ORIGINAL ARTICLE ÖZGÜN ARAŞTIRMA

Obesity Prevalence and Related Variables in Children Aged 4-6 Years, Pursaklar Sample

4-6 Yaş Arası Çocuklarda Obezite Prevalansı ve İlişkili Değişkenler, Pursaklar Örneği

Şefik Yurdakul (0000-0003-2700-5904), Yazgı Beriy Altun Güzelderen (0000-0003-3328-2529), Mehmet Enes Gökler (0000-0002-1524-8565)

Ankara Yıldırım Beyazıt University, Department of Public Health, Ankara, Turkey

Abstract

Introduction: Our study aimed to investigate the prevalence of overweight/obesity and factors that may be associated with obesity in preschool children.
Materials and Methods: The study is a descriptive cross-sectional study. All children between the ages of 4 and 6 years attending relevant educational institutions were included in the study. The height, weight, waist circumference and hip circumference of 822 children were measured and 556 of the questionnaires were completed and included in the study. Our questionnaire included questions on socio-demographic characteristics and the Quality Index of the Mediterranean Diet in Children(KIDMED scale). The data were analyzed in the SPSS package, and logistic regression models were created with the variables found to be significant after univariate analysis. P≤0.05 was considered statistically significant.
Results: Of the participants, 68(12.3%) were overweight and 28(5%) were obese. When analyzing the overweight/obesity status, it was observed that the frequency of being overweight/obese was higher in males(p=0.05), children whose mothers were obese(p<0.001) and children who started complementary feeding before 6 months(p=0.042). In the KIDMED classification, 19.6% of the participants had a high level of compliance and 18% had a low level of compliance. In the logistic regression model, higher maternal Body Mass Index(BMI) increased the risk of obesity status of the participants approximately sevenfold, and switching to complementary foods before 6 months increased the risk approximately threefold.
Conclusion: Because the mother is in the most important position in preventing pre-school childhood obesity, maternal health and education should be given importance.

Öz

Giriş: Çalışmamızda okul öncesi çocuklarda aşırı kilo/obezite prevalansını ve obezite ile ilişkili olabilecek faktörleri araştırmayı amaçladık.
Gereç ve Yöntem: Araştırma tanımlayıcı kesitsel bir çalışmadır. Araştırmaya ilgili eğitim kurumlarına devam eden 4-6 yaş arası tüm çocuklar dahil edilmiştir. Toplam 822 çocuğun boyu, kilosu, bel çevresi ve kalça çevresi ölçülmüş ve anketi tam olan 556 tanesi çalışmaya dahil edilmiştir. Anketimizde sosyo-demografik özellikleri içeren sorular ve Çocuklarda Akdeniz Diyeti Kalite İndeksi (KIDMED ölçeği) ile ilgili sorular yer almıştır. Veriler SPSS paket programında analiz edilmiş ve tek değişkenli analiz sonrasında anlamlı bulunan değişkenler ile lojistik regresyon modelleri oluşturulmuştur. P≤0.05 istatistiksel olarak anlamlı kabul edilmiştir.
Bulgular: Katılımcıların 68'i (%12,3) fazla kilolu, 28'i (%5) ise obezdi. Fazla kilo/obezite durumu incelendiğinde fazla kilolu/obez olma sıklığının erkeklerde (p=0,05), annesi obez olan çocuklarda (p<0,001) ve 6 aydan önce ek gıdaya başlayan çocuklarda daha fazla olduğu görüldü (p=0,042). KIDMED sınıflandırmasında

* The study has been presented as an oral presentation at 6th International and 24th National Public Health Congress in 2022.

Keywords
Childhood obesity, KIDMED scale, maternal obesity, obesity prevalence, preschoolers

Anahtar kelimeler
Çocukluk çağı obezitesi, KIDMED ölçeği, anne obezitesi, obezite prevalansı, okul öncesi çocuklar

Received/Geliş Tarihi : 27.11.2023
Accepted/Kabul Tarihi : 11.02.2024

DOI:10.4274/jcp.2024.46872

Address for Correspondence/Yazışma Adresi: Şefik Yurdakul, Ankara Yıldırım Beyazıt University, Department of Public Health, Ankara, Turkey
Phone: +90 545 406 10 09
E-mail: drsefikyurdakul@gmail.com

katılımcıların %19,6'sının diyete yüksek düzeyde uyum, %18'inin ise düşük düzeyde uyum gösterdiği görüldü. Lojistik regresyon modelinde annenin Beden Kitle İndeksi'nin(BKİ) yüksek olmasının katılımcıların obezite riskini yaklaşık yedi kat artırdığı, 6 aydan önce ek gıdalara geçişin ise riski yaklaşık üç kat artırdığı görüldü.
Sonuç: Okul öncesi çocukluk çağı obezitesinin önlenmesinde anne en önemli konumda olduğundan anne sağlığına ve eğitimine önem verilmelidir.

