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

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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.1

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 datas 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=Weight / height² (kg/m²)) and relative body mass index (Rel BMI) of each child were all calculated. When BMIs were calculated, percentile tables and graphics of disease prevention according to age and gender were used, as approved by the control center.

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 ≥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).

| Methods | Normal | Overweight | Obese | Total |
|---------|--------|------------|-------|-------|
| BMI     | 628    | 83.7       | 92    | 12.3  | 30 | 4 | 750 |
| Rel BMI | 575    | 76.7       | 78    | 10.4  | 97 | 12 | 9 | 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 | 6 | 2 | 19 | 4 | 6 | 12 | 5 | 3 |
| Activities Done and Foods consumed occasionally | 60% | 30% | 10% | 50% | 20% | 30% | 60% | 25% | 15% |
| Activities Done | 331 | 53 | 17 | 294 | 49 | 58 | 326 | 38 | 37 |
| and Foods consumed | 82.5% | 13.2% | 4.2% | 73.3% | 12.2% | 14.5% | 81.3% | 9.5% | 9.2% |
| Once or Twice a Week | 151 | 20 | 4 | 143 | 14 | 18 | 149 | 15 | 11 |
| 3-4 times a Week | 115 | 11 | 6 | 110 | 10 | 12 | 116 | 7 | 9 |
| 5-6 times a Week | 19 | 2 | 1 | 18 | 1 | 3 | 19 | 1 | 2 |
| P value | =0.000 | =0.000 | =0.000 |

Doing Sports Activities Regularly on a Daily Basis

| Sports Activities are performed regularly | 314 | 53 | 19 | 287 | 51 | 58 | 316 | 41 | 39 |
| Sports Activities | 81.8% | 13.4% | 11% | 72.5% | 12.9% | 14.6% | 94.8% | 10.4% | 9.8% |
| Sports Activities are not performed regularly | 303 | 39 | 11 | 287 | 27 | 39 | 305 | 25 | 23 |
| Sports Activities | 85.8% | 11% | 11% | 81.3% | 7.6% | 11% | 86.4% | 7.1% | 6.5% |
| P value | =0.153 | =0.027 | =0.020 |

The Presence of an Obese Individual within the Family

| No Obesity | 401 | 41 | 6 | 367 | 42 | 39 | 397 | 32 | 19 |
| Obesity | 89.5% | 9.2% | 1.3% | 81.9% | 9.4% | 8.7% | 88.6% | 7.1% | 4.2% |
| 1-2 obese individuals | 201 | 43 | 14 | 187 | 29 | 42 | 199 | 31 | 28 |
| 1-2 obese individuals | 77.9% | 16.7% | 5.4% | 72.5% | 11.2% | 6.3% | 77.1% | 12% | 10.9% |
| 3-4 obese individuals | 20 | 20 | 6 | 16 | 6 | 11 | 20 | 3 | 10 |
| 3-4 obese individuals | 60.6% | 21.7% | 18.2% | 48.5% | 18.2% | 33.3% | 60.6% | 9.1% | 30.3% |
| 5-6 obese individuals | 6 | 1 | 4 | 5 | 1 | 5 | 6 | 0 | 5 |
| P value | =0.000 | =0.000 | =0.000 |

Consumption of Butter

| Butter is not consumed daily, or it is consumed very rarely | 257 | 39 | 12 | 189 | 29 | 40 | 207 | 24 | 27 |
| Butter | 80.2% | 15.1% | 4.7% | 73.1% | 11.2% | 15.2% | 80.2% | 9.3% | 10.5% |
| consumed on a daily basis, either during meals or directly | 420 | 53 | 18 | 385 | 49 | 57 | 414 | 42 | 35 |
| Butter | 85.5% | 10.8% | 3.7% | 78.4% | 10% | 11.6% | 84.5% | 8.6% | 7.1% |
| P value | =0.002 | =0.003 | =0.002 |
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.\(^9\)

