

Original Research Article

The prevalence of obesity and the factors affecting obesity in the students of secondary education

Feyzi Gokosmanoglu¹, Hasret Cengiz², Ceyhun Varim^{2*}, Selcuk Yaylaci², Ahmet Nalbant²,
Cengiz Karacaer²

¹Department of Endocrinology, Medical Park Hospital, Ordu, Turkey

²Department of Endocrinology and Internal Medicine, Sakarya University Medicine Faculty, Sakarya, Turkey

Received: 23 May 2019

Revised: 17 June 2019

Accepted: 03 July 2019

*Correspondence:

Dr. Ceyhun Varim,

E-mail: ceyhunvarim@yahoo.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Childhood obesity has reached alarming dimensions all around the world. In this study, our objective is to determine the prevalence of childhood obesity in the secondary education as well as genetic, cultural and environmental factors giving rise to obesity, nutritional habits, family history and activity status.

Methods: The research was performed on 750 students aged between 14-18. Body Mass Index (BMI= weight/height² (kg/m²)) and Relative Body Mass Index (Rel BMI) values of each child were calculated by making use of their height and weight measurements. An evaluation was made through the use of a questionnaire form consisting of 46 questions that questioned the family history, nutritional habits and activity status of the children at issue.

Results: About 41.7% of 750 children incorporated into the study were female, whereas 58.2% of them were male. The age distribution was between the age range, 14-18. According to BMI values, 12.3% of the children were overweight, while 4% of them were obese. According to Relative BMI values, on the other hand, 10.4% of the children were overweight, whereas 12.9% of them were obese. When the children's nutritional habits, activity status and family history were evaluated, we ascertained that doing physical exercises irregularly, consuming pastry foods at home and the presence of obesity history within the family had all led to the development of obesity as well as being overweight ($p < 0.05$).

Conclusions: In these research subjects comprising children of secondary education, we showed that the nutritional habits, cultural nutritional differences and the insufficiency in physical activities as well as the genetic susceptibility in children could be the determinants in obesity development.

Keywords: Children, Nutrition, Obesity

INTRODUCTION

Obesity starting in childhood may continue into adulthood and pose a risk in terms of health. The rapid increase of obesity in the children of the Mediterranean countries has been found to be quite striking.¹ In Turkey, the idea that "a fat child is healthy and well-cared for" is still accepted by most families.²

Family obesity levels, socio-economic status, educational attainment, and family structure are all related to childhood obesity.³

In this study, we aimed to determine the prevalence of childhood obesity in secondary students as well as the genetic, cultural, and environmental factors which may

give rise to obesity in terms of nutritional habits, family history, and activity levels of children.

METHODS

The research was conducted on 750 students attending secondary education schools. Students' data were collected between January 2017 and June 2017.

Written informed consent was obtained from each subject and subject's mother or father following a detailed explanation of the objectives and protocol of the study. Subjects, who did not agree to answer questionnaire form or not signature patient consent form, were not included in the study. The genders and ages of the students were processed into data collecting charts.

Weights and heights were measured via a digital platform, and body mass index ($BMI = \text{Weight} / \text{height}^2$ (kg/m^2)) and relative body mass index (Rel BMI) of each child were all calculated.⁴ When BMIs were calculated, percentile tables and graphics of disease prevention according to age and gender were used, as approved by the control center.⁵⁻⁶

BMI levels between 25-29.99 were accepted as overweight, ≥ 30 were obese, while those between 110 and 120.99% according to Rel BMI values were accepted as overweight. Those at $\geq 121.0\%$ were obese, while those between the 85 and 94.99 percentiles according to BMI percentiles were regarded as overweight. Those at ≥ 95 percentile were accepted as obese. A questionnaire form consisting of 46 questions concerning family history, nutritional habits, and activity status of children was filled out.

Statistical analyses of the data obtained from the measurements in question were performed using the SPSS 20.0 package program. Mean values and standard deviations of the obtained data were calculated as well. In statistical analyses, compliance of continuous variables with the normal distribution was checked using the Shapiro-Wilk Test.

The homogeneity of group variances, on the other hand, was examined via Levene's Test. Mann-Whitney U Test was used in order to compare the average of two independent groups in terms of these variables which did not ensure parametric test estimations. Group averages were compared through Student's t-test in terms of the variables that fulfilled the estimations.

