



ELSEVIER

Contents lists available at ScienceDirect

Journal of Pediatric Nursing

journal homepage: www.pediatricnursing.org

A cross-sectional study examining self-reported anthropometric measurements with adolescents' nutrition attitudes, obesity awareness and diet quality indices during the pandemic

Adem Sümen, PhD, RN^{a,*}, Derya Evgin, PhD, RN^b^a Department of Public Health Nursing, Kumluca Faculty of Health Sciences, Akdeniz University, Antalya, Turkey^b Department of Child Health Nursing, Kumluca Faculty of Health Sciences, Akdeniz University, Antalya, Turkey

ARTICLE INFO

Article history:

Received 22 November 2021

Revised 22 January 2022

Accepted 28 January 2022

Keywords:

Adolescent

Nutrition

KIDMED

Obesity awareness

Pandemic

ABSTRACT

Purpose: The purpose of this study is to evaluate the relationship between adolescents' nutritional attitudes, obesity awareness, and diet quality with their self-reported anthropometric measurements taken during the COVID-19 pandemic.

Design and methods: This cross-sectional type of study was conducted in a district in the south of Turkey. The research was carried out online with 907 adolescents who agreed to participate voluntarily.

Results: Among the adolescents, 28.5% considered themselves overweight, and 32.1% were currently trying to lose weight. According to BMI, 16.1% were affected by overweight/obesity. Adolescents' nutritional attitudes and obesity awareness levels were moderate, while their KIDMED nutritional habits were also moderate. In this study, a negative relationship was found between the adolescents' ASHN mean scores and their body weight, waist circumference, hip circumference, neck circumference, waist/hip ratio and waist/height ratio measurements; and between their OAS mean scores and their body weight, waist circumference, waist/hip ratio and waist/height ratio measurements; and between their KIDMED index scores and their waist/height ratio measurements ($p < 0.001$).

Conclusions: The rate of adolescents who perceive themselves as overweight is higher than the results obtained from the measurement values. BMI levels and other anthropometric measurement values of adolescents with positive nutrition attitudes and physical activity behaviours are also positively affected.

Practice implications: This study may have a significant impact on the formulation and implementation of interventions to prevent obesity and increase physical activity for school health nurses. Since the pandemic is still continuing, healthcare providers must stress the risk of obesity in adolescence.

© 2022 Elsevier Inc. All rights reserved.

Introduction

Coronavirus disease 2019 (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was discovered as a result of unexplained cases of pneumonia in December 2019 in Wuhan, China. After breaking out in China, COVID-19 has spread rapidly and become a global crisis. The World Health Organisation (WHO) declared it a pandemic from March 2020 onwards (World Health Organization, 2020a, Zhu et al., 2020). The COVID-19 pandemic has had widespread effects on health, social and economic areas all over the world. Public health recommendations and government measures against the COVID-19 pandemic have made restrictions related to free movement, such as spending longer periods at home, social distancing

and quarantine obligatory. In some countries, prohibitions limiting periods of participation in open-air activities or completely restricting open-air activities have been implemented (Hossain et al., 2020; Yuce & Muz, 2021). In Turkey, the first Covid 19 cases were reported in March 2020. This led to the rapid implementation of stricter social isolation and social distancing measures in an attempt to reduce transmission and school closure ordered, and lockdown decreed (Ministry of Health, 2020).

While the measures taken have helped to reduce the rate of infection, these have led to sudden and radical changes in people's habits and lifestyles (Ammar et al., 2020; Hossain et al., 2020). Physical distancing and social isolation have had an impact on people's lifestyles, especially regarding their eating habits and daily physical activities. Staying at home, digital learning, working from home, and restriction of physical activities in the open air and sports halls have limited participation in normal daily activities (Ammar et al., 2020; Hossain et al., 2020; Hu et al., 2020; Yuce & Muz, 2021; World Health Organization, 2020b).

* Corresponding author.

E-mail addresses: ademsumen@akdeniz.edu.tr (A. Sümen), deryaevgin@akdeniz.edu.tr (D. Evgin).

Prior to the pandemic, children and adolescents were mainly in one-to-one interaction with their teachers and peer groups. Along with the closure of schools, over 91% of the global student population has been negatively affected (Lee, 2020). Children and adolescents have spent long periods in isolation at home has curtailed their opportunities for physical activity and socialisation (Jiao et al., 2020). It is stated that compared to adults, the long-term negative consequences of the pandemic for children and adolescents may continue to increase (Qiu et al., 2020).

National Public Health mandates for social isolation limited people's access to fresh food and increased the risk of the tendency to consume less nutritious food with a long shelf life containing salt, sugar and trans fats and having higher calories compared with standard living conditions (Ammar et al., 2020; Hu et al., 2020; World Health Organization, 2020b; Yuce & Muz, 2021). This situation has also prevented the maintenance of a healthy and varied diet and of physical activity, and has increased the prevalence of obesity (Ammar et al., 2020; Todisco & Donini, 2021). Obesity is major risk factor for severe disease and increased mortality in COVID-19 (Ribeiro et al., 2020).

Studies conducted globally and, in our country, reveal that adolescent obesity is increasing in both genders (Banik et al., 2020; Kartal et al., 2019; Kutlu et al., 2021; Stavridou et al., 2021; Todisco & Donini, 2021). During the pandemic, numerous factors, such as the increase in the time that individuals spend at home and in front of the screen, the decrease in their physical mobility, their desire to strengthen their immune system, and anxiety caused by the pandemic have led to changes in their nutritional habits (Kutlu et al., 2021; Mattioli et al., 2020). Starting from this point of view, this study was conducted with the aim of determining the relationship of adolescents' nutritional attitudes, obesity awareness and diet quality indices with anthropometric measurements during the pandemic.

Method

Study design and sample

This is a cross-sectional study conducted in a district in the south of Turkey. In the 2020–2021 academic year, there were a total of 4602 students in 15 high schools affiliated to the District Directorate of National Education. Since teaching and learning are conducted via distance education within the scope of the COVID-19 measures, the research was carried out online via the District Directorate of National Education and the school principals. All students registered in high schools between December 2020 and January 2021 were invited to take part in the study. The study was completed with a total of 907 students who volunteered to participate and who filled in their forms in full. The error rate originating from the sample number of the research was found to be 3.83% at a 99% confidence interval.

