Food addiction: A key factor contributing to obesity?

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Background: People may develop addiction to hyperpalatable foods, which may be a cause of obesity. This study aimed to determine the prevalence of obesity among adolescents and the effect of food addiction on obesity. Materials and Methods: In this cross-sectional study, food addiction and obesity status of high school students were investigated. Among 17,000 10th and 11th grade students, assuming the design effect as 2.0, with obesity prevalence of 10%, with 3% error, and 95% confidence interval, at least 752 participants were included. Obesity was the dependent variable, whereas sociodemographic characteristics, body image, eating habits, and food addiction were the independent variables. Food addiction was assessed using the Yale Food Addiction Scale. Obesity was determined by age- and sex-specific body mass index (BMI) percentiles for adolescents < 18 years of age and BMI ≥ 30.0 for those aged ≥ 18. Data were collected through face-to-face interviews. Statistical analyses were performed using SPSS 25.0. After adjustment for age, sex, and other variables, the effect of food addiction on obesity was determined through logistic regression. \( P < 0.05 \) was deemed statistically significant. Results: Among adolescents (\( n = 874 \)), 18.9% were food addict, 25.1% were overweight, and 12.1% were obese. After adjusted for age, sex, and other variables, food addiction significantly increased the risk of obesity (odds ratio: 1.9; 95% confidence interval: 1.167–3.335). Having a fragmented family, working mother, overweight father, and participants not knowing their weight correctly significantly increased obesity. Conclusion: While quarter of the adolescents had weight problems, one-fifth suffered from food addiction. After adjusting for confounders, food addiction significantly increased obesity. Identifying individuals with food addiction, providing treatment to overcome that, paying special attention to adolescents with obese parents or living in fragmented families, and providing support to both parents and adolescents could be useful in tackling obesity.

Key words: Adolescents, food addiction, obesity, student

INTRODUCTION

Obesity is a growing health problem, affecting all age groups in the world.\(^1\) The prevalence of obesity is also increasing among adolescents, which is stated by the World Health Organization as one of the most important public health problems of the 21st century.\(^2\) In a great number of countries, the prevalence of obesity in children and adolescents has doubled since the 1980s.\(^3,4\) Latest Organisation for Economic Co-operation and Development (OECD) report says that the prevalence of overweight (including obesity) was 15.5% in the OECD countries, with the highest rate in the USA (31%) and the lowest in Denmark (9.5%).\(^5\) The Turkish Nutrition and Health Survey (2010) revealed that the prevalence of obesity among adolescents aged 15–18 years was 8.3%, and that one out of every five (21.6%) adolescents had a weight problem.\(^6\) Several studies have demonstrated that given the complex interaction between genetic and environmental influences, overweight or obesity in adolescence may be explained by hereditary factors.\(^7\) Although 18 genes have been identified likely to lead to excessive fat accumulation, it is extremely difficult to reveal the genetic basis of obesity because families share not only genetic material, but also environmental factors and eating habits.\(^8\)

The American Psychiatric Association defines addiction as a chronic disorder whose development and maintenance are affected by biological, psychological,
social, and environmental factors. In the Diagnostic and Statistical Manual of Mental Disorders-V, addiction is given under the heading “substance-related and addictive disorders,” and is defined as inappropriate substance use which leads to clinical disorder manifesting itself as having at least 2 of the 11 criteria within the last 12 months, which is detailed elsewhere.\textsuperscript{[10,11]} Instinctive behaviors such as eating that give people happiness and are necessary for the survival of life are called “natural rewards.”\textsuperscript{[12]} Gearhardt et al. listed the common characteristics of addictive substances and hyperpalatable foods as follows: they increase dopamine and opioid neural system activity, trigger artificially high levels of reward, enter the bloodstream rapidly, stimulate the neurobiological systems, lead to the continued consumption despite negative consequences, and are difficult to quit although the person is willing to quit.\textsuperscript{[13]} Studies suggest that foods containing excess fat/sugar overstimulate reward pathways, and increase dopamine release, which leads to compulsive food consumption, i.e. to food addiction.\textsuperscript{[9,14,15]}

The present study aimed to determine the prevalence of obesity among adolescents in different high schools in an urban area and the effect of food addiction on obesity.