In the analysis of categorical variables, Fisher's exact test was used. The results were represented in terms of the number of observations (n) and percentage (%). The $p < 0.05$ level was accepted as statistically significant. The dataset was analyzed using SPSS 20.0 (SPSS version 20.0; SPSS Inc., Chicago IL, USA) statistical software.

RESULTS

About 41.7% of the 750 children incorporated into the study were female, whereas 58.2% of them were male. Ages ranged from 14 to 18. According to BMI values, 12.3% (n=92) of all the children were overweight, whereas 4% (n=30) of them were obese. According to relative BMI values, 10.4% (n=78) of children were overweight, while 12.9% (n=97) were obese. When the anthropometric measurements of the students were evaluated according to Neyzi standards, it was determined that 8.8% (n=66) of the children were overweight, whereas 8.3% (n=62) were obese (Table 1).

Table 1: The prevalence of obesity and being overweight in children through 3 different methods.

Methods	Normal		Over weight		Obese		Total
	n	%	n	%	n	%	
BMI	628	83.7	92	12.3	30	4	750
Rel BMI	575	76.7	78	10.4	97	12.9	750
BMI-Percent ile	622	82.9	66	8.8	62	8.3	750

In children's family history, the presence of obese individuals within the family was found to be statistically significant for both obesity and overweight; the more the number of obese individuals increase within the family, the more the state of overweight and obese was observed ($p < 0.05$). As daily pastry food cooking and consumption at home increased, a statistically significant decrease was determined in the prevalence of obesity and overweight ($p < 0.05$). A decrease in the prevalence of obesity and overweight was determined in those that consumed saturated fat, particularly butter, when compared with those that consumed edible oil ($p < 0.05$). Regular physical exercises reduced the prevalence of obesity and overweight, which was also found to be statistically significant ($p < 0.05$) (Table 2).

Although a decrease was determined in the prevalence of obesity and overweight as the number of daily meals increased, this was found to be statistically insignificant ($p > 0.05$). As the number of bread slices consumed during meals increased, a decrease was found in the prevalence of obesity and overweight, which was also found to be statistically insignificant ($p > 0.05$). On the other hand, as daily walking distance increased, a decrease in the negative direction was determined in the prevalence of obesity and overweight, which was found to be statistically insignificant as well ($p > 0.05$). No relationship was determined between obesity and overweight and a sedentary lifestyle, such as using electronic devices such as watching TV on a daily basis and using smart phones for entertainment (Table 3).

Table 2: The distribution and percentages of the effects of pastry foods, consumption of bakery products, regular sports activities, the presence of an obese individual in the child's family history, and consumption of saturated fat on children's weight according to the body mass index value.

Frequency of Activities	BMI			Rel BMI			BMI Percentile		
	Normal	Overweight	Obese	Normal	Overweight	Obese	Normal	Overweight	Obese
Consumption of Pastry Foods and Bakery Products / Weekly									
None	12 60%	6 30%	2 10%	19 50%	4 20%	6 30%	12 60%	5 25%	3 15%
Activities Done and Foods consumed occasionally	331 82.5%	53 13.2%	17 4.2%	294 73.3%	49 12.2%	58 14.5%	326 81.3%	38 9.5%	37 9.2%
Once or Twice a Week	151 86.3%	20 11.4%	4 2.3%	143 8.7%	14 8%	18 10.3%	149 85.1%	15 8.6%	11 6.3%
3-4 times a Week	115 87.1%	11 8.3%	6 4.5%	110 83.3%	10 7.6%	12 9.1%	116 87.9%	7 5.3%	9 6.8%
5-6 times a Week	19 86.4%	2 9.1%	1 4.5%	18 81.8%	1 4.5%	3 13.6%	19 86.4%	1 4.5%	2 9.1%
P value	=0.000			=0.000			=0.000		
Doing Sports Activities Regularly on a Daily Basis									
Sports Activities are performed regularly	314 81.8%	53 13.4%	19 11%	287 72.5%	51 12.9%	58 14.6%	316 94.8%	41 10.4%	39 9.8%
Sports Activities are <u>not</u> performed regularly	303 85.8%	39 11%	11 3.1%	287 81.3%	27 7.6%	39 11%	305 86.4%	25 7.1%	23 6.5%
P value	=0.153			=0.027			=0.020		
The Presence of an Obese Individual within the Family									
No Obesity	401 89.5%	41 9.2%	6 1.3%	367 81.9%	42 9.4%	39 8.7%	397 88.6%	32 7.1%	19 4.2%
1-2 obese individuals	201 77.9%	43 16.7%	14 5.4%	187 72.5%	29 11.2%	42 6.3%	199 77.1%	31 12%	28 10.9%
3-4 obese individuals	20 60.6%	20 21.7%	6 18.2%	16 48.5%	6 18.2%	11 33.3%	20 60.6%	3 9.1%	10 30.3%
5-6 obese individuals	6 54.5%	1 9.1%	4 36.4%	5 45.5%	1 9.1%	5 45.5%	6 54.5%	0 0%	5 45.5%
P value	=0.000			=0.000			=0.000		
Consumption of Butter									
Butter is not consumed daily, or it is consumed very rarely	257 80.2%	39 15.1%	12 4.7%	189 73.1%	29 11.2%	40 15.2%	207 80.2%	24 9.3%	27 10.5%
Butter is consumed on a daily basis, either during meals or directly	420 85.5%	53 10.8%	18 3.7%	385 78.4%	49 10%	57 11.6%	414 84.5%	42 8.6%	35 7.1%
P value	=0.002			=0.003			=0.002		

