The COVID-19 Pandemic and the Prevalence of Childhood Obesity in Turkiye

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ABSTRACT

Objectives: To examine the prevalence of overweight and obesity in school-age children in Isparta Province, Turkiye, during the coronavirus disease 2019 (COVID-19) pandemic, and to compare the results with those of previous studies conducted in Isparta in 2005, 2009, and 2014.

Methods: The study was carried out in schools in the city center of Isparta in March 2022, during which the weight and height of students were measured using a scale and stadiometer, and the body mass indices (BMI), BMI percentiles, and z scores were calculated.

Results: Of the 8871 students assessed, 4547 (51.3%) were female and the mean age of the sample was 11.92 ± 3.42 (6–18.93) years. The prevalence of overweight was 12%, the prevalence of obesity was 14.5%, and the prevalence of overweight + obesity was 26.5%. A comparison of the figures since 2005 revealed the prevalence of overweight to be stable, while the prevalence of obesity and the prevalence of overweight + obesity were found to have witnessed a decrease ($\chi^2: 57.01, P < 0.001$). The prevalence of obesity was 13% among girls under 11 years of age and 14.3% among girls over 11 years of age; and 18.2% and 12.8% among boys under and over 11 years of age, respectively ($\chi^2: 23.26, P < 0.001$). The prevalence of obesity was significantly higher in boys under 11 years of age.

Conclusions: The prevalence of overweight + obesity was nearly stable in the 3 studies conducted over the 17-year period, but we witnessed an increase in our most recent study conducted during the pandemic. The prevalence of obesity is significantly higher in boys under 11 years of age.

Key Words: child, obesity, pandemic

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The coronavirus disease 2019 (COVID-19) pandemic has had many negative effects on the economic, social, psychological, and physical health all over the world. The quarantine(s) that have been imposed have led to changes in eating habits and lifestyles. Although this situation is expected to affect obesity, it has been a matter of great curiosity how much of an effect it has on the prevalence of obesity.

Obesity has been associated with genetic, environmental (excessive calorie intake, sedentary lifestyle, irregular sleep and medications), endocrine, and syndromic factors (1). Among children and adolescents aged 5–19 years, the prevalence of overweight and obesity has increased dramatically from just 4% in 1975 to just over 18% in 2016 (2). As the increasing prevalence of obesity causes the prevalence of associated comorbidities to increase, it is extremely important for health care providers to detect overweight and obese children early and provide timely counseling and treatment services for a healthy future generation.

The prevalence of obesity is variable around the world as the socioeconomic levels, eating habits, and activity levels of people differ from country to country. The prevalence of overweight and obesity was reported to be 13.8%–24.2% and 10.7–21.5%, respectively, in some studies from different countries (3–5). Studies have reported that a significant proportion of cases of adolescent obesity develop before the age of 11. The prevalence of childhood obesity in Turkiye is similar to that of the United Kingdom, France, Canada, and Ireland, according to Organisation for Economic Co-Operation and Development OECD 2019 data (6).

The prevalence of overweight and obesity differs also from city to city in Turkiye. In Malatya, a city in the eastern part of Turkiye, in primary and secondary school children, the prevalence of overweight and obesity were reported to be 15.9% and 6.9%, respectively (7). The prevalence of overweight and obesity was reported to be 21.2% and 14.6%, respectively, in school-age children in a study conducted in Ankara, the capital city of Turkiye in the central region of Turkiye (8). The prevalence of overweight and obesity was reported to be 23.2% and 9.8%, respectively, in a study performed in Antalya, a city in the south-western part of Turkiye (9). Rates also vary between urban, rural, and urban-rural areas, which in turn depend on different eating habits and rates of physical activity in different places.

Ethical approval was obtained from the local ethics committee of our hospital (Decision date: 23.12.2021 and No: 364). Informed consent was obtained from the families of all children participating in the study. Written consent was obtained from the patient’s family for publication. Copyright © 2022 by European Society for Pediatric Gastroenterology, Hepatology, and Nutrition and North American Society for Pediatric Gastroenterology, Hepatology, and Nutrition.

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What Is Known

- The rates of overweight and obesity in children worldwide have increased considerably in developed countries over the last 5 decades, although recent reports indicate a plateauing or decline in some high-income countries.
- Studies show that childhood obesity occurs most often before the age of 5 years.