Data collection tools

For the data collection, a Descriptive Information Form developed by the researchers by examining the literature, the Anthropometric Measurement Form, the Attitude Scale for Healthy Nutrition, the Obesity Awareness Scale, and the Mediterranean Diet Quality Index were used.

Descriptive Information Form

The Descriptive Information Form consists of 13 questions including questions about the adolescents' gender, age, grade, disease history, use of vitamin supplements, consuming regular meals, skipped meal, number of main meals and snacks consumed, overweight person in family, self-evaluation in terms of weight, currently try to lose weight, doing physical activity.

Anthropometric Measurement Form

Adolescents' body weight, height, and waist, hip and neck circumferences were used. With these measurement values, their body mass

index (BMI), waist/hip ratio and waist/height ratio were calculated. BMI was assessed with the z score specified for children aged 5–19 by the World Health Organisation using the formula "body weight (kg) / height (m²). Accordingly, BMI was separated into three groups: <−2 SD = "underweight", between −2 SD and +1 SD = "normal", and >+1 SD = "overweight/obese". Due to distance education, the measurements could not be made by the researchers. Therefore, a video explaining how all measurements were to be made was taken and sent to the students. The students were required to take measurements in the same way, record them on the form and send their measurement videos. When schools opened, 100 students were randomly selected. All anthropometric measurements were repeated and compared by the researchers. Correlation values were determined to vary between 0.83 and 0.92.

Attitude Scale for Healthy Nutrition (ASHN)

The Attitude Scale for Healthy Nutrition was developed by Demir and Cicioğlu (2019) with the aim of measuring attitudes towards healthy nutrition. The five-point, Likert-type scale has a structure consisting of 21 items and four factors. These factors are named Information on Nutrition (IN), Emotion for Nutrition (EN), Positive Nutrition (PN) and Malnutrition (M). An example item of PN is "I eat protein-containing foods (meat, milk, eggs, etc.) every day," and an example item of M is "I eat different kinds of snacks every day," and an example item of IN is "I know the benefits of a healthy diet," and an example item of EN is "I enjoy eating fast-food products (hamburger, pizza, etc.)." The lowest score that can be obtained from the scale is 21, while the highest score is 105. Scores obtained by participants from the ASHN related to their attitudes towards healthy nutrition are evaluated as follows: 21 = very low, 22–42 = low, 43–63 = moderate, 64–84 = high, and 85–105 = ideal. The internal consistency coefficients of the scale were found to be 0.90 for IN, 0.84 for EN, 0.75 for PN, and 0.83 for M (Demir & Cicioğlu, 2019). For this study, it was seen that the internal consistency coefficients were 0.90 for the whole scale and that they ranged between 0.79 and 0.90 for the subdimensions.

Obesity Awareness Scale (OAS)

The Obesity Awareness Scale was developed by Allen (2011), and its adaptation to Turkish was made by Kafkas and Özen (2014). The 4-point Likert-type scale consists of 21 items and three subdimensions, named Obesity Awareness (OA), Nutrition (N) and Physical Activity (PA). As scores obtained in the general scale and in the subdimensions increase, obesity awareness increases. The internal consistency coefficients of the scale were found to be 0.82 for OA, 0.5 for N and 0.87 for PA (Kafkas & Özen, 2014). In this study, it was seen that the internal consistency coefficients were 0.94 for the whole scale and that they ranged between 0.90 and 0.94 for the subdimensions.

Mediterranean Diet Quality Index (KIDMED)

The Mediterranean Diet Quality Index was developed by Serra-Majem et al. (2004) in order to assess children's and youths' levels of compliance with the traditional Mediterranean diet. The traditional Mediterranean diet is characterized by high consumption of vegetables, fruits, legumes, unrefined cereals, including bread; and low consumption of meat and meat products; and moderate consumption of milk and dairy products; and rich in olive oil. Mediterranean diet is very common in our country, and adequate and balanced nutrition, physical activity, and obesity are included in health education classes in schools. The KIDMED index was translated into Turkish by Kabaran and Gezer (2013). The index consists of 16 questions, of which 12 are positive and 4 are negative, and those who answer "yes" to positive questions receive +1 point, while those answering "yes" to negative questions receive −1 point. By adding up the points, at the end of the evaluation, scores ranging between 0 and 12 are obtained. The sum of these value scores is classified in to 3 levels: ≥8 points indicating the optimal Mediterranean diet (good), between 4 and 7 points indicating that

compatibility with the Mediterranean diet should be improved (moderate), and ≤ 3 points indicating very poor diet quality (low) (Kabaran & Gezer, 2013; Serra-Majem et al., 2004).

Data collection

For the collection of the data, an online web-based questionnaire prepared with Google Forms was used. The questionnaire form was sent to the students via the District Directorate of National Education and the school principals. The adolescents and their families were informed about the aim of the research, that it would be used only for scientific purposes, that the confidentiality of the collected data would be protected, that participation was based on the principle of voluntariness, and that participation or non-participation would not affect their academic success. Along with the online form, videos demonstrating how each of the anthropometric measurements in the research should be made were sent to the adolescents. Accordingly, they were asked to take the measurements, make videos of them and record them on the form. A total of 1058 adolescents filled in the forms, and it took them an average of 15–20 min to answer them. Following review, 113 completed questionnaire forms had missing data and 38 videos showed inaccurate measuring technique. Thus, 151 participants and their questionnaires were excluded from evaluation. Therefore, the data collection process was completed with 907 students.

Data evaluation

The statistical analyses of the data were made using the SPSS Statistics Base version 23.0 of the Akdeniz University-licensed Statistical Package for the Social Sciences software. For evaluation of the study data, descriptive statistical methods (frequency, percentage, mean and standard deviation) were used; *t*-test for independent variables and one-way analysis of variance were used to test differences between groups; the post-hoc multiple comparison Bonferroni and Tukey tests were used for comparisons between groups; and Pearson correlation analysis was used to determine the relationships between the anthropometric measurements and scales. The results were evaluated at a 95% confidence interval and at $p < 0.05$, $p < 0.01$, $p < 0.001$ levels of significance.

Ethical approval of the research

Institutional permission to conduct the research was obtained from the Antalya Provincial Directorate of National Education (Date: 04/09.2020, No: E.12063623), and ethical approval was obtained from the Clinical Research Ethics Committee of Mediterranean University (Date: 19/02/2020, No: KAEK-175). Consent of the adolescents and their parents was obtained by giving them information about the study on the first page of the online link for the data collection tools.