Table 3: The distribution and percentages of the effects of the number of daily meals, the number of bread slices consumed during a single meal/course, and the daily walking distance on children's weight according to the classification of body mass index value.

Frequency of Activities	BMI			Rel BMI			BMI Percentile		
	Normal	Overweight	Obese	Normal	Overweight	Obese	Normal	Overweight	Obese
The Number of Daily Meals									
2 meals / day	128 83.1%	19 12.3%	7 4.5%	119 77.3%	10 6.5%	25 16.2%	127 82.5%	12 7.8%	15 9.7%
3 meals / day	319 80.6%	58 14.6%	19 4.8%	289 73%	52 13.1%	55 13.9%	320 80.8%	39 9.8%	37 9.3%
4 meals / day	119 89.5%	10 7.5%	4 3%	109 82%	11 8.3%	13 9.8%	114 85.7%	11 8.3%	8 6%
5 meals / day	39 92.9%	3 7.1%	0 0%	36 85.7%	4 9.5%	2 4.8%	38 90.5%	3 7.1%	1 2.4%
≥ 6 meals / day	23 92%	2 8%	0 0%	22 88%	1 4%	2 8%	23 92%	1 4%	1 4%
P value	=0.20			=0.08			=0.59		
The Number of Bread Slices Consumed During a Single Meal									
1-2 slice/s / meal	163 84.5%	19 9.8%	11 5.7%	148 76.7%	20 10.4%	25 13%	161 83.4%	11 5.7%	21 10.9%
3-4 slices / meal	212 81.5%	36 13.8%	12 4.6%	191 73.5%	27 10.4%	42 16.2%	207 79.6%	27 10.4%	6 10%
5-6 slices / meal	143 84.1%	22 12.9%	5 2.9%	131 77.1%	20 11.8%	19 11.2%	142 8.5%	17 10%	11 6.5%
≥ 7 slices / meal	110 86.6%	15 11.8%	2 1.6%	105 82.7%	11 8.7%	11 8.7%	112 88.2%	11 8.7%	4 3.1%
P value	=0.44			=0.43			=0.08		
Daily Walking Distance									
1-2 km/ day	274 82.5%	43 13%	15 4.5%	244 73.5%	38 11.4%	50 15.1%	266 80.1%	33 9.9%	33 9.9%
3-4 km/ day	193 82.8%	30 12.9%	10 4.3%	177 76%	27 11.6%	29 12.4%	195 83.7%	19 8.2%	19 8.2%
5-6 km/ day	94 87%	11 10.2%	3 2.8%	90 83.3%	6 5.6%	12 11.1%	93 86.1%	8 7.4%	7 6.5%
7-8 km/ day	33 82.5%	6 15%	1 2.5%	31 77.5%	5 12.5%	4 10%	33 82.5%	5 12.5%	2 5%
≥ 9 km/ day	33 91.7%	2 5.6%	1 2.8%	32 88.9%	2 5.6%	2 5.6%	34 94.4%	1 2.8%	1 2.8%
P value	=0.95			=0.49			=0.67		