Introduction

Childhood obesity is a global public health problem that affects whole world (1). According to World Health Organization (WHO) data for 2020, 39 million children under 5 years of age worldwide are overweight or obese (2). In the WHO European Region, the problem is much more pronounced, with one in four children reported to be affected by obesity (1). The prevalence of obesity in children under 5 in the WHO European Region was 7.9% (3). Childhood obesity has increased significantly in recent years, particularly in developing countries (4). A review of the literature showed that the first comprehensive study of childhood obesity in preschool children in Türkiye was the Turkish Demographic and Health Survey (TDHS) study conducted in 2013. In this study, 11% of preschool children were found to be overweight/obese (5). According to the 2018 TDHS report, 8.1% of children under 5 were overweight (6). This study only reported the rate of overweight children and not the rate of obese children.

There are many protective factors and risk factors for childhood obesity. Firstly, breastfeeding and the duration of breastfeeding appear to be strong protective factors against obesity (7). On the other hand, the use of infant formula has also been shown to be an important risk factor (8). Parental obesity, especially maternal obesity, has been shown to increase the risk of childhood obesity (9).

During the Covid-19 pandemic, which affected whole world and the effects of which are still being observed, measures to reduce transmission, such as school closures and quarantine practices, significantly increased the risk of weight gain and obesity in children (10).

In terms of dietary diversity, a Mediterranean-style diet has been shown to be effective in preventing obesity in both children and adults (11).

Obesity is a public health problem that is increasingly affecting the whole society and most importantly is preventable. For this reason, it is important to determine the current situation after the pandemic, the possible factors that may be related, the Mediterranean dietary status and its relationship with obesity in order to guide the decision makers.

It is important to study the tendency of obesity and related factors in preschool children (12).

The aim of our study is to provide families with recommendations based on scientific data against the increasing obesity-related problems in the childhood age group. In this regard, the aim is to determine the prevalence of overweight/obesity in preschool children and to investigate intervenable factors that may be related to obesity, such as the socioeconomic status of the family, educational status, nutritional status of the child, and conditions directly related to the mother. It is aimed to link the results of our study with the literature and guide healthcare professionals and policy makers working in the field.

Materials and Methods

This study is a cross-sectional field study conducted by Ankara Yıldırım Beyazıt University, Department of Public Health. The field phase of the study was conducted between 01/05/2022 and 30/06/2022 in the preschool educational institutions of Pursaklar Municipality of the Ministry of National Education and Presidency of Religious Affairs in Pursaklar district of Ankara province. The study was designed in accordance with the principles of the Declaration of Helsinki. The study was approved by the Ethics Committee of Ankara Yıldırım Beyazıt University on 07.04.2022 with decision number 06. In addition, written permission to conduct the study was obtained from Ankara Provincial Directorate of National Education on 12/05/2022 with number E-14588481-605.99-49465498. All children between the ages of 4 and 6 who were enrolled in the relevant educational institutions in Pursaklar district were included in the study. After making an appointment with the educational institutions, the participants and their parents were informed about the study, their verbal and

written consent was obtained, and they were invited to participate in the study. The study continued with those who agreed to participate. Data were collected by the researchers through in-school measurements and parent questionnaires. In total, 822 children were measured. Of the questionnaires given, 556(67.6%) were completed and included in the study.

Data Collection Tools

Our questionnaire was consisted of two parts. The first part asked about the socio-demographic characteristics of the parents and the background information of children. There were 19 questions on the parents' age, marital status, educational status, weight and height, chronic diseases and medications used, if any; number of people living in the household; mother's smoking status; perceived financial status; child's age, sex, weight and height, week of birth, breastfeeding status, whether the child used infant formula or not, and time of transition to complementary foods. The second part included the "Quality Index of the Mediterranean Diet in Children-KIDMED", which consists of 16 yes/no questions. The scale measures the Mediterranean diet, which has been shown to be protective against obesity. In questions 6, 12, 14, 16 the answer "yes" was calculated as -1 point, while in the other 12 questions it was calculated as +1 point. No answer was calculated as 0 points for all questions. Overall, a score of 3 or less than 3 points was considered as low, 4-7 points as medium, and 8 points or more as high adherence to the Mediterranean diet. The Turkish validity and reliability study of the scale was conducted by Şahingöz et al. and the scale was originally prepared by Serra-Majem et al. (13,14).