Results

Over half (55.2%) of the adolescents were girls, 39.7% were in ninth grade, and their average age was 15.89 ± 1.05 . 7.9% of the adolescents had a diagnosed illness and 15.4% were using vitamin supplements. Over half of the adolescents (66.0%) had regular meals, and almost half (49.4%) of those who did not have regular meals skipped the morning meal. 53.7% of the adolescents ate three main meals per day and 20.1% did not consume any snacks. 37.7% of the adolescents had an overweight person in their family and 28.5% considered themselves overweight. 32.1% of the adolescents were currently trying to lose weight, while 41.7% of them sometimes performed physical activity and 26.1% regularly performed physical activity (Table 1).

Mean values for the adolescents' anthropometric values are presented in Table 2. It was determined that their mean body weight was 50.34 ± 12.82 , mean height was 152.22 ± 11.27 , mean waist

circumference was 77.11 ± 13.54 , mean hip circumference was 89.44 ± 10.13 , mean neck circumference was 31.30 ± 2.28 , mean waist/hip ratio was 0.87 ± 0.12 , mean waist/height ratio was 0.46 ± 0.09 , and mean BMI was 21.39 ± 3.80 . Mean adolescents' ASHN, OAS, and KIDMED scores are reported in Table 3. The adolescents' ASHN mean score for adolescents was 61.75 ± 14.94 , which indicates that their attitudes towards healthy nutrition were moderate. Their OAS mean score for adolescents was found to be 54.86 ± 12.21 , indicating moderate awareness of obesity. The adolescents' KIDMED index mean score for adolescents was 5.81 ± 2.04 , which indicates moderate compliance with a Mediterranean diet (Table 3).

In this study, a negative relationship was found between the adolescents' body weight, waist circumference, hip circumference, neck circumference, waist/hip ratio and waist/height ratio measurements with all subdimensions in the ASHN and OAS scores ($p < 0.001$) except PA, and neck circumference which was significant at $p < 0.01$. A negative relationship also was found between KIDMED index scores and adolescents' body weight, neck circumference and BMI ($p < 0.05$); waist circumference, hip circumference ($p < 0.01$) and waist/height ratio measurements ($p < 0.001$) (Table 2).

Adolescents with normal BMI had higher Total ASHN, ASHN-IN, ASHN-EN, Total OAS, OAS-OA, ve OAS-N mean scores ($p < 0.001$). Adolescents with normal and underweight BMI had higher mean scores for ASHN-PN ($p < 0.001$), ASHN-M ($p < 0.01$), OAS-PA ($p < 0.001$) and KIDMED index ($p < 0.001$) (Table 3).

ASHN mean scores were higher for female students ($p < 0.01$), those with no overweight people in the family ($p < 0.001$), those who had regular meals ($p < 0.05$), those who consumed snacks ($p < 0.01$), those who sometimes performed regular physical activity ($p < 0.001$) and those who did not consider themselves overweight ($p < 0.05$). OAS mean scores were higher for girls ($p < 0.001$), eleventh grade students ($p < 0.05$), those with no overweight people in the family ($p < 0.01$), those who had regular meals ($p < 0.001$), those who sometimes performed regular physical activity ($p < 0.05$), those who considered their weight to be normal ($p < 0.01$) and those who were currently trying to lose weight ($p < 0.01$). KIDMED index scores were higher for those with no overweight people in the family ($p < 0.001$), those who had regular meals ($p < 0.001$), those who ate three meals per day ($p < 0.001$), those who performed physical activity ($p < 0.001$) and those who were not currently trying to lose weight ($p < 0.05$) (Table 1).

In this study, the adolescents' mean scores were higher for those with no overweight people in the family; those who considered their weight to be normal; consuming regular meals with all subdimensions scores except EN; those who sometimes performed regular physical activity with all subdimensions scores except PA. IN, EN, OA, N and PA mean scores were higher for female students; PN mean scores were higher for those aged 16 and under; OA and N mean scores were higher for eleventh grade students and those who were currently trying to lose weight; M mean scores were higher for those who used vitamin supplements; EN, PN and PA mean scores were higher for those who skipped the morning meal; PN mean scores were higher for those who had regular meals; EN, PN, N and PA mean scores were higher for those who consumed snacks ($p < 0.05$) (Table 4).

Discussion

Healthy and balanced nutrition is of great importance in terms of obtaining sufficiently, and on time, the energy and nutritional elements required for growth, development, protecting health, and increasing life quality (Keeley et al., 2019). The periods of childhood and adolescence are important for acquiring and maintaining healthy lifestyle behaviours. In the period of adolescence, lifestyle and nutrition behaviours develop, individuals' control over their dietary preferences increases, and dietary behaviours acquired in this period also influence adulthood (Schneider et al., 2016; Winpenny et al., 2018).

Table 1
Some characteristics of adolescents with their ASHN, OAS and KIDMED mean scores (n: 907).