DISCUSSION

Throughout the world, obesity prevalence in children continues to increase, even though it varies according to country and age.⁷ In research carried out in European countries, the prevalence of overweight for those aged between 9 and 18 has been shown to be range from 26.6% to 48.9%, whereas obesity was found to range from 9% to 22.3%.⁸ The prevalence of overweight in the children in India ranges from 21.3% and 27.3%, while the prevalence of obesity was determined to be 11.8%.⁹ The prevalence of overweight for the age group 2 to 19 was

found to range from 9.9% and 17.6%, whereas obesity prevalence was determined to range from 1.6% to 7.8% in Turkey.¹⁰

In our study, children aged between 14 and 18 proved to be overweight by 12.3%, while 4% of them proved to be obese in accordance with BMI values. According to relative BMI values, however, 10.4% of the children were overweight, while 12.9% of them were obese. When the anthropometric measurements of the children were evaluated according to Neyzi standards, we ascertained that 8.8% of the children were overweight, while 8.3% were obese. It was seen in our study that the prevalence

of obesity and overweight was less seen in our country than the USA and the European and Asian countries.

In our study, it was determined that there was an increase in obesity prevalence, yet a decrease in the prevalence of being overweight. As seen throughout the world, obesity prevalence is increasing at an alarming rate in Turkey. Such children are candidates for societal and health problems as adult obese individuals in the future.^{10,11}

Although several factors have had an impact on the increase in obesity prevalence in children, the primary environment in this matter remains the family environment. It has been determined that the presence of obesity within a family, their socio-economic status, and their educational levels all have an effect on obesity.² Since risk factors in children are not fully known, we determined the nutritional habits, activity status, and family history of the children in this study.

In the literature, the fact that one or both of the parents are obese has been reported to increase the likelihood childhood obesity.^{12,13} In our research, we found a statistically significant relationship between the presence of an obese individual within the child's family circle and obesity and overweight. Our study is consistent with the literature. Yet, the rapidly increasing obesity prevalence in the developed countries should be associated with environmental factors rather than genetic factors.

Apart from the view that the total amount of fat found on the basis of dietary treatments related with obesity should be minimized, it must be emphasized that energy requirements should be provided through carbohydrates. However, here, the type and the amount of carbohydrates are of great importance.¹⁴ One article reported that diets low in carbohydrates are more effective for maintaining short-term (≤ 6 months) body weight loss.¹⁵ In another study, a strong relationship was found between obesity prevalence and the type of carbohydrate consumed in developed countries.¹⁶ In our research, we determined that there was a statistically significant decrease in the prevalence of obesity and overweight as the daily pastry food cooking and consumption at home increased. In our region, pastry foods prepared at home are fermented and prepared from whole wheat flour containing no sweetening agent. Separately, these foods are enriched by adding several additional local nutrients, such as cheese, skim-milk cheese, spring onion, nettle, spinach, mallow, yoghurt, and eggs, and the dough or pastry is thus enhanced. There are major differences in our cultural nutritional habits and those of Europe and the USA, which are quite distinct in terms types of fast foods consumed. This factor is considered prominent.

Obesity tends to mostly be seen in children who are physically inactive. Hence, obesity may be minimized by encouraging physical activities and minimizing the sedentary lifestyle.¹⁷ In our study, the fact that sports activities regularly decreased the prevalence of obesity

and overweight was found to be statistically significant. We found that there was a decrease in the negative direction in the prevalence of obesity and being overweight as the daily walking distance increased. Activities that lead to a decrease in physical activity, such as watching television and playing video games, are closely associated with obesity.¹⁸ However, in our study, we could not determine a relationship between the prevalence of obesity and overweight and a sedentary lifestyle, such as using electronic devices for watching television on a daily basis or using smart phones for entertainment.

Another important point concerns arguments over consuming meals regularly and the amount of meals consumed. According to the results of a study conducted by Chapelot et al., in which the body compositions of individuals who consumed three (3 main courses) and four (3 main courses - 1 snack) meals or courses were evaluated, it was determined that there was an increase in the body fat mass, leptin concentration, and respiration capacity due to skipping meals.¹⁹ We determined, however, that there was a statistically insignificant decrease in the prevalence of obesity and overweight as the number of daily courses or meals increased.