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

| 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  | 19     | 7     | 119 | 10     | 25    | 127   | 12     | 15   |
|                         | 83.1% | 12.3%  | 4.5%  | 77.3% | 6.5%  | 16.2% | 82.5%  | 7.8%  | 9.7% |
| 3 meals / day           | 319  | 58     | 19    | 289 | 52     | 55    | 320   | 39     | 37   |
|                         | 80.6% | 14.6%  | 4.8%  | 73%  | 13.1%  | 13.9% | 80.8%  | 9.8%  | 9.3% |
| 4 meals / day           | 119  | 10     | 4     | 109 | 11     | 13    | 114   | 11     | 8    |
|                         | 89.5% | 7.5%   | 3%    | 82%  | 8.3%   | 9.8%  | 85.7%  | 8.3%  | 6%   |
| 5 meals / day           | 39   | 3      | 0     | 36  | 4      | 2     | 38    | 3      | 1    |
|                         | 92.9% | 7.1%   | 0%    | 85.7% | 9.5%  | 4.8%  | 90.5%  | 7.1%  | 2.4% |
| ≥ 6 meals / day         | 23   | 2      | 0     | 22  | 1      | 2     | 23    | 1      | 1    |
|                         | 92%  | 8%     | 0%    | 88%  | 4%     | 8%    | 92%   | 4%     | 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%                                                  |
| 9.8%                                                   |
| 5.7%                                                   |
| 76.7%                                                  |
| 10.4%                                                  |
| 13%                                                    |
| 83.4%                                                  |
| 5.7%                                                   |
| 10.9%                                                  |
| 3-4 slices / meal                                      |
| 212                                                    |
| 81.5%                                                  |
| 36                                                     |
| 12                                                     |
| 4.6%                                                   |
| 73.5%                                                  |
| 10.4%                                                  |
| 16.2%                                                  |
| 79.6%                                                  |
| 10.4%                                                  |
| 10%                                                    |
| 6.5%                                                   |
| 5-6 slices / meal                                      |
| 110                                                    |
| 86.6%                                                  |
| 15                                                     |
| 2                                                       |
| 105                                                    |
| 82.7%                                                  |
| 8.7%                                                   |
| 8.7%                                                   |
| 88.2%                                                  |
| 8.7%                                                   |
| 3.1%                                                   |
| P value                                                |
| =0.44                                                  |
| =0.43                                                  |
| =0.08                                                  |

| Daily Walking Distance |
|------------------------|
| 1-2 km/ day            |
| 274                    |
| 82.5%                  |
| 13%                    |
| 4.5%                   |
| 73.5%                  |
| 11.4%                  |
| 15.1%                  |
| 80.1%                  |
| 9.9%                   |
| 9.9%                   |
| 3-4 km/ day            |
| 193                    |
| 82.8%                  |
| 12.9%                  |
| 4.3%                   |
| 76%                    |
| 11.6%                  |
| 12.4%                  |
| 83.7%                  |
| 8.2%                   |
| 8.2%                   |
| 5-6 km/ day            |
| 94                     |
| 87%                    |
| 10.2%                  |
| 2.8%                   |
| 83.3%                  |
| 5.6%                   |
| 11.1%                  |
| 86.1%                  |
| 7.4%                   |
| 6.5%                   |
| 7-8 km/ day            |
| 33                     |
| 82.5%                  |
| 15%                    |
| 2.5%                   |
| 77.5%                  |
| 12.5%                  |
| 10%                    |
| 82.5%                  |
| 12.5%                  |
| 5%                     |
| ≥ 9 km/ day            |
| 33                     |
| 91.7%                  |
| 5.6%                   |
| 2.8%                   |
| 88.9%                  |
| 5.6%                   |
| 5.6%                   |
| 94.4%                  |
| 2.8%                   |
| 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.\(^3\) 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 233%.\(^9\) 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.\(^10\)
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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{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.\textsuperscript{14} One article reported that diets low in carbohydrates are more effective for maintaining short-term (≤6 months) body weight loss.\textsuperscript{15} In another study, a strong relationship was found between obesity prevalence and the type of carbohydrate consumed in developed countries.\textsuperscript{16} In our research, we determined that there was a statistically significant decrease in the prevalence of obesity and 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.\textsuperscript{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.\textsuperscript{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.

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