Characteristics	n (%)	ASHN		OAS		KIDMED		
		Mean (SD)	Test / p	Mean (SD)	Test / p	Mean (SD)	Test / p	
Gender	Female	501 (55.2)	63.13 (11.96)	2.985 ¹	56.41 (9.84)	4.137 ¹	5.78 (1.98)	-0.536 ¹
	Male	406 (44.8)	60.04 (17.82)	0.003**	52.94 (14.40)	<0.001***	5.85 (2.11)	0.592
Age	14	103 (11.4)	62.09 (13.49)	0.832 ²	55.24 (9.98)	1.763 ²	5.79 (2.07)	0.440 ²
	15	253 (27.9)	61.71 (14.28)	0.476	53.37 (12.67)	0.153	5.79 (1.94)	0.724
	16	191 (21.1)	63.06 (15.21)		55.65 (12.09)		5.96 (1.81)	
	17	360 (39.7)	60.98 (15.63)		53.38 (12.48)		5.76 (2.21)	
Grade	9th grade ^a	251 (27.7)	63.00 (13.59)	0.846 ²	54.97 (10.50)	3.297 ²	5.81 (1.95)	0.860 ²
	10th grade ^b	256 (28.2)	61.39 (15.82)	0.469	53.77 (13.06)	0.020*	5.81 (1.91)	0.462
	11th grade ^c	204 (22.5)	61.38 (14.77)		57.04 (11.94)	c > b,d	5.66 (2.33)	
	12th grade ^d	196 (21.6)	60.98 (15.59)		53.87 (13.15)		5.98 (1.97)	
Disease history	Yes	72 (7.9)	60.79 (12.67)	-0.567 ¹	53.88 (11.36)	-0.706 ¹	5.58 (1.91)	-1.021 ¹
	No	835 (92.1)	61.83 (15.12)	0.512	54.94 (12.29)	0.480	5.83 (2.05)	0.307
Use of vitamin supplements	Yes	140 (15.4)	63.45 (14.62)	1.470 ¹	56.31 (10.80)	1.528 ¹	5.56 (2.20)	-1.607 ¹
	No	767 (84.6)	61.43 (14.99)	0.142	54.59 (12.44)	0.127	5.86 (2.00)	0.108
Consuming regular meals	Yes	599 (66.0)	62.64 (14.86)	2.509 ¹	55.88 (12.06)	3.536 ¹	6.24 (1.89)	9.077 ¹
	No	308 (34.0)	60.01 (14.97)	0.012*	52.87 (12.29)	<0.001***	4.99 (2.06)	<0.001***
Skipped meal ^v	Morning	152 (49.4)	61.42 (12.57)	1.639 ¹	54.11 (10.85)	1.760 ¹	4.96 (2.09)	-0.303
	Noon	142 (46.1)	58.64 (16.92)	0.102	51.66 (13.48)	0.079	5.03 (2.04)	0.762
	Evening	14 (4.5)						
Number of main meals consumed	2	420 (46.3)	61.46 (14.46)	-0.536 ¹	54.93 (11.83)	0.163 ¹	5.50 (2.07)	-4.314 ¹
	3	487 (53.7)	61.99 (15.35)	0.592	54.80 (12.54)	0.870	6.08 (1.97)	<0.001***
Number of snacks consumed	0 ^a	182 (20.1)	57.91 (15.86)	5.081 ²	54.42 (14.28)	2.520 ²	5.56 (2.15)	2.085 ²
	1 ^b	202 (22.3)	62.64 (12.54)	0.002**	56.48 (9.73)	0.057	5.77 (2.05)	0.101
	2 ^c	326 (35.9)	62.85 (13.32)	b,c,d > a	55.11 (10.42)		6.02 (2.01)	
	3 ^d	197 (21.7)	62.53 (18.09)		53.20 (14.78)		5.76 (1.95)	
Overweight person in family	Yes	342 (37.7)	58.52 (16.11)	-4.943 ¹	53.11 (12.76)	-3.370 ¹	5.49 (2.19)	-3.604 ¹
	No	565 (62.3)	63.70 (13.84)	<0.001***	55.92 (11.76)	0.001**	6.01 (1.92)	<0.001***
Self-evaluation in terms of weight	Underweight ^a	196 (21.6)	62.35 (14.37)	3.994 ²	53.51 (11.87)	5.288 ²	5.82 (1.78)	0.241 ²
	Normal ^b	453 (49.9)	62.74 (15.18)	0.019*	56.17 (11.96)	0.005**	5.85 (2.04)	0.786
	Overweight ^c	258 (28.5)	59.54 (14.76)	a,b > c	53.58 (12.70)	b > a,c	5.74 (2.21)	
Currently try to lose weight	Yes	291 (32.1)	62.00 (13.48)	0.345 ¹	56.45 (9.25)	3.072 ¹	5.60 (2.14)	-2.212 ¹
	No	616 (67.9)	61.63 (15.59)	0.730	54.11 (13.33)	0.002**	5.92 (1.98)	0.027*
Doing physical activity	Yes ^a	237 (26.1)	59.67 (13.78)	20.724 ²	54.13 (9.71)	4.355 ²	6.03 (1.66)	23.144 ²
	No ^b	292 (32.2)	58.67 (16.12)	<0.001***	53.65 (13.73)	0.013*	5.17 (2.04)	<0.001***
	Sometimes ^c	378 (41.7)	65.42 (13.91)	c > a,b	56.25 (12.27)	c > b	6.18 (2.13)	a,c > b

ASHN: Attitude Scale for Healthy Nutrition, OAS: Obesity Awareness Scale, KIDMED: Mediterranean Diet Quality Index, SD: Standard Deviation.

¹ Independent samples t-test.

² One-Way ANOVA.

* p < 0.05.

** p < 0.01.

*** p < 0.001.

^v n: 308.

Nutritional habits such as snacking, skipping meals, eating out and consuming fast food, and behaviours such as dieting are frequently seen in adolescents (Banik et al., 2020). It was determined that over half (66.0%) of the adolescents participating in this study had regular

meals, and that almost half (49.4%) of those who did not have regular meals skipped the morning meal. Moreover, 53.7% of the adolescents ate three main meals a day and 20.1% did not consume snacks at all. From the literature (Cardel et al., 2020; Kartal et al., 2019; Khan &

Table 2
Distribution of the correlation between some anthropometric measurements and ASHN, OAS, KIDMED mean scores of adolescents (n: 907).

Characteristics	Mean (SD)	ASHN	ASHN - IN	ASHN - EN	ASHN - PN	ASHN - M	OAS	OAS - OA	OAS - N	OAS - PA	KIDMED	
Weight (kg)	50.34 (12.82)	r	-0.294	-0.290	-0.285	-0.158	-0.121	-0.240	-0.250	-0.201	-0.205	-0.073
		p	<0.001***									
Height (cm)	152.22 (11.27)	r	-0.033	-0.045	-0.059	-0.005	0.021	-0.040	-0.055	0.003	-0.062	0.044
		p	0.320	0.174	0.077	0.882	0.533	0.229	0.095	0.924	0.063	0.182
Waist circumference (cm)	77.11 (13.54)	r	-0.303	-0.307	-0.283	-0.148	-0.141	-0.245	-0.275	-0.210	-0.176	-0.100
		p	<0.001***									
Hip circumference (cm)	89.44 (10.13)	r	-0.218	-0.178	-0.218	-0.127	-0.117	-0.137	-0.135	-0.114	-0.130	-0.101
		p	<0.001***									
Neck circumference (cm)	31.30 (2.28)	r	-0.222	-0.245	-0.164	-0.126	-0.107	-0.186	-0.240	-0.153	-0.098	-0.067
		p	<0.001***	<0.001***	<0.001***	<0.001***	0.001 ^{**}	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
Waist/hip ratio	0.87 (0.12)	r	-0.269	-0.299	-0.236	-0.126	-0.113	-0.255	-0.297	-0.223	-0.163	-0.041
		p	<0.001***	<0.001***	<0.001***	<0.001***	0.001 ^{**}	<0.001***	<0.001***	<0.001***	<0.001***	<0.001***
Waist/height ratio	0.46 (0.09)	r	-0.316	-0.314	-0.288	-0.168	-0.148	-0.262	-0.284	-0.233	-0.190	-0.124
		p	<0.001***									
BMI	21.39 (3.80)	r	-0.158	-0.115	-0.164	-0.085	-0.108	-0.130	-0.095	-0.111	-0.165	-0.085
		p	<0.001***	0.001 ^{**}	<0.001***	0.010 [*]	0.001 ^{**}	<0.001***	0.004 ^{**}	0.001 ^{**}	<0.001***	<0.001***