**MATERIALS AND METHODS**

This cross-sectional study was conducted with 10\textsuperscript{th} and 11\textsuperscript{th} grade students of different socioeconomic levels going to three high schools in an urban district in İzmir, a province in western part of Turkey. There are 26 state high schools in this district. In these high schools, the number of 10\textsuperscript{th} and 11\textsuperscript{th} grade students is approximately 17,000. The minimum number of students to be included in the study was calculated as 376, assuming the prevalence of obesity in adolescents to be 10% with a margin of error of 3% and 95% confidence interval. Assuming the design effect as 2.0, the minimum number of students to be included in the sample was 752. However, it was decided to include at least 10% more students (n = 825) considering the possibility of withdrawals or losses during the study. The schools in the district were divided into three categories according to the socioeconomic level of their location by the Ministry of Education (MoE) Provincial Directory and using the list of schools given by MoE, one school from each category was randomly determined. Because the total number of students going to the designated schools was higher than the sample size, these three schools were considered sufficient.

While the main dependent variable of the study was obesity (body mass index [BMI] ≥95 percentiles for those aged <18 years\textsuperscript{[16,17]} and BMI ≥30.0 for those aged ≥18), overweight (BMI ≥ 85 percentiles for those aged <18 years\textsuperscript{[16,17]} and BMI ≥25.0 for those aged ≥18) was also evaluated. Independent variables were sociodemographic characteristics, eating habits, body image, knowing his/her own weight correctly, and food addiction. While the variables such as age, sex, family type, the number of siblings, and socioeconomic level of the school’s location were considered as sociodemographic variables, the variables such as how the student perceived his/her body image (underweight, normal, overweight, or obese), having breakfast, adding salt to the food without tasting it, consumption of vegetables and fruits daily, and having junk food at home were addressed as eating habits.

Before students’ weights were measured, they were asked about their weights, and if the weight they stated was within ± 5% of the measured weight, it was considered that they knew their weight correctly. Food addiction was determined using the Yale Food Addiction Scale developed by Gearhardt et al. in 2009.\textsuperscript{[18]} The scale consists of 27 items and 8 subscales. Scoring of the scale was given elsewhere in detail.\textsuperscript{[18]} The Turkish validity and reliability study of the Yale Food Addiction Scale was conducted by Bayraktar et al. in 2012.\textsuperscript{[19]}

The data were collected in schools through face-to-face interviews. The participants wore light clothes and did not take off shoes when their measurements were conducted because they were reluctant to do so. However, because the data were collected during the warm months, shoes they wore were light sports shoes or flat shoes, therefore, 1 kg for weight measurement and 2 cm for height measurement were subtracted from the actual measurement values. Height measurements were performed via a portable stadiometer as the participant was in the standing position with the head in the Frankfort horizontal plane, eyes looking straight ahead, and legs straight and together. Weight measurements were performed with a 100-gr precision digital scale.

Statistical analyses were performed using SPSS 25.0 (IBM SPSS Statistics, version 25; IBM, New York, NY, USA). Continuous variable was presented with mean ± standard deviation, and classified data were presented with numbers and percentages. The relationship between continuous independent variables and obesity was determined with independent samples t-test, and the relationship between the classified data and obesity was determined by Yates corrected Chi-square test. After adjusting for other confounders which are the variables found to have significant association in univariate analysis, the effect of food addiction on the prevalence of overweight or obesity was determined by logistic regression models. Three different models were constituted for both obesity and overweight. In the first model, the effect of food addiction on obesity or overweight was determined after adjusted for age and sex. The second model was adjusted for age...
and sex and sociodemographic factors such as number of siblings, family type, employment status, smoking status, and physical appearance were included in the model. The third model was adjusted for the variables present in the second model and for not knowing his/her weight correctly and presence of junk food at home. \( P < 0.05 \) was considered statistically significant.

Ethical approval to conduct the study was obtained from Ege University Medical Research Ethics Committee (19-2T/25). To use the Yale Food Addiction Scale, permission from the researchers who conducted the Turkish validity and reliability study of the scale was obtained. The permissions to perform the study in schools were obtained from Izmir Governorship and Buca Provincial Directorate of National Education (No. 12018877-604.01.02-E.8308125). The participating students were informed before data collection, and their written informed consent was obtained.

