Preparation, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Writing – Review & Editing, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Visualization, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Supervision, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Project Administration, A.T., A.F.O., T.K.A., A.K. and S.Ö.; Funding Acquisition, A.T., A.F.O., T.K.A., A.K. and S.Ö.

Conflicts of interest

The authors declare that there are no conflict of interests.

Data availability

Data available on request from the authors.

Ethics approval

The study was approved by ethics committee of Zonguldak Bülent Ecevit University Human (Date: 26.01.2017, No: 192).

References

- Gülmez R, Demirel F, Emir S. Obez çocuk ve ergenlerde obeziteye eşlik eden endokrin ve metabolik bozukluklar ve ilişkili faktörler. *Turkish J Pediatr Dis.* 2015;2:104–112.
- World Health Organization. Childhood overweight and obesity. 2016. <https://www.who.int/>. Accessed July 21, 2022.
- Ezzati M. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet.* 2017;390:2627–2642.
- Alasmari HD, Al-Shehri AD, Aljuaid TA, Alzaidi BA, Alswat KA. Relationship Between Body Mass Index and Obesity Awareness in School Students. *J Clin Med Res.* 2017;9(6):520–524.
- Bhattacharya P, Gogoi N, Roy A. Prevalence and awareness of obesity and its risk factors among adolescents in two schools in a Northeast Indian city. *Int J Med Sci Public Heal.* 2016;5(6):1111.
- Bozbulut R, Ertaş-Öztürk Y, Döğer E, Bideci A, Köksal E. Increased obesity awareness and adherence to healthy lifestyle-diet reduce metabolic syndrome risk in overweight children. *J Am Coll Nutr.* 2020;39(5):432–437.
- Sheinbein DH, Stein RI, Hayes JE, et al. Factors associated with depression and anxiety symptoms among children seeking treatment for obesity: A social-ecological approach. *Pediatr Obes.* 2019;14(8):1–9.
- Park S, Choo J, Chang SO. Healthy eating for obese children from socioeconomically disadvantaged families: Its ecological factors and strategies. *J Transcult Nurs.* 2019;30(3):268–279.

9. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *J Clin Epidemiol.* 2008;61(4):344–349.
10. Mölbert SC, Sauer H, Dammann D, et al. Multimodal body representation of obese children and adolescents before and after weight-loss treatment in comparison to normal-weight children. *PLoS One.* 2016;11(11):1–14.
11. AlBlooshi A, Shaban S, AlTunaiji M, et al. Increasing obesity rates in school children in United Arab Emirates. *Obes Sci Pract.* 2016;2(2):196–202.
12. Kafkas ME, Özen G. The Turkish Adaptation of the Obesity awareness Scale: A validity and reliability study. *İnönü Univ J Phys Educ Sport Sci.* 2014;1(2):1–15.
13. Tanır H, Yoncalık O. The relationship between elementary school eight grade students' physical activity level and various anthropometric characteristics with their academic achievement. *Nigde Univ J Phys Educ Sport Sci.* 2014;8(1):1–10.
14. Alper Z, Ercan İ, Uncu Y. A meta-analysis and an evaluation of trends in obesity prevalence among children and adolescents in Turkey: 1990 through 2015. *J Clin Res Pediatr Endocrinol.* 2018;10(1):59–67.
15. Wang JJ, Baranowski T, Lau WP, Chen TA, Pitkethly AJ. Validation of the physical activity questionnaire for older children (PAQ-C) among Chinese children. *Biomed Env Sci.* 2016;29(3):177–186.
16. Herbenick SK, James K, Milton J, Cannon D. Effects of family nutrition and physical activity screening for obesity risk in school-age children. *J Spec Pediatr Nurs.* 2018;23(4):1–5.
17. Wilk P, Clark AF, Maltby A, Smith C, Tucker P, Gilliland JA. Examining individual, interpersonal, and environmental influences on children's physical activity levels. *SSM - Popul Heal.* 2018;4(2017):76–85.
18. Friedenreich CM, Ryder-Burbidge C, McNeil J. Physical activity, obesity and sedentary behavior in cancer etiology: epidemiologic evidence and biologic mechanisms. *Mol Oncol.* 2021;15(3):790–800.
19. Moore ES, Wilkie WL, Desrochers DM. All in the family? Parental roles in the epidemic of childhood obesity. *J Consum Res.* 2017;43(5):824–859.
20. Bahreynian M, Qorbani M, Khaniabadi BM, Motlagh ME, Safari O. Association between obesity and parental weight status in children and adolescents. *J Clin Res Pediatr Endocrinol.* 2017;9(2):111–117.
21. Arreola E, Martínez O, Armendáriz P, Maldonado M, Lara B. Evaluation of genetic damage and eating habits in children with normal weight and obesity in school age. *Nutr Hosp.* 2019;36(2):309–314.
22. Demir G, Süer O, Kaya S. Investigation of milk and dairy products consumption of adolescents. *J Curr Res Heal Sect.* 2018;8(2):303–314.
23. Larson N, Miller JM, Eisenberg ME, Watts AW, Story M, Neumark-Sztainer D. Multicontextual correlates of energy-dense, nutrient-poor snack food consumption by adolescents. *Appetite.* 2017;112:23–34.