ASHN: Attitude Scale for Healthy Nutrition, OAS: Obesity Awareness Scale, KIDMED: Mediterranean Diet Quality Index, IN: Information on Nutrition, EN: Emotion for Nutrition, PN: Positive Nutrition, M: Malnutrition, OA: Obesity Awareness, N: Nutrition, PA: Physical Activity, BMI: Body Mass Index, SD: Standard Deviation, r: Pearson correlation coefficient, * p < 0.05, ** p < 0.01, *** p < 0.001.

Table 3
Distribution of adolescents' ASHN, OAS and KIDMED mean scores by BMI (n: 907).

Scales	Mean (SD)	Body mass index			F	p	Difference
		Underweight 209 (%23.0)	Normal 552 (%60.9)	Overweight/obese 140 (%16.1)			
Total ASHN	61.75 (14.94)	58.78 (10.55)	65.98 (15.36)	49.99 (10.89)	84.619	<0.001**	b > a > c
ASHN - Information on nutrition	17.33 (5.76)	15.15 (4.04)	19.33 (5.80)	12.89 (3.71)	114.688	<0.001**	b > a > c
ASHN - Emotion for nutrition	17.44 (5.02)	17.04 (3.45)	18.59 (5.41)	13.65 (3.14)	64.368	<0.001**	b > a > c
ASHN - Positive nutrition	16.30 (5.04)	15.99 (4.40)	17.06 (5.37)	13.88 (3.66)	24.757	<0.001**	b,a > c
ASHN - Malnutrition	10.66 (4.16)	10.58 (3.32)	10.98 (4.67)	9.56 (2.78)	6.878	0.001*	b,a > c
Total OAS	54.86 (12.21)	52.10 (7.46)	57.87 (12.91)	47.43 (10.86)	54.998	<0.001**	b > a > c
OAS - Obesity awareness	20.92 (5.07)	18.94 (3.63)	22.48 (5.15)	17.84 (4.06)	81.034	<0.001**	b > a > c
OAS - Nutrition	19.34 (4.61)	18.35 (3.55)	22.48 (5.15)	17.84 (4.06)	43.556	<0.001**	b > a > c
OAS - Physical activity	14.59 (3.58)	14.79 (2.86)	15.01 (3.77)	12.72 (3.19)	25.290	<0.001**	b,a > c
KIDMED Index	5.81 (2.04)	5.97 (0.85)	5.93 (2.36)	5.14 (1.79)	9.720	<0.001**	b,a > c

ASHN: Attitude Scale for Healthy Nutrition, OAS: Obesity Awareness Scale, KIDMED: Mediterranean Diet Quality Index, SD: Standard Deviation, F: One-Way ANOVA, *p < 0.01, **p < 0.001.

Smith, 2020; Kutlu et al., 2021; Stavridou et al., 2021), it was reported that adolescents' nutritional habits changed rapidly and that they exhibited fewer planned eating habits, that they consumed more meals outside the home. Adolescents were influenced by their social circles and friends, and that they exhibited unhealthy nutritional habits such as skipping breakfast, consuming snacks instead of lunch, and increased soft drink consumption. In our research results, one-third of the adolescents included in the sample do not eat regularly, and one-fifth of them skip breakfast supports the literature. In a study conducted in Brazil, it was reported that 23.8% of adolescents skipped at least one meal (Silva et al., 2017). In a study by Ostachowska-Gasior et al. (2016), it was revealed that the most frequently consumed main meal by adolescents was lunch, and that when evaluated in terms of age, individuals of high school age were inclined to skip this meal.

At these ages, rates of skipping meals are very high, and on most days, adolescents eat fewer than three meals per day. Lunch is the most frequently eaten meal, and the rate of eating breakfast is the lowest (Giménez-Legarre et al., 2020). In fact, in our study, it was found that the adolescents' attitudes towards healthy nutrition were moderate (61.75 ± 14.94). Students' negative attitudes towards healthy nutrition can create a risk in terms of eating disorders and obesity. Unhealthy nutrition behaviours are associated with overweight and obesity (Banna et al., 2020; Koca et al., 2017). Among the adolescents, 32.1% were currently trying to lose weight, while 41.7% of them sometimes performed physical activity and 26.1% regularly performed physical activity. Accordingly, one third of the adolescents experienced weight problems and their lack of physical activity is striking. One of the most important factors associated with obesity is a sedentary lifestyle. As the time spent on sedentary behaviours increases, the time spent on physical activities decreases (Baddou et al., 2018).

We found; the adolescents' OAS mean scores were moderate. They had scores of 20.92 ± 5.07 in the OA subdimension, 19.34 ± 4.61 in the N subdimension, and 14.59 ± 3.58 in the PA subdimension of the scale. In a study with similar results to those of this study, it was determined that students obtained scores of 26.55 ± 6.59 in the OA subdimension, 18.20 ± 4.37 in the N subdimension, and 14.70 ± 3.60 in the PA subdimension, and that they obtained a total mean score of 57.06 ± 9.26 from the general scale (Özkan et al., 2020). In our study, it was found that 16.1% of the students were affected by overweight/obesity, and that these students had lower OAS scores than the others. It is estimated by the WHO that due to the order to remain at home during the pandemic, the health of 1.9 billion overweight people (over 18 years of age) and of 650 million affected by obesity people will deteriorate (World Health Organization, 2020c). The newly-created term "covid obesity" is used to define the increase in rates of obesity observed as a result of the stay-at-home and quarantine measures implemented during the pandemic (Khan & Smith, 2020; Stavridou et al., 2021). It is reported that during the COVID-19 pandemic, children's, adolescents' and young people's food consumption and weight gains have increased

(Khan & Moverley Smith, 2020; Kutlu et al., 2021; Ribeiro et al., 2020; Stavridou et al., 2021; Todisco & Donini, 2021; Yuce & Muz, 2021).