When evaluated along with extant studies in the literature, it may be seen that meals should not be skipped and that the prevalence of obesity is minimized by making snacks available between meals.

CONCLUSION

The prevalence of childhood obesity is properly regarded as a health crisis which threatens every segment of society in the USA and Europe. Obesity is increasing at an alarming rate in Turkey as well. Obese children may experience elevated levels of comorbid symptoms and mortality in adulthood. Additionally, obesity may also cause systemic complications in childhood. For this reason, childhood obesity must be recognized and diagnosed early, and preventive measures must be taken while keeping all risk factors in mind. In this respect, children's awareness of the dangers of obesity must be raised, particularly at schools.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Europe, WHO. The Challenge of Obesity in the WHO European Region, 2005. Internet Communication. Available at: http://www.euro.who.int/__data/assets/pdf_file/0008/98243/E89858.pdf. Accessed September 2005.
2. Inal S, Canbulat N. General overview on childhood obesity. *Guencel Pediatri*. 2013;11(1).

3. Golan M, Weizman A. Familial approach to the treatment of childhood obesity: conceptual model. *J Nutri Edu.* 2001;33(2):102-7.
4. Neyzi O, Gunoz H, Furman A, Bundak R, Gokcay G, Darendeliler F, et al. Weight, height, head circumference and body mass index references for Turkish children. *J Child Heal Dis.* 2008;51(1):1.
5. Kuczmarski, R. 2000 CDC growth charts for the United States; methods and development, 2002. <https://stacks.cdc.gov/view/cdc/6451>. Accessed May 2002.
6. World Health Organization. Obesity: preventing and managing the global epidemic. World Health Organization; 2000.
7. Skinner AC, Skelton JA. Prevalence and trends in obesity and severe obesity among children in the United States, 1999-2012. *JAMA Pediatr.* 2014;168(6):561-6.
8. Wijnhoven TM, van Raaij JM, Spinelli A, Starc G, Hassapidou M, Spiroski I, et al. WHO European Childhood Obesity Surveillance Initiative: body mass index and level of overweight among 6–9-year-old children from school year 2007/2008 to school year 2009/2010. *BMC Pub Heal.* 2014;14(1):806.
9. Aziz N, Kallur SD, Nirmalan PK. Implications of the revised consensus body mass indices for Asian Indians on clinical obstetric practice. *J Clinic Diagnos Res: JCDR.* 2014;8(5):OC01.
10. Sancak R, Dundar C, Totan M. The prevalence of obesity and predisposal factors in students of secondary school and lycee. *J Exp Clin Med.* 1999;16(1):19-24.
11. Dünder C, Öz H. Obesity-related factors in Turkish school children. *Sci World J.* 2012.
12. Hui LL, Nelson EA, Yu LM, Li AM, Fok TF. Risk factors for childhood overweight in 6-to 7-y-old Hong Kong children. *Int J Obes.* 2003;27(11):1411.
13. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *New Eng J Med.* 1997;337(13):869-73.
14. Erol A. Effects of fat-rich diet on BMI and other metabolic parameters. “Obesity” Ankara, Turkey *Obes Res Associat Pub.* 2001;2: 44-8.
15. Klein S. Clinical trial experience with fat-restricted vs. carbohydrate-restricted weight-loss diets. *Obes Res.* 2004;12(S11):141S-4S.
16. Wylie-Rosett J, Segal-Isaacson CJ, Segal-Isaacson A. Carbohydrates and increases in obesity: does the type of carbohydrate make a difference?. *Obes Res.* 2004;12(S11):124S-9S.
17. Epstein LH, Paluch RA, Gordy CC, Dorn J. Decreasing sedentary behaviors in treating pediatric obesity. *Arch Pediatr Adolesc Med.* 2000;154(3):220-6.
18. Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA.* 1999;282(16):1561-7.
19. Marques-Vidal P, Goncalves A, Dias CM. Milk intake is inversely related to obesity in men and in young women: data from the Portuguese Health Interview Survey 1998–1999. *Int J Obes.* 2006;30(1):88.

Cite this article as: Gokosmanoglu F, Cengiz H, Varim C, Yaylaci S, Nalbant A, engiz Karacaer C. The prevalence of obesity and the factors affecting obesity in the students of secondary education. *Int J Res Med Sci* 2019;7:2989-94.