What Is New

- The prevalence of obesity and overweight + obesity was noted to have increased during pandemic.
- The prevalence of obesity in children under 11 years of age is high, especially in boys.
The social isolation and the changes in dietary and lifestyle habits that occurred in the pandemic have been identified as risk factors for the increase in the prevalence of obesity. The food consumed and the changes in eating habits (type of food, uncontrolled eating, snacks between meals, number of main meals) were reported to be unhealthier during the lockdown periods in the Effects of home Confinement on multiple Lifestyle Behaviours (ECLB)-COVID19 international online survey (10). Furthermore, a survey conducted in Italy revealed that the participants easily consumed the foods and increased their food intake to feel better, and that almost half of the participants had developed anxiety as a result of their eating habits. Age and diet control were found to be inversely correlated (odds ratio [OR] = 0.971, P = 0.005), and girls were found to be more anxious than boys, and were more likely to eat more (P < 0.001; P < 0.001) (11). Although it is understood that the prevalence of obesity has increased in the pandemic, few studies have been conducted to address this issue to date.

The present study investigates the prevalence of overweight and obesity in school-age children aged 6–19 in Isparta during the COVID-19 pandemic, and compares the results with those of previous studies conducted in Isparta in 2005, 2009, and 2014. Also, this study determines the prevalence of obesity in the COVID-19 pandemic according to age groups and gender, compare it with 2005, 2009, and 2014 studies.

**METHODS**

**Participants**

A total of 8871 children from 9 elementary schools, 8 secondary schools, and 8 high schools, 2 of which private were included in the present cross-sectional descriptive epidemiological study in the city center of Isparta in March 2022. Isparta is a province in southwestern Türkiye with a population of 445,678. The study population comprised approximately 40,000 students aged 6–19 years studying in schools in the city center of Isparta. The sample size was calculated based on the number of students in the population. Based on the 2014 study by Koca et al (12), the expected prevalence of obesity in this study was accepted as 9.9%, and it was calculated that the sample size should be 8700 students with a confidence level of 95% and a deviation of 5%. The schools from which the sample was drawn were selected by a random sampling method to ensure the inclusion of different schools and to best reflect the socioeconomic and cultural structure of the province.

**Measurements**

The weight and height of the students were measured using a SECA 767 (Hamburg, Germany) scale and a stadiometer. Body weight measurements were made in school clothes and without shoes after the removal of such excess clothing as jackets, vests, and sweaters. The height measurements were made while the students were stood without shoes, with their backs against the wall, with their heads, hips, and heels touching the wall, and with the tops of the earlobes and eyes at the same level.

**Assessments**

Body mass index (BMI; kg/m²) was calculated by dividing the body weight by squared height. The BMI percentiles and z scores were determined using a program prepared based on the percentile curves prepared by Neyzi et al (13) for Turkish children. The percentiles were defined as follows: <5th percentile, underweight; 5th–84.99th percentile, normal; 85th–95th percentile, overweight; and >95th percentile, obese. The children were grouped in line with the World Health Organization (WHO) method of below 11 years of age and 11 years and above, and also as elementary school students for the first 4 years, as secondary school students for the second 4 years and as high school students for the last 4 years.

**Permissions**

Written permissions for the study were obtained in advance from the Isparta Provincial Directorate of National Education and the Isparta Governor’s Office. Ethical approval for the study was obtained from the local ethics committee of our hospital (decision date: December 23, 2021 and No: 364), and the study was carried out in line with the Declaration of Helsinki. Informed consent was obtained from the families of all children participating in the study.

**Statistical Analysis**

Descriptive statistics were used for girl/boy percentages, mean age, mean BMI, prevalence of overweight, obesity and overweight + obesity. Descriptive statistics were calculated for all variables on the survey years (2005, 2009, 2014, and 2022) and for the different sexes.

Prior to the statistical analysis, the variables were identified as either categorical or continuous. A Chi-square test was used for the analysis of non-parametric variables among the categorical parameters. Changes in obesity prevalence by year were analyzed by chi-square test, comparison of overweight, obesity and overweight + obesity prevalences by gender, and comparison of obesity prevalences under 11 years and over 11 years of age by gender were analyzed by chi-square test.

Changes across time (in the analysis of categorical data in more than 2 independent groups) were analyzed using chi-square testing.

SPSS 26 package program was used in the evaluation of the data. P < 0.05 was accepted as significant.