### RESULTS

Of the participants (\( n = 874 \)), 54.2% were boys, 84.1% were 15–17 years old, 25.1% (\( n = 106 \)) were overweight, and 12.1% (\( n = 219 \)) were obese. The prevalence of food addiction was 18.9% (\( n = 165 \)). Table 1 shows the association of sociodemographic characteristics of the participants and obesity and overweight.

As shown in Table 1, the increase in the prevalence of overweight and obesity was significantly high in the participants as their age and number of siblings decreased and high in the participants who had a fragmented family, smoking mothers, and working mothers. The greater the prevalence of overweight and obesity in the participants was, the more overweight and obese their fathers were. The effect of nutritional habits of adolescents on the prevalence of obesity and overweight is given in Table 2.

The incidence of obesity and overweight decreased in those as the prevalence of having junk food at home increased. On the other hand, the prevalence of overweight and obesity was significantly higher among the participants who had overweight appearance, who were food addicts, and who did not know their weight correctly. The prevalence of food addiction was 25.6% in the overweight participants and 29.2% in the obese participants.

The time spent watching TV on the weekend was more than was that spent on weekdays. However, the average time spent watching TV on the weekend or on weekdays did not significantly affect the prevalence of overweight or obesity (\( P > 0.05 \)). After adjustments for confounders, the effect of food addiction on the prevalence of overweight is summarized in Table 3.

### Table 1: The association of sociodemographic characteristics of the participants and obesity and overweight

| Characteristic                        | Obesity \( n(\%) \) | \( P \) | Overweight \( n(\%) \) | \( P \) |
|---------------------------------------|---------------------|-------|-------------------------|-------|
| **Sex**                               |                     |       |                         |       |
| Boys                                  | 60 (12.7)           | 0.676 | 127 (26.8)              | 0.226 |
| Girls                                 | 46 (11.5)           |       | 92 (23.0)               |       |
| **Age (years)**                       |                     |       |                         |       |
| 15–16                                 | 52 (14.1)           | 0.013*| 108 (29.3)              | 0.011*|
| 17                                    | 47 (12.8)           |       | 84 (23.0)               |       |
| 18–19                                 | 7 (5.0)             |       | 27 (19.4)               |       |
| **SES of the school’s location**      |                     |       |                         |       |
| Low                                   | 42 (15.6)           | 0.077*| 79 (29.3)               | 0.188*|
| Middle                                | 33 (10.6)           |       | 69 (22.1)               |       |
| High                                  | 31 (10.6)           |       | 71 (24.3)               |       |
| **Family type**                       |                     |       |                         |       |
| Nuclear-extended                      | 89 (11.0)           | <0.001| 194 (24.1)              | 0.007 |
| Fragmented                            | 17 (30.4)           |       | 23 (41.4)               |       |
| **Number of siblings**                |                     |       |                         |       |
| Single child                          | 21 (22.3)           | 0.024*| 33 (35.1)               | 0.005*|
| 2–3 siblings                          | 66 (11.0)           |       | 150 (25.1)              |       |
| ≥4 siblings                           | 19 (10.8)           |       | 34 (19.3)               |       |
| **Mother’s characteristics**          |                     |       |                         |       |
| Education                             |                     |       |                         |       |
| Nongraduate                           | 13 (9.7)            | 0.082*| 32 (23.9)               | 0.404*|
| Elementary-junior high school         | 51 (11.1)           |       | 111 (24.1)              |       |
| Senior high school-higher school      | 40 (15.0)           |       | 72 (27.1)               |       |
| Employment                            |                     |       |                         |       |
| Employed                              | 50 (18.0)           | <0.001| 93 (33.5)               | <0.001|
| Unemployed                            | 53 (9.1)            |       | 121 (20.8)              |       |
| Smoking                               |                     |       |                         |       |
| Smoker                                | 48 (17.0)           | 0.003 | 88 (31.3)               | 0.004 |
| Nonsmoker                             | 56 (9.7)            |       | 126 (21.9)              |       |
| Physical appearance                   |                     |       |                         |       |
| Underweight-normal                    | 68 (12.0)           | 0.429 | 135 (23.8)              | 0.198 |
| Overweight                            | 27 (10.6)           |       | 68 (26.8)               |       |
| Obese                                 | 10 (20.4)           |       | 15 (30.6)               |       |
| **Father’s characteristics**          |                     |       |                         |       |
| Education                             |                     |       |                         |       |
| Elementary-junior high school         | 61 (12.2)           | 1.000 | 120 (24.0)              | 0.299 |
| Senior high school-higher school      | 44 (12.4)           |       | 97 (27.3)               |       |
| Employment                            |                     |       |                         |       |
| Employed                              | 91 (12.0)           | 0.777 | 194 (25.6)              | 0.825 |
| Unemployed                            | 10 (13.9)           |       | 17 (23.6)               |       |
| Smoking                               |                     |       |                         |       |
| Smoker                                | 64 (14.1)           | 0.066 | 128 (28.3)              | 0.024 |
| Nonsmoker                             | 38 (9.7)            |       | 83 (21.3)               |       |
| Physical appearance                   |                     |       |                         |       |
| Underweight-normal                    | 56 (10.7)           | 0.013*| 117 (22.4)              | 0.001*|
| Overweight                            | 31 (11.7)           |       | 66 (24.8)               |       |
| Obese                                 | 16 (24.2)           |       | 30 (45.5)               |       |