For anthropometric measurements, body weight was measured unshod using a Tanita HD-366 professional digital scale with a sensitivity of 0.1kg. Height was measured using a Stanley inflexible metal measuring tape with a sensitivity of 1mm. Height was measured in a standing, upright position and without shoes. Waist circumference was measured from the midpoint between the lowest costa and the iliac crest at the exposed waist circumference, in a standing position with arms relaxed, in a slightly exhaled position, using a flexible measuring device sensitive to 0.1 cm. The hip circumference was measured in an upright position with the arms at the side and the feet next to each other. The highest point of the hip was determined and measured with a flexible measuring device. After the measurements, percentile values were calculated by using the reference values created by Neyzi for Turkish children (15). Those with a Body Mass Index (BMI) Z score between 1-2 were defined as overweight, and those over +2 were defined as obese. In our study, the definitions of overweight and obese were made by calculating the BMI Z score.

Statistical Analysis

The data were analyzed using the IBM SPSS statistical package program (version 22.0) in a computer environment. Number, percentage, mean ± standard deviation (SD), median, minimum(min), maximum(max) and 25-75 quartiles were used for descriptive statistics. Chi-square test was used to compare categorical data. The Shapiro-Wilk test was used to compare continuous data, and parametric and non-parametric tests were selected according to conformity to normal distribution as a result of the normality test. Logistic regression models were fitted with the variables found to be significant after univariate analysis. Statistical significance was accepted as $p \leq 0.05$.

Results

269(48.4%) of the participants were male with a mean age of 66.5±7.1 months (min 48 - max 80). Of the participants, 68(12.3%) were overweight and 28(5%) were obese. 547(98.3%) of the questionnaires were completed by the mothers. Boys were taller (p=0.001) and had wider waist circumference (p=0.016) and hip circumference (p<0.001) than girls (Table 1).

The overweight/obesity status of participants was determined by calculating their BMI-Z scores. When examining the status of being overweight/obese, no association was found between the groups for low financial status (p=0.289), maternal and paternal education level of 8 years or less (p=0.459, p=0.833), maternal and paternal employment status (p=0.783, p=1.000), maternal tobacco use during pregnancy (p=0.263) and breastfeeding for less than 6 months (p=0.820). The prevalence of overweight/obesity was higher in male children (p=0.05), in children with obese mothers (p<0.001) and in children who started complementary feeding before 6 months (p=0.042). In the KIDMED classification, 19.6% of the participants had a high level of compliance and 18% had a low level

of compliance. There was no protective association between increasing levels of compliance and being overweight or obese (Table 2).

In the logistic regression model fitted with the variables found to be significant in the univariate analysis, gender had no effect on obesity status (p=0.09). It was found that a high maternal BMI increased the risk of obesity status in the participants by about seven times, and that switching to formula feeding before 6 months increased the risk by about three times (Table 3).

Table 1. Comparison of participants' anthropometric measurements by gender

		Boy (n:269)	Girl (n:287)	p-value
Weight(kg)	**Mean ± SD**	21.6±4.61	20.05±3.53	**<0.001**
	Median (P25-P75)	20.8 (18.5-23.3)	19.5 (17.7-22.0)	
	Min-Max	13.8–41.4	12.3–36.0	
Height(cm)	**Mean ± SD**	115.35±6.17	113.51±6.22	**0.001**
	Median (P25-P75)	115.5 (111.0–120.0)	114.0 (110.0–118.0)	
	Min-Max	100.0–130.5	97.0–128.0	
BMI(kg/m^2)	**Mean ± SD**	16.12±2.32	15.48±1.81	**<0.001**
	Median (P25-P75)	15.59(14.70-16.98)	15.23(14.29-16.40)	
	Min-Max	12.05-28.19	11.76-24.35	
Waist circumference(cm)	**Mean ± SD**	53.38±5.3	52.09±4.19	**0.016**
	Median (P25-P75)	53.0 (50.0–54.0)	52.0 (50.0–54.0)	
	Min-Max	44.0–80.0	43.0–73.0	
Hip circumference(cm)	**Mean ± SD**	59.25±5.38	57.59±4.38	**<0.001**
	Median (P25-P75)	58.0 (56.0–60.0)	57.0 (55.0–60.0)	
	Min-Max	48.0–85.0	47.0–81.0	