**RESULTS**

The study sample of 8871 students included 4547 (51.3%) girls, and the mean age was 11.92 ± 3.42 (6–18.93) years. The mean BMI of the children was 20.01 ± 4.44 kg/m² (10.5–43.43 kg/m²). The socio-demographic characteristics of children are presented in Table 1. The prevalence of overweight was 12%; the prevalence of obesity was 14.5%; and the prevalence of overweight + obesity was 26.5%. An assessment of the figures since 2005 reveals the prevalence of overweight to have been stable. The prevalence of obesity and overweight + obesity was found to have increased when compared to the 2005, 2009, and 2014 studies, and the difference was statistically significant (χ²: 57.01, P < 0.001). The prevalences of overweight, obesity, and overweight + obesity in 2005, 2009, 2014, and in 2022 study are presented in Table 2 and Figure 1.

The prevalence of overweight was 12.2%; the prevalence of obesity was 13.8% and the prevalence of overweight + obesity was 26% among girls, while the prevalence of overweight was 11.9%, the prevalence of obesity was 15.2%, and the prevalence of overweight + obesity was 27.1% among boys. There was no statistically significant difference between sexes (χ²: 1.45, P = 0.22). The prevalence of obesity was 9%, 11.2% and 8%, respectively, in girls and 14%, 13.4%, and 11.7%, respectively, in boys in the studies performed in 2005, 2009, and 2014, respectively.

The prevalences of obesity in children under the age of 11 years and over the age of 11 years in 2005, 2009, 2014, and in 2022 study are presented in Table 3. Our study found the prevalence of obesity increased to 15.6% in children under the age of 11 years; and to 13.6% in children over the age of 11 years.

The prevalence of obesity was 13% in girls under the age of 11 years and 14.3% in girls over the age of 11 years; and 18.2% and 12.8% among boys under and over the age of 11 years, respectively.
DISCUSSION

Overweight and obesity are major health problems with increasing prevalence in school-age children. As obesity and its associated problems underlie many diseases, childhood obesity can be considered a major problem that affects future generations in society. Knowing the prevalence of overweight and obesity in school-age children and taking the necessary precautions should be the primary goal of healthcare administrators.

Our study is a valuable study that compares with 3 other studies that evaluated the prevalence of obesity in school children intermittently in the previous 17-year period in Isparta province and shows the change over the years. Since our study includes the pandemic process, we think it is extremely valuable in terms of showing the possible effects of the pandemic on obesity. In the literature, we could not find studies comparing the prevalence of obesity with intermittent repetitive studies covering such a long period of time and including the pandemic period. In this respect, we believe that our study is extremely valuable in terms of providing important information about the change in obesity prevalence during the pandemic period.

In a study conducted in the United States, it was stated that the prevalence of obesity in children increased from 15.1% in 2018 to 15.7% in 2019 and, to 17.3% in 2020 with the pandemic. There was a higher-than-expected increase in the prevalence of obesity in boys aged 6–11 years (2.8%; 95% confidence interval (CI), 0.8%–4.8%) (14). In a study conducted in China, it was found that the prevalence of obesity in children increased from 12.29% in 2017 to 13.28% in 2019 and 15.29% in 2020. The increase in boys was found to be significant compared to girls (15). In another

There was a statistically significant difference between sexes according to age classification ($\chi^2$: 23.26, $P < 0.001$).

The prevalence of overweight + obesity was higher in the elementary school group than in the other groups, and the difference between the groups was statistically insignificant ($\chi^2$: 1.37, $P = 0.504$). The prevalences of overweight, obesity, and overweight + obesity in elementary, secondary, and high school are presented in Table 4.

### TABLE 1. The sociodemographic characteristics of children

| Gender       | Girl (n/%) | Boy (n/%) |
|--------------|-----------|-----------|
| Age average  | 12.07 ± 3.44 | 11.77 ± 3.40 |
| Weight average | 45.97 ± 16.68 | 48.34 ± 19.8 |
| Height average | 149.12 ± 16.13 | 152.54 ± 19.80 |
| BMI average   | 19.97 ± 4.44 | 20.05 ± 4.43 |
| Age (under 11 y old) | 1899 (49.9%) | 1907 (50.1%) |
| Age (11 y and older) | 2648 (52.3%) | 2417 (47.7%) |
| Primary school | 1662 (49.3%) | 1709 (50.7%) |
| Secondary school | 1359 (44.3%) | 1416 (55.7%) |
| High school    | 1526 (56%) | 1199 (44%) |

BMI = body mass index.