Bold fonts indicate significant difference. \( \chi^2 \text{Yates; } * \chi^2 \text{ for trend. SES=Socioeconomic status} \)

In all the models, the presence of food addiction increased the prevalence of overweight 1.8 times significantly when
all the confounders were considered (95% confidence interval [CI]: 1.234–2.822). In addition to food addiction, living in a fragmented family (odds ratio [OR]: 2.0, 95% CI: 1.059–3.788), mothers working at a paid job (OR: 1.6, 95% CI: 1.128–2.243), fathers overweight appearance (OR: 2.1, 95% CI: 1.179–3.835), and the participants not knowing his/her own weight correctly (OR: 1.9, 95% CI: 1.365–2.719) significantly increased the prevalence of overweight in adolescents. The prevalence of overweight increased significantly in those as the prevalence of having junk food at home decreased significantly. The effect of food addiction on the prevalence of obesity after adjustments were made for other factors is summarized in Table 4.

The analysis of the effect of food addiction on the prevalence of obesity demonstrated that food addiction increased the prevalence of obesity by 2.0 times (95% CI: 1.263–3.183) after the adjustments for age and sex and increased the prevalence 1.9 times (95% CI: 1.159–3.312) when all the confounders were taken into account. Other factors increasing the prevalence of obesity were as follows: having a fragmented family, mothers working at a paid job, fathers obese appearance, not knowing his/her own weight correctly, and having junk food at home occasionally or never.

**DISCUSSION**

According to the Turkish Nutrition and Health Survey (TNHS) (2010), while the prevalence of overweight (including obesity) among adolescents aged 15–18 years was 21.6%, the prevalence of obesity alone was 8.2%. In their meta-analysis conducted to investigate obesity tendencies in children and adolescents aged 5–19 years, Alper et al. determined that the prevalence of obesity was 7.3% between 2011 and 2015, which was 11.6 times higher than what was that between 1990 and 1995. The literature review performed by Erem demonstrated that

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![Table 3: The effect of food addiction on the prevalence of overweight after adjustments for confounders](image)
the prevalence of overweight and obesity ranged between 8.3% and 22.4% and between 1.6% and 10.6%, respectively, in regional studies conducted from 2001 to 2011. The differences between the results of these studies may have stemmed from the fact that the studies were conducted in different places with participants of different age groups. In the present study, the prevalence of overweight, although slightly higher, is consistent with that given in the TNHS, but the prevalence of obesity was higher than was that given in the TNHS. This difference may be due to the fact that the present study was conducted in an urban area, and that prevalence of obesity was a bit more common in urban areas than in rural areas, or that the prevalence of obesity actually increased during the 9-year period from 2010 when TNHS was performed until now.

In large-scale studies conducted on adolescents, the prevalence of food addiction has been found to range between 2% and 16%. In a study which included 600 high school students from three randomly selected high schools, the prevalence of food addiction was 12.4%, which was somewhat lower than that (18.9%) determined in the present study. This difference might be due to the higher prevalence of obesity in the participants in the present study.