The period of adolescence is a critical period which has an important role in shaping current and future behaviours. The acquisition of behaviour skills for improving health in this period will increase the likelihood of maintaining these behaviours throughout life (Winpenny et al., 2018). It is reported that adolescents with high health literacy assess their own health as better (Paakkari et al., 2020). It has been shown that adolescents who evaluate their health as better have lower BMI values, whereas the obese, those who are worried about their body weight, and those who consider themselves underweight or overweight evaluate their health as worse (Marques & de Matos, 2016). In this study, it was found that attitudes related to healthy nutrition were higher in female students, those with no overweight people in the family, those who had regular meals, those who consumed snacks, those who sometimes performed regular physical activity and those who did not consider themselves overweight. It can be said that those who had individual and environmental characteristics that motivate positive healthy lifestyle behaviours had higher attitudes towards healthy nutrition. Other factors that increase diet quality are parents who have high education levels and who work, mothers who have good nutrition knowledge, a healthy home environment, an absence of distracting elements at breakfast, and regular physical activity (Arouca et al., 2019; Bacopoulou et al., 2017). In our study, it was determined that adolescents with no overweight people in the family, those who had regular meals, those who had three meals per day, those who performed physical activity and those who were not currently trying to lose weight had higher KIDMED index scores. Involving adolescents in the preparation of family meals at home is important in improving diet quality and eating habits. (Haines et al., 2019). Parental and peer support for healthy nutrition behaviours is associated with higher perception levels by adolescents and an increase in their diet quality (Moitra et al., 2021). The responsibility of individuals to support the immune system during the COVID-19 pandemic is stated as choosing a healthy lifestyle, eating plenty of fruits and vegetables, exercising in their spare time, trying to maintain a healthy body weight and getting enough sleep (Naja & Hamadeh, 2020).

In adolescents, an increase in diet quality has positive effects such as reducing indicators of obesity, increasing cognitive functions, and improving mental health (Bacopoulou et al., 2017). The adolescents' KIDMED index mean score was 5.81 ± 2.04, indicating moderate compliance with the Mediterranean diet. Research shows reveal that young people had low compliance with the Mediterranean diet, and that the majority of them had low or moderate diet quality (Baydemir et al., 2018; Çağiran et al., 2019; Gümüş & Yardımcı, 2019). The implementation of the Mediterranean diet is an important factor in enabling adequate and balanced nutrition. As well as the determined increase in diet quality and improvement in physical and mental health of adolescents based on compliance with the Mediterranean diet. This

Table 4
Some characteristics of adolescents with their ASHN and OAS subscales mean scores (n: 907).