### TABLE 2. The prevalences of overweight, obesity, and overweight + obesity in 2005, 2009, 2014, and the current study

|          | 2005 | 2009 | 2014 | 2022 |
|----------|------|------|------|------|
| Overweight % | 12.2 | 10.4 | 13.6 | 12  |
| Obesity %   | 11.6 | 12.5 | 9.9  | 14.5 |
| Overweight + obesity % | 23.8 | 23.5 | 23.5 | 26.5 |

$\chi^2 = 57.01, P < 0.001$.

FIGURE 1. The prevalences of overweight, obesity, and overweight + obesity by years.
TABLE 3. Obesity prevalences of children under the age of 11 y and over the age of 11 y in 2005, 2009, 2014, and in the current study

| Year       | 2005   | 2009   | 2014   | 2022   |
|------------|--------|--------|--------|--------|
| Under the age of 11 y | 11.1   | 10.2   | 10.1   | 15.6   |
| Over the age of 11 y | 11.6   | 14.6   | 9.8    | 13.6   |

The prevalence of obesity was reported to increase from 13.7% (June–December 2019) to 15.4% (June–December 2020) during the pandemic in a study conducted in Philadelphia, and the increase was more prominent in patients aged 5–9 years. Obesity was found to increase for all age ranges, reported to be 1.0% and 2.6% among patients aged 13–17 years and 5–9 years, respectively (26). An assessment from the United Kingdom also found that the prevalence of obesity in primary school seniors increased sharply from 14.4% to 25.5% between 2020 and 2021 (27). These data support our study and suggest a more significant increase in the prevalence of obesity, especially in boys under the age of 11. Therefore, it can be said that more attention should be paid to childhood nutrition in boys under 11 years of age. The significantly higher prevalence of obesity among boys under the age of 11 years may be related to the greater hyperactivity in this age group prior to the pandemic, and their poorer adaptation to a sedentary lifestyle than girls during the pandemic. The increased prevalence of obesity in those under the age of 11 years may lead to obesity in adolescence-adulthood and an increased rate of cardiovascular and diabetic diseases. The fact that the prevalence of obesity under the age of 11 continues to increase also indicates that adequate measures have not yet been taken in Turkey.

Özsoy et al (28) from Turkey reported a statistically significant increase in the prevalence of overweight and obesity among children with increasing age and number of education years ($\chi^2 = 8.432, P = 0.015; \chi^2 = 9.520, P = 0.023$). The 2005 study of Şimşek et al (29) reported that the prevalence of obesity increased as the age of children increased. Our study revealed the prevalence of overweight + obesity to be higher in the elementary school age group than in the other age groups, and that the prevalence of overweight and obesity decreased with age, although the difference between the groups was statistically insignificant. This may be attributed to the easier access to electronic devices such as television, computers, and tablets, and the subsequent increase in screen times during the lockdowns imposed in response to the pandemic. Also, the increased rate of sedentary living, the changing play habits of children from mobile outside games to inside games, the impaired dietary habits associated with economic decline and with the higher rates of interference of mothers with nutrition of elementary schoolchildren may be other causes.

If we compare the studies conducted in Isparta since 2005, it is seen that the prevalence of obesity has increased significantly in our last study. It may not be correct to attribute this increase to the pandemic alone (29,30). Other factors that we did not take into account may also be effective in this process. However, we can say that the biggest share in this change is the pandemic that clearly affects our lives. This may be linked to the drastically increased screen time of children watching TV, playing games, or studying on tablets. Also, irregular eating habits such as eating less healthy, non-core or highly processed foods at home may have affected these rates.

The consumption of healthy food, physical exercise, weight management, follow-up, and evaluations in early childhood and in those of school age are recommended to prevent the development of obesity. The adequate and balanced consumption of fruit and vegetables, refraining from sugary snacks and sodas, and working out rather than watching TV and using other electronic devices are recommended. The greater prevalence of obesity among boys under the age of 11 indicates a need to reduce the prevalence of obesity.
especially among children under the age of 11 years. The World Health Organization (WHO) recommends at least 60 minutes of moderate-intensity physical activity per day for children aged 5–17 years, and it has been stated that moderate-intensity physical activity at least 3 times a week is required to strengthen the muscles and bones in this age group (31).

One drawback of our study is that it was carried out in a single region in Türkiye, and the risk factors affecting the development of obesity during the pandemic and non-pandemic periods were not analyzed.

CONCLUSIONS

In conclusion, the pandemic and related factors have an increasing effect on the prevalence of obesity. More comprehensive studies are needed that will support the results of this study with the aim of taking into account the causes and associated risk factors.

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