SD:Standard deviation, Min: Minimum, Max: Maximum, BMI:Body mass ındex

Table 2. Distribution of the participants' obesity status according to some sociodemographic and clinical characteristics

		Normal		Overweight/Obese		
		n	**%**	**n**	**%**	**p-value**
Sex	**Boy**	210	45.7	59	61.5	**0.005**
	Girl	250	54.3	37	38.5	
Age	**4**	52	11.3	11	11.5	0.337
	5	223	48.5	39	40.6	
	6	185	40.2	46	47.9	
Socio-economic status	**High**	174	37.8	29	30.2	0.289
	Middle	272	59.1	65	67.2	
	Low	14	3.0	2	2.1	
Mother educational level	**≤8 years**	126	27.4	30	29.4	0.459
	>8 years	334	72.6	66	70.6	
Father educational level	**≤8 years**	94	20.4	19	21.2	0.833
	>8 years	366	79.6	77	78.8	
Mother's working status	**Not working**	373	81.1	79	82.3	0.783
	Working	87	18.9	17	17.7	

Table 2. Continued						
		Normal		Overweight/Obese		
		n	%	n	%	p-value
Father's working status	Not working	2	0.4	0	0.0	1.000
	Working	458	99.6	96	100.0	
Tobacco use status of the mother during pregnancy	Yes	79	17.1	21	22.1	0.263
	No	382	82.9	74	77.9	
Mother BMI	Normal	214	48.0	25	26.3	**<0.001**
	Overweight-Obese	232	52.0	71	73.3	
Breastfeeding	≥6 months not used	8	1.7	2	2.1	0.820
	≥6 months used	451	98.3	95	97.9	
Transition to supplementary food	Transition before 6 months	67	14.6	22	22.9	**0.042**
	Transition after 6 months	393	85.4	74	77.1	
KIDMED compliance level	Low	78	17.0	22	22.9	0.357
	Middle	292	63.5	55	57.3	
	High	90	19.6	19	19.8	

BMI: Body mass index, KIDMED: Quality index of the mediterranean diet in children

Table 3. Adjusted OR and 95% CI values for obesity risk factors identified in univariate analysis								
Veriable	Coefficients	B	S.E.	Wald	OR	p-value	%95 CI	
							Lower	Upper
Sex	Ref=[Girl] Boy	-0.727	0.429	2.879	0.48	0.090	0.209	1.119
Mother BMI	Ref=[Normal] Overweight/Obese	1.954	0.623	9.856	7.05	0.002	2.084	23.913
Transition to supplementary food	Ref=[Transition after 6 months] Transition before 6 months	1.136	0.432	6.935	3.11	0.008	1.337	7.258

OR: Odds ratio, B: Coefficient, SE: Standart error, CI: Confidence interval, BMI: Body mass index

Discussion

Childhood obesity, which affects healthy life in childhood and adulthood, is an alarming problem worldwide. Türkiye is included among the countries at risk in the World Atlas of Obesity and the WHO European Region Obesity Report (3,16).

In our study, the rate of overweight/obese children was 17.3%. In a study conducted by Altunsuyu et al.(17) in 2021 in a similar age group, the rate of overweight/obese children was found to be 13.4%, and in another study conducted by Önal et al.(18) in Ankara in 2016, the rate was found to be 14.5%. Similar to some other studies conducted in Türkiye, the prevalence of obesity was found to be higher in boys than in girls. In a study by Karaketir et al.(19) using data from five TDHS studies conducted between 1993 and 2013, which is one of the most comprehensive studies in Türkiye, the prevalence of overweight/obesity was found to be higher in boys than in girls. Similarly, in the study conducted by Alkan et al.(20), boys were found to be more obese. Similarly, to our country, the prevalence of obesity was found to be higher in boys in other Mediterranean countries (21,22).