Characteristics		Attitude scale for healthy nutrition				Obesity awareness scale		
		IN	EN	PN	M	OA	N	PA
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Gender	Female	17.93 (4.99)	17.92 (4.66)	16.61 (4.34)	10.65 (3.77)	21.68 (4.45)	19.74 (3.86)	14.99 (2.94)
	Male	16.59 (6.52)	16.84 (5.39)	15.93 (5.77)	10.67 (4.59)	19.98 (5.61)	18.85 (5.35)	14.10 (4.19)
	Test¹	3.414	3.169	1.961	-0.040	4.954	2.809	3.602
Age	P	0.001**	0.002**	0.050	0.968	<0.001***	0.005**	<0.001***
	14	17.60 (5.13)	17.55 (4.57)	16.85 (4.86)	10.08 (3.17)	20.86 (4.25)	19.65 (4.24)	14.72 (2.86)
	15	17.06 (5.37)	17.47 (4.79)	16.45 (4.66)	10.70 (4.04)	20.29 (5.04)	18.66 (4.84)	14.41 (3.98)
Grade	16	17.73 (5.45)	17.80 (5.21)	16.92 (4.83)	10.59 (4.11)	21.27 (5.11)	19.70 (4.45)	14.68 (3.36)
	17	17.23 (6.33)	17.18 (5.21)	15.71 (5.41)	10.83 (4.50)	21.19 (5.25)	19.54 (4.59)	14.64 (3.59)
	Test²	0.600	0.659	3.088	0.884	1.936	2.581	0.320
9th grade	P	0.615	0.578	0.026*	0.449	0.122	0.052	0.811
	10th grade	17.43 (5.08)	17.92 (4.64)	16.78 (4.55)	10.87 (4.06)	20.93 (4.37)	19.37 (4.23)	14.66 (3.25)
	11th grade	17.33 (5.76)	17.19 (5.17)	16.56 (4.96)	10.29 (3.93)	20.46 (5.29)	18.94 (4.89)	14.36 (3.83)
12th grade	17.48 (5.68)	17.30 (5.12)	15.93 (5.41)	10.65 (4.42)	21.84 (4.78)	20.16 (4.42)	15.03 (3.47)	
	17.06 (6.63)	17.28 (5.19)	15.75 (5.30)	10.88 (4.27)	20.92 (5.76)	18.96 (4.80)	14.35 (3.74)	
	Test²	0.216	1.071	2.119	1.078	3.323	3.222	1.711
Disease history	P	0.885	0.361	0.096	0.357	0.019*	0.022*	0.163
	Yes	16.72 (4.83)	17.18 (4.27)	16.80 (4.75)	10.08 (4.26)	20.50 (4.37)	19.31 (4.25)	14.06 (3.34)
	No	17.39 (5.83)	17.46 (5.08)	16.26 (5.07)	10.71 (4.15)	20.95 (5.29)	19.34 (4.64)	14.64 (3.60)
Use of vitamin supplements	Test¹	-1.105	-0.530	0.871	-1.234	-0.735	-0.047	-1.305
	P	0.272	0.597	0.384	0.217	0.462	0.962	0.192
	Yes	16.93 (5.51)	17.95 (5.03)	16.22 (4.75)	11.33 (4.56)	21.47 (4.68)	19.85 (3.83)	14.98 (3.30)
Consuming regular meals	No	17.22 (5.80)	17.34 (5.02)	16.32 (5.07)	10.54 (4.07)	20.82 (5.13)	19.25 (4.73)	14.52 (3.63)
	Test¹	1.336	1.321	-0.204	2.082	1.413	1.632	1.482
	P	0.182	0.187	0.838	0.038*	0.158	0.104	0.140
Skipped meal	Yes	17.84 (5.70)	17.52 (5.07)	17.19 (5.09)	10.07 (4.18)	21.24 (5.01)	19.82 (4.54)	14.80 (3.52)
	No	16.35 (5.75)	17.28 (4.93)	14.57 (4.48)	11.80 (3.86)	20.28 (5.13)	18.40 (4.60)	14.18 (3.67)
	Test¹	3.723	0.681	7.637	-6.058	2.717	4.454	2.478
Morning	P	<0.001***	0.496	<0.001***	<0.001***	0.007**	<0.001***	0.013*
	Evening	16.32 (5.08)	17.86 (4.53)	14.59 (4.14)	12.63 (3.92)	20.73 (4.72)	18.75 (4.22)	14.63 (3.21)
	Noon	16.37 (6.36)	16.71 (5.24)	14.56 (4.80)	11.00 (3.63)	19.85 (5.47)	18.06 (4.93)	13.75 (4.02)
Number of main meals consumed	Test¹	-0.065	2.073	0.055	3.801	1.504	1.312	2.141
	P	0.948	0.039*	0.956	<0.001***	0.134	0.191	0.033*
	2	17.16 (6.02)	17.65 (5.01)	15.76 (4.78)	10.87 (3.86)	20.99 (4.98)	19.35 (4.52)	14.57 (3.40)
Number of snacks consumed	3	17.48 (5.53)	17.25 (5.03)	16.77 (5.22)	10.48 (4.39)	20.85 (5.15)	19.33 (4.68)	14.61 (3.74)
	Test¹	-0.835	1.203	-3.004	1.413	0.418	0.094	-0.157
	P	0.404	0.229	0.003**	0.158	0.676	0.925	0.876
Overweight person in family	0	16.31 (6.07)	16.07 (4.82)	14.67 (5.25)	10.85 (4.33)	20.86 (5.54)	19.11 (5.21)	14.44 (4.14)
	1	17.63 (5.73)	17.86 (4.32)	16.63 (4.67)	10.50 (4.14)	21.47 (4.20)	19.94 (3.90)	15.06 (2.98)
	2	17.60 (5.05)	17.80 (4.69)	16.92 (4.65)	10.51 (4.06)	20.76 (4.65)	19.62 (4.11)	15.71 (3.11)
Self-evaluation in terms of weight	3	17.52 (6.49)	17.65 (6.11)	16.46 (5.53)	10.88 (4.18)	20.67 (6.01)	18.47 (5.30)	14.06 (4.21)
	Test²	2.395	5.740	8.576	0.539	1.057	4.080	2.885
	P	0.067	0.001**	<0.001***	0.656	0.367	0.007**	0.035*
Currently try to lose weight	Yes	16.47 (5.88)	16.21 (5.51)	15.57 (4.99)	10.25 (4.07)	20.49 (5.12)	18.69 (4.60)	13.92 (3.60)
	No	17.85 (5.62)	18.18 (4.55)	16.75 (5.02)	10.90 (4.19)	21.18 (5.02)	19.73 (4.57)	15.00 (3.51)
	Test¹	-3.483	-5.544	-3.436	-2.294	-1.978	-3.326	-4.414
Doing physical activity	P	0.001**	<0.001***	0.001**	0.022*	0.048*	0.001**	<0.001***
	Underweight	16.53 (5.49)	18.22 (4.53)	15.86 (5.03)	11.72 (4.20)	20.01 (4.83)	18.80 (4.69)	14.69 (3.76)
	Normal	18.28 (5.91)	17.34 (5.00)	16.73 (5.20)	10.37 (4.29)	21.50 (5.10)	19.79 (4.51)	14.87 (3.49)
Overweight	16.27 (5.41)	17.01 (5.35)	15.89 (4.71)	10.36 (3.75)	20.58 (5.07)	18.96 (4.64)	14.04 (3.56)	
	12.778	3.454	3.248	8.259	6.820	4.467	4.541	
	P	<0.001***	0.032*	0.039*	<0.001***	0.001**	0.012*	0.011*
Currently try to lose weight	Yes	17.38 (5.20)	17.55 (4.87)	16.40 (4.57)	10.64 (3.97)	21.84 (4.02)	19.94 (3.46)	14.66 (2.76)
	No	17.31 (6.01)	17.38 (5.10)	16.26 (5.25)	10.67 (4.24)	20.48 (5.44)	19.06 (5.04)	14.56 (3.91)
	Test¹	0.192	0.476	0.432	-0.088	4.220	3.082	0.443
Doing physical activity	P	0.847	0.634	0.666	0.930	<0.001***	0.002*	0.658
	Yes	16.33 (5.56)	17.10 (4.27)	16.21 (5.30)	10.02 (3.58)	19.95 (4.16)	19.38 (4.15)	14.79 (3.14)
	No	16.29 (6.01)	16.76 (5.68)	15.28 (4.68)	10.33 (3.45)	20.68 (5.59)	18.72 (4.81)	14.24 (3.97)
Sometimes	18.77 (5.38)	18.17 (4.83)	17.15 (4.83)	11.32 (4.85)	21.71 (5.05)	19.79 (4.68)	14.74 (3.52)	
	20.981	7.288	11.650	8.582	9.431	4.484	2.092	
	P	<0.001***	0.001**	<0.001***	<0.001***	<0.001***	0.012*	0.124

IN: Information on Nutrition, EN: Emotion for Nutrition, PN: Positive Nutrition, M: Malnutrition, OA: Obesity Awareness, N: Nutrition, PA: Physical Activity, SD: Standard Deviation, ¹Independent Samples t-Test, ²One-Way ANOVA, *p < 0.05, **p < 0.01, ***p < 0.001.

compliance helps adolescents to lead a healthy life by preventing the development of obesity and the related chronic diseases (Bacopoulou et al., 2017; Esteban-Gonzalo et al., 2019; Winpenny et al., 2018). It has been shown that in adolescents, diet quality has positive effects on improving life quality, on preventing obesity, and on metabolic parameters that indicate the risk of cardiovascular disease (Bacopoulou et al., 2017; Esteban-Gonzalo et al., 2019).