Studies conducted on the issue demonstrated that there was a correlation between food addiction and the prevalence of obesity. Studies have shown that both genetic and environmental factors are associated with obesity. According to Erem, low physical activity, high income, parents’ education level, living in a city, and having obese parents are some of the factors affecting obesity in Turkish children and adolescents. In the present study, the parents’ obesity status was evaluated based on the perception of the participating adolescents. The risk of being overweight and obese was significantly high in the participants whose fathers were overweight and obese. In a study conducted with approximately 23,000 children/adolescents (6–18 years old) in Iran, those who had overweight or obese parents were about twice as likely to be overweight or obese. Parents’ feeding practices and life habits may have influenced children’s eating habits at an early age because children imitate to learn. Practices such as family food culture, preparing meals at home, eating out, and skipping meals may have caused both the father and adolescent to become overweight/obese.

Women’s participation in working life and their receiving inadequate support from other members of the family may have caused them to devote less time preparing food at home or to cook foods that are practical, ready to eat, and energy intensive or to eat out more frequently. A study indicated that in Bulgaria whose economic conditions were like those of Turkey, mothers working status was a risk factor for obesity in children, but that in Sweden, which has advanced economy, mothers working status at a paid job had an opposite effect.

In the present study, the prevalence of obesity was significantly higher in children having fragmented families. The separation/divorce process can cause stress not only on parents but also on children; cause them to...
experience economic difficulties; change the family’s daily routine (e.g., meal times and types of foods) for the worse, which damages child–parent relationships; and the child will have to live in a new social environment if the family has to move somewhere else, all of which will affect the child’s eating habits adversely.\textsuperscript{[27]} and it is argued that all these changes will cause the child to develop unhealthy eating habits, which can be linked with divorce.\textsuperscript{[28]} In a study, it was found that routine behaviors in the family affected nutritional habits positively and protected family members against obesity, and that in families with divorced parents, stress levels were higher, nutritional habits were negative, and obesity was more prevalent.\textsuperscript{[29]} In the UK, a cohort study found that children whose parents were separated or divorced were more at risk for obesity not at the beginning but at the later part of the separation/divorce.\textsuperscript{[27]} The fact that the participants having a fragmented families were at risk for obesity, even after adjustments made for age, sex, and other variables, is the strength of the present study, although it is cross-sectional in nature.

The frequency of having junk food at home (always, sometimes, and never) was inversely related to obesity. The prevalence of obesity was almost twice higher in the participants who occasionally had junk food at home and five times higher in the participants who never had junk food at home. Contrary to expectations, this result may be due to the cross-sectional nature of the study and therefore the direction of causality was not determined. The families may have refrained from having junk food at home because there was an adolescent with a weight problem at home.

This study has several limitations. The fact that the parents’ weight and height were not measured instead the adolescents’ perceptions of their parents appearance were taken into account may have not reflected the actual weight status of the parents. The reason that the mother’s appearance did not have a significant effect on the obesity of the adolescent may be due to the fact it was a perception-based reporting. The cross-sectional nature of the study may have led to the inability to evaluate the direction of causality, which may cause doubts whether the negative eating habits are the cause or the result of obesity.

CONCLUSION

One-quarter (25.1\%) of the participants had weight problems and the prevalence of food addiction was 18.9\%, reaching nearly one out of three in obese adolescents. After adjustments were made for age, sex, and other confounders, the presence of food addiction significantly increased the prevalence of both overweight and obesity. Recognition and appropriate treatment of food addiction to prevent obesity or to ensure weight loss, paying special attention to adolescents whose parents are obese or who have fragmented families, and providing support both to adolescents and to their parents if necessary may help the fight against obesity.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Ghanbari S, Ayatollahi SM. Comparing the role of standard references on the prevalence of Iranian children and adolescents’ overweight and obesity: A systematic review and meta-analysis. J Res Med Sci 2016;21:121.

2. Alper Z, Ercan İ, Ucnu 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;10:59-67.

3. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study 2013. Lancet 2014;384:766-81.

4. Weihrauch-Blüher S, Schwarz P, Klusmann J. Childhood obesity: Increased risk for cardiometabolic disease and cancer in adulthood. Metabolism 2019;92:147-52.