Obesity is a multifactorial disease in which genetic and environmental factors play a role together. Genetic factors have been shown to explain 50-90% of variations in BMI (23). Apart from this, factors such as diet and lifestyle, consumption of packaged sweetened foods, poor quality nutrition, and lack of physical activity have also been shown to be important determinants of obesity (24). When the relationship between parental obesity and childhood obesity was

examined, it was found that the prevalence of obesity was higher in children whose mothers were obese in our study. When the international literature is scanned, it is seen that maternal obesity in the preschool group increases the frequency of obesity in children, similar to our study.

In the study conducted by Whitaker et al.(25) in England and the study conducted by Kurspahić and Mujčić et al.(26), it was determined that maternal obesity increases the risk of childhood obesity. The study by Altunsuyu et al.(17) concluded that children with obese parents were more likely to be obese. Karaketir et al.(19) found that the prevalence of obesity was higher in children born to mothers with a high maternal BMI. In the study conducted by de Lauzon-Guillain et al.(27), it was stated that genetic factors may partially explain obesity in early childhood up to the age of 5. In another study conducted by Moradi et al.(28), it was found that maternal nutritional patterns were correlated with children's nutritional patterns in a similar age group. Considering the relevant researches, the finding that maternal obesity was associated with obesity in the participants in our study appears to be compatible with the literature.

When anthropometric data were analysed in our study, it was found that boys were taller and had larger waist and hip circumferences than girls. Consistent with our study, anthropometric measurements of preschool children of similar age groups in our country and abroad found that height, waist and hip circumference were higher in boys (29,30). In a study conducted in Iran, height, weight and waist circumference were found to be higher in boys than in girls, while hip circumference was found to be higher in girls (31).

Many studies have shown that caesarean delivery increases the risk of childhood obesity (32,33). In contrast, our study found no association between caesarean delivery and obesity. While cesarean delivery is more preferred in the delivery of overweight babies in other countries, the high rate of off-label cesarean delivery in Türkiye may be the reason why we could not find a relationship in our study (34,35).

In reviewing the literature on the effect of socioeconomic level on obesity, high socioeconomic level was found to increase the risk of childhood obesity in studies by Yardim et al.(36) and Sarıtekin and Dindar(37) in similar age groups. On the other hand, some studies concluded that children growing up in families with a lower economic level were more obese (38,39). In our study, no association was found between obesity and socioeconomic level. Studies have shown mixed results regarding the effect of maternal education and employment status on childhood obesity. A study by Santas et al. showed that increasing levels of maternal education increased the risk of obesity, whereas another study found no association between educational status and obesity (12, 40). In the systematic review by El Sayed et al.(41), it was shown that studies had different results. In our study, no association was found between maternal education and obesity.

In our study, 18% of mothers had a history of smoking during pregnancy. A 2017 study found that exposure to smoking during pregnancy may increase childhood BMI (42). Again, two meta-analyses with large sample sizes conducted by Rayfield and Plugge(43) and Oken et al.(44) found a risk-increasing association between maternal prenatal smoking history and childhood overweight. Although smoking has been reported in the literature to be a major risk factor for childhood obesity, no association with obesity risk was found in our study. This may be due to the fact that our questionnaire was mainly answered by mothers.

Many studies have shown that breast milk is an important protective factor against childhood obesity. In a meta-analysis conducted by Qiao et al.(7) and published in 2020, breastfeeding was shown to reduce the risk of childhood obesity by half. A prospective study published in 2018 found that the duration of breastfeeding was protective against childhood obesity (45). In our study, no association was found for the protective effect of breast milk. This may be because the number of participants who received breast milk for less than 6 months was very small, and the response to duration of breast milk intake was influenced by recall factors.

Many studies in the literature have shown that the duration of the transition to complementary foods, especially 4 months and earlier, increases the risk of childhood obesity (46,47). On the other hand, there are also studies indicating that obesity may be a reason for early transition to supplementary food (48,49). This suggests that there may be a two-way relationship. WHO also states that the transition to complementary foods should occur at 6 months of age. Our study also found that transitioning to complementary foods before 6 months increased the risk of obesity.

It has been shown that the most effective factor in preventing obesity in the preschool age group is informing parents and caregivers about feeding practices at home or in settings such as day-care centers (50). Therefore, the KIDMED scale was preferred in our study to investigate healthy eating in the preschool age group.

Studies using the KIDMED Scale, which measures the degree of adaptation to a Mediterranean diet, have yielded different results. In the literature, there are studies showing that it is not associated with obesity, as well as studies showing that the KIDMED compliance of overweight/obese children is lower than that of normal/low-weight children (51,52). In a systematic review published in 2017 examining adherence to the Mediterranean diet, 10 of the 12 studies reporting no association between adherence and weight status used measurement-based anthropometric data, as in our study. Correspondingly, six of the 13 studies that reported an association between adherence and obesity used measurement-based data, and the rest used self-reported data. In our study, adherence to the KIDMED scale had no effect on obesity. This may be due to differences in the adaptation of cultural behaviors to the Mediterranean diet in the Central Anatolian region where the study was conducted.

In our study, it has been shown that nutritional status and social characteristics are generally not associated with obesity. This may be related to the low rate of obesity in our study population and the fact that obesity is less common in our age group compared to older ages.

The study identified 20 malnourished children. Both overweight/obese and malnourished children were referred to family doctors or pediatricians for assessment after interviewing their families and teachers.

Conclusion

In conclusion, it is known that genetic and environmental factors are effective together in childhood obesity, which is a preventable public health problem. Since genetic factors cannot be changed, they can be addressed by health professionals through screening and education for lifestyle changes at the family level that are likely to be effective. In particular, as we determined in our study, the impact of mothers as caregivers and lifestyle determinants is undeniable. We therefore recommend that regular obesity screening and, in particular, education for mothers is the best way to prevent childhood obesity. Regular, large-scale studies should be conducted in collaboration with health policy makers and academia to determine the risk of obesity and to implement early/precise interventions. We searched obesity and related factors in preschool children. Especially maternal obesity and supplementary feeding time were found to be closely related to obesity in our study. We think that identifying obesity at an early age and knowing the associated factors will guide intervention studies.

Study Limitations

Limitations of our study include parental recall and the use of self-reported data to calculate parental BMI.

Ethics

Ethics Committee Approval: The study was approved by the Ethics Committee of Ankara Yıldırım Beyazıt University on 07.04.2022 with decision number 06.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Mapping the health system response to childhood obesity in the WHO European Region an overview and country perspectives. Copenhagen: WHO Regional Office for Europe 2019.
2. Obesity and overweight [Internet]. 2021 Jun. Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
3. WHO European Regional Obesity Report 2022. Copenhagen: WHO Regional Office for Europe 2022. ISBN: 978-92-890-5773-8.
4. Gupta N, Goel K, Shah P, Misra A. Childhood obesity in developing countries: epidemiology, determinants, and prevention. Endocr Rev 2012;33:48-70.
5. Hacettepe Üniversitesi Türkiye Nüfus ve Sağlık Araştırması 2013 (Turkish Demographic and Health Survey 2013). Ankara: Hacettepe University of Population Studies 2013. ISBN 978-975-491-390-3
6. Hacettepe Üniversitesi Türkiye Nüfus ve Sağlık Araştırması 2018 (Turkish Demographic and Health Survey 2018). Ankara: Hacettepe University of Population Studies 2018. ISBN 978-975-491-493-1
7. Qiao J, Dai LJ, Zhang Q, et al. A meta-analysis of the association between breastfeeding and early childhood obesity. J Pediatr Nurs 2020;53:57–66.