5. OECD. Obesity Update 2017. (Access: http://www.oecd.org/health/health-systems/obesity-update-2017.pdf).

6. Turkish Ministry of Health, General Health Research Directorate. Turkish Nutrition and Health Survey (2010)(Press no:SB-SAG-2014/02). Ankara, 2014. (Access: https://bsgm.saglik.gov.tr/depo/birimler/saglikli-beslenme-hareketli-hayat-db/Yayinlar/kitaplar/diger-kitaplar/TBSA-Beslenme-Yayini.pdf).

7. Bahreynian M, Qorbani M, Khaniabadi BM, Motlagh ME, Safari O, Asayesh H, et al. Association between obesity and parental weight status in children and adolescents. J Clin Res Pediatr Endocrinol 2017;9:111-7.

8. Atay Z, Bereket A. Current status on obesity in childhood and adolescence: Prevalence, etiology, co-morbidities and management. Obesity Med 2016;3:1-9.

9. Gordon EL, Ariel-Donges AH, Bauman V, Merlo LJ. What is the evidence for “food addiction?” A systematic review. Nutrients 2018;10. pii: E477.

10. Blumenthal DM, Gold MS. Neurobiology of food addiction. Curr
11. American Psychiatric Association. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders. Vol. 5. Arlington, VA: American Psychiatric Association; 2013.

12. Davis C, Carter JC. Compulsive overeating as an addiction disorder. A review of theory and evidence. Appetite 2009;53:1-8.

13. Gearhardt AN, Davis C, Kuschner R, Brownell KD. The addiction potential of hyperpalatable foods. Curr Drug Abuse Rev 2011;4:140-5.

14. Volkow ND, Wang GJ, Baler RD. Reward, dopamine and the control of food intake: implications for obesity. Trends Cogn Sci 2011;15:37-46.

15. Wang GJ, Volkow ND, Thanos PK, Fowler JS. Imaging of brain dopamine pathways: implications for understanding obesity. J Addict Med 2009;3:8-18.

16. Godoy-Matos AF, Guedes EP, Souza LL, Martins MF. Management of obesity in adolescents: state of art. Arq Bras Endocrinol Metabol 2009;53:252-61.

17. Kukulu K, Sarvan S, Muslu L, Yirmibesoglu SG. Dietary habits, economic status, academic performance and body mass index in school children: a comparative study. J Child Health Care 2010;14:355-66.

18. Gearhardt AN, Corbin WR, Brownell KD. Food addiction: an examination of the diagnostic criteria for dependence. J Addict Med 2009;3:1-7.

19. Bayraktar F, Erkman FK. Adaptation study of Yale food addiction scale. Klinik Psikofarmakoloji Blnteni 2012;22 Supp 1:38.

20. Erem C. Prevalence of overweight and obesity in Turkey. IJC Metab Endocr 2015;8:38-41.

21. Rodriguez C, Gearhardt AN, Bégín C. Food addiction in adolescents: Exploration of psychological symptoms and executive functioning difficulties in a non-clinical sample. Appetite 2019;141:104303.

22. Daylar Candan H, Köçük L. Food addiction and affecting factors in high school students. J Psychiatric Nurs 2019;10:12-9.

23. Boris enkov MF, Tserne TA, Bakutova LA. Food addiction in Russian adolescents: Associations with age, sex, weight, and depression. Eur Eat Disord Rev 2018;26:671-6.

24. Şanlier N, Türközü D, Toka O. Body Image, Food Addiction, Depression, and Body Mass Index in University Students. Ecol Food Nutr 2016;55:491-507.

25. Mies GW, Treur JL, Larsen JK, Halberstadt J, Pasman JA, Vink JM. The prevalence of food addiction in a large sample of adolescents and its association with addictive substances. Appetite 2017;118:97-105.

26. Lissner L, Wijnhoven TM, Mehlig K, Sjöberg A, Kunesova M, Yngve A, et al. Socioeconomic inequalities in childhood overweight: heterogeneity across five countries in the WHO European Childhood Obesity Surveillance Initiative (COSI-2008). Int J Obes (Lond) 2016;40:796-802.

27. Goisis A, Özcan B, Van Kerm P. Do children carry the weight of divorce? Demography 2019;56:785-811.

28. Mauskopf SS, O’Leary AK, Banihashemi A, Weiner M, Cookston JT. Divorce and eating behaviors: A 5-day within-subject study of preadolescent obesity risk. Child Obes 2015;11:122-9.