8. Azad MB, Vehling L, Chan D, Klopp A, Nickel NC, McGavock JM, et al. Infant feeding and weight gain: Separating breast milk from breastfeeding and formula from food. Pediatrics. 2018;142:e20181092.
9. Martínez-Villanueva J, González-Leal R, Argente J, Argente J, Martos-Moreno GÁ. La obesidad parental se asocia con la gravedad de la obesidad infantil y de sus comorbilidades [Parental obesity is associated with the severity of childhood obesity and its comorbidities]. An Pediatr (Engl Ed) 2019;90:224-31.
10. Kiess W, Kirstein AS, Stein R, Vogel M. Obesity after the Covid-19 pandemic and beyond. J Pediatr Endocrinol Metab. 2022;35:135-8.
11. Archero F, Ricotti R, Solito A, Carrera D, Civello F, Di Bella R, et al. Adherence to the mediterranean diet among school children and adolescents living in northern italy and unhealthy food behaviors associated to overweight. Nutr. 2018;10:1322.
12. Santas F, Santas G. Prevalence of pre-school children for overweight/obesity in Turkey. World J Pediatr. 2018;14:77–83.
13. Serra-Majem L, Ribas L, Ngo J, Ortega RM, García A, Pérez-Rodrigo C, et al. Food, youth and the mediterranean diet in spain. Development of kidmed, mediterranean diet quality index in children and adolescents. Public Health Nutr. 2004;7:931-935.
14. Şahingöz SA, Özgen L, Yalçın E. Akdeniz diyet kalitesi ölçeğinin (Mediterranean diet quality-kidmed) geçerlik ve güvenirlik çalışması (Validity and reliability of the mediterranean diet quality scale (Kidmed)). Proc B 5th Int Eurasian Congr Nat Nutr Heal Life Sport. 2019.
15. Neyzi O, Bundak R, Gökçay G, Günöz H, Furman A, Darendeliler F, et al. Weight, height, head circumference and body mass index references for turkish children. J Clin Res Pediatr Endocrinol. 2008;51:1–14.
16. Lobstein T, Brinsden H. Atlas of childhood obesity [Internet]. London; 2019. Available from: www.worldobesity.org
17. Altunsuyu BS, Çalişkan Z, Kocaöz S. Okul öncesi çocukların yemek yeme davranışları ve etkileyen faktörlerin belirlenmesi (Determination the eating behaviors and affecting factors of preschool children. GÜSBD. 2021;10:495–506.
18. Önal S, Özdemir A, Meşe C, Koca Özer. Evaluation of the prevalence of obesity and malnutrition in preschool children: The case of Ankara. DTCF Dergisi 2016;56:210-25.
19. Görçin Karaketir Ş, Lüleci NE, Eryurt MA, Emecen AN, Haklıdır M, Hıdıroğlu S. Overweight and obesity in preschool children in Turkey: A multilevel analysis. J Biosoc Sci 2023;55:344-66.
20. Alkan H, Enç N, Yeni K, Yıldız Ayvaz M, Kayıkcı EE, Kalkan Uğurlu Y. Evaluation of Childhood Obesity, Prevalence, and Related Factors in Istanbul. Florence Nightingale J Nurs 2022;30:267-73.
21. Stival C, Lugo A, Barone L, Fattore G, Odone A, Salvatore S, et al. Prevalence and correlates of overweight, obesity and physical activity in Italian children and adolescents from Lombardy, Italy. Nutrients 2022;14:2258.
22. Kotanidou EP, Grammatikopoulou MG, Spiliotis BE, Kanaka-Gantenbein C, Tsigga M, Galli-Tsinopoulou A. Ten-year obesity and overweight prevalence in Greek children: a systematic review and meta-analysis of 2001-2010 data. Hormones (Athens) 2013;12:537-49.
23. Stunkard AJ, Harris JR, Pedersen NL, McClearn GE. The body-mass index of twins who have been reared apart. N Engl J Med 1990;322:1483-7.
24. Hruby A, Manson JE, Qi L, Malik VS, Rimm EB, Sun Q, et al. Determinants and consequences of obesity. Am J Public Health 2016;106:1656-62.
25. Whitaker KL, Jarvis MJ, Beeken RJ, Boniface D, Wardle J. Comparing maternal and paternal intergenerational transmission of obesity risk in a large population-based sample. Am J Clin Nutr 2010;91:1560-7.
26. Kurspahić-Mujčić A, Mujčić A. Factors associated with overweight and obesity in preschool children. Med Glas 2020;17:538-543.
27. de Lauzon-Guillain B, Koudou YA, Botton J, Forhan A, Carles S, Pelloux V, et al. Association between genetic obesity susceptibility and mother-reported eating behaviour in children up to 5 years. Pediatr Obes. 2019;14:e12496.
28. Moradi M, Jalilpiran Y, Askari M, Surkan PJ, Azadbakht L. Associations between mother-child dyad dietary patterns and child anthropometric measures among 6-year-old children. Eur J Pediatr 2022;181:225-34.
29. Cadenas-Sanchez C, Intemann T, Labayen I, Artero EG, Alvarez-Bueno C, Sanchis-Moysi J, et al. Prevalence of severe/morbid obesity and other weight status and anthropometric reference standards in Spanish preschool children: The prefit project. Pediatr Res 2020;87:501-10.
30. Ozkaya SO, Ozkaya V, Garipagaoglu M. Obesity risk factors in Turkish preschool children : a cross-sectional study. Cukurova Med J 2022;47:1670-81.
31. Mardali F, Naziri M, Sohouli MH, Fatahi S, Sadat Hosseini-Baharanchi F, Găman MA, et al. Predictors of central and general obesity in Iranian preschool children: which anthropometric indices can be used as screening tools? BMC Pediatr 2022;22:1-10.
32. Zhang S, Qin X, Li P, Huang K. Effect of elective cesarean section on children 's obesity from birth to adolescence : A systematic review and meta-analysis. Front Pediatr. 2022;9:793400.
33. Li H, Zhou Y, Liu J. The impact of cesarean section on offspring overweight and obesity : a systematic review and meta-analysis. Int J Obes 2013;37:893-99.
34. Mylonas I, Friese K. Indications for and risks of elective cesarean section. Dtsch Arztebl Int 2015;112:489-95.
35. Eyi EG, Açmaz G, Keskin HL, Uzunlar Ö, Engin Üstün Y. Cesarean section clinical protocol. Ministry of Health, General Directorate of Health Services Research, Development and Health Technology Evaluation Department; 2022:110.
36. Yardim MS, Özcebe LH, Araz OM, Uner S, Li S, Unlu HK, et al. Prevalence of childhood obesity and related parental factors across socioeconomic strata in Ankara, Turkey. East Mediterr Health J 2019;25:374-84.
37. Sarıtekin S, Dindar I. Growth and development status of 2-6 year-old children enrolled to nurseries and kindergartens in Edirne and the associated factors. Ankara J Heal Serv 2013;12:2-6.
38. Wang Y, Lim H. The global childhood obesity epidemic and the association between socio-economic status and childhood obesity. Int Rev Psychiatry. 2012;24:176-88.
39. Balistreri KS, Van Hook J. Trajectories of overweight among US school children : A focus on social and economic characteristics. Matern Child Health J 2011;15:610-9.

40. Yılmaz M. Determination of obesity prevalence of primary school children in Düzce and investigation of risk factors specialization (thesis). Düzce University. Düzce: 2015.
41. El-Sayed AM, Scarborough P, Galea S. Socioeconomic inequalities in childhood obesity in the United Kingdom: A systematic review of the literature. Obes Facts 2012;5:671-92.
42. Aucott L, Bhattacharya S, McNeill G, Turner S. Differences in Body Mass Index between Siblings Who Are Discordant for Exposure to Antenatal Maternal Smoking. Paediatr Perinat Epidemiol 2017;31:402-8.
43. Rayfield S, Plugge E. Systematic review and meta-analysis of the association between maternal smoking in pregnancy and childhood overweight and obesity. J Epidemiol Community Heal 2017;71:162-73.
44. Oken E, Levitan EB, Gillman MW. Review maternal smoking during pregnancy and child overweight: systematic review and meta-analysis. Int J Obes 2008;32:201-10.
45. Ortega-García JA, Kloosterman N, Alvarez L, Tobarra-Sánchez E, et al. Full breastfeeding and obesity in children: A prospective study from birth to 6 years. Child Obes 2018;14:327-37.
46. Brophy S, Cooksey R, Gravenor MB, Mistry R, Thomas N, Lyons RA, et al. Risk factors for childhood obesity at age 5: Analysis of the millennium cohort study. BMC Public Health 2009;9:1–7.
47. Pearce J, Taylor MA, Langley-Evans SC. Timing of the introduction of complementary feeding and risk of childhood obesity: A systematic review. Int J Obes 2013;37:1295-306.
48. Vail B, Prentice P, Dunger DB, Hughes IA, Acerini CL, Ong KK. Age at Weaning and Infant Growth: Primary Analysis and Systematic Review. J Pediatr 2015;167:317-24.e1.
49. Wright CM, Parkinson KN, Drewett RF. Why are babies weaned early? Data from a prospective population based cohort study. Arch Dis Child 2004;89:813.
50. Klein D, De Toia D, Weber S, Wessley N, Koch B, Dordel S, et al. Effects of a low threshold health promotion intervention on the bmi in pre-school children under consideration of parental participation. E Spen Eur. EJ Clin Nutr Metab 2010;5:125-31.
51. Korkmaz GO, Kabaran S. Protective effects of a mediterranean-like dietary pattern on obesity, abdominal obesity and large neck circumference in a cohort of Turkish children aged 6-9 years. Asia Pac J Clin Nutr 2020;29:363-71.
52. Iaccarino Idelson P, Scalfi L, Valerio G. Adherence to the mediterranean diet in children and adolescents: A systematic review. Nutr Metab Cardiovasc Dis 2017;27:283-99.