We found, it was found that adolescents with normal and underweight BMI had higher scores for total ASHN and its subdimensions. It was determined that adolescents with high obesity awareness and high Mediterranean diet indices had normal and underweight BMI. These results can be interpreted to say that the body mass indices of adolescents showing characteristics of nutritional knowledge, healthy nutrition behaviours, nutrition awareness, physical activity and nutrition

including the Mediterranean diet were considered to be normal, and reduced the likelihood of obesity risk and of the occurrence of diseases caused by obesity. The Mediterranean diet, which is revealed to be a safeguard against mental illnesses and obesity-related diseases associated with increase in inflammation in the body, and which includes a diet that consists mainly of anti-inflammatory ingredients, is a type of nutrition that can help adolescents to maintain a healthy lifestyle both at their current ages and at later ages (Arouca et al., 2019; Bujtor et al., 2021). Diet quality is an important factor that is related with healthy nutritional habits and is associated with nutrition that increases life quality (Bolton et al., 2016).

We found, it was determined that the body weight, waist circumference, hip circumference, neck circumference, waist/hip ratio and waist/height ratio measurements of adolescents with high healthy nutrition and levels of obesity awareness were smaller or normal range. Increasing adolescents' nutrition knowledge is an important goal and has the potential to improve their nutritional habits and lifestyle while reducing the incidence of obesity-related throughout their whole lifespan (Hamulka et al., 2018). It is stated that nutrition education in adolescents is an effective method for fostering healthy nutritional habits and for protection against chronic diseases associated with obesity (Moitra et al., 2021).

Practical implications

The need to stay at home and school closures due to the COVID-19 pandemic can increase the risk factors associated with weight gain, which is common during the summer months. The benefits and risks of social distancing need to be considered by school administrators, public health nurses and school health nurses. This study may have a significant impact on the formulation and implementation of interventions to prevent obesity and increase physical activity for school health nurses. In order to balance the increase in risk factors associated with weight gain during the pandemic, attempts should be made to help adolescents gain proper dietary habits and live exercise classes that require little, or no equipment should be given.

Limitations of the research

This research has certain limitations. Firstly, the study is limited to students attending high schools in the district where the study was made. The obtained results and generalisations are valid only for the universe of the study. Secondly, the anthropometric measurements in this study could not be made by the researchers due to distance education. The anthropometric measurements were completed and self-reported by the participants.

Conclusion

The closure of schools and other COVID-19 restrictions have disrupted children's and adolescents' daily routines and led to changes in their eating behaviours and physical activities. Therefore, this study aimed to determine the nutritional and obesity levels of adolescents (14–17 years) during the continuing COVID-19 pandemic. In our study, a negative relationship was found between adolescents' mean scores for nutrition knowledge, feelings towards nutrition, obesity awareness and physical activity, and their body weight, waist circumference, hip circumference, neck circumference, waist/hip ratio and waist/height ratio measurements. Moreover, it was determined that BMI was normal or underweight in adolescents who had high scores for healthy nutritional attitudes, nutritional knowledge, feelings towards nutrition, obesity awareness, positive nutrition and physical activity. Based on these results, nutrition literacy and healthy lifestyle awareness and behaviours of adolescents can be increased with nutrition and exercise training to be given to adolescents under ongoing pandemic conditions. In this way, obesity and the problems it causes can be

prevented. There is a need for intervention studies and multicentre interdisciplinary cooperation in order to protect these age groups from obesity and its devastating consequences. Since the pandemic is still continuing, healthcare providers must stress the risk of obesity in adolescence, and preventive strategies that include parental participation should be provided. Globally, policies, regulations and forward-looking ideal measures should be created.

Authors' contribution

Adem Sümen and Derya Evgin contributed to conception, design, acquisition, analysis, and interpretation; drafted the manuscript; critically revised the manuscript; gave final approval; and agreed to be accountable for all aspects of work ensuring integrity and accuracy.

Ethical approval

Ethics committee approval was received for this study from the Akdeniz University Medical Faculty Clinical Research Ethics Committee (Document ID: KAEK-175, Date: 19/02/2020).

Funding information

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Authorship statement

All listed authors meet the authorship criteria and that all authors are in the agreement with the content of the manuscript.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Competing Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Acknowledgment

The authors thank all participating, adolescents, their parents, school directors and teachers of the schools for their collaboration in the study.

References

- Allen, A. (2011). Effects of educational intervention on children's knowledge of obesity risk factors (Doctoral dissertation). Retrieved from: <https://www.carroll.edu/nursing/studentssuccesses>.
- Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., ... Hoekelmann, A. (2020). Effects of COVID-19 home confinement on physical activity and eating behaviour preliminary results of the ECLB-COVID19 international online-survey. *Nutrients*, 12(6), 1583. <https://doi.org/10.3390/nu12061583>.
- Arouca, A., Moreno, L. A., Gonzalez-Gil, E. M., Marcos, A., Widhalm, K., Molnár, D., ... Michels, N. (2019). Diet as moderator in the association of adiposity with inflammatory biomarkers among adolescents in the HELENA study. *European Journal of Nutrition*, 58(5), 1947–1960. <https://doi.org/10.1007/s00394-018-1749-3>.
- Bacopoulou, F., Landis, G., Rentoumis, A., Tsitsika, A., & Efthymiou, V. (2017). Mediterranean diet decreases adolescent waist circumference. *European Journal of Clinical Investigation*, 47(6), 447–455. <https://doi.org/10.1111/eci.12760>.
- Baddou, I., El Hamdouchi, A., El Harchaoui, I., Benjeddou, K., Saeid, N., Elmzibri, M., ... Aguenou, H. (2018). Objectively measured physical activity and sedentary time among children and adolescents in Morocco: A cross-sectional study. *BioMed Research International*, 2018, 1–7. <https://doi.org/10.1155/2018/8949757>.
- Banik, R., Naher, S., Pervez, S., & Hossain, M. M. (2020). Fast food consumption and obesity among urban college going adolescents in Bangladesh: A cross-sectional study. *Obesity Medicine*, 17, 100161. <https://doi.org/10.1016/j.obmed.2019.100161>.
- Banna, M. H. A., Brazendale, K., Hasan, M., Khan, M. S. I., Sayeed, A., & Kundu, S. (2020). Factors associated with overweight and obesity among Bangladeshi university

- students: A case-control study. *Journal of American College Health*, 1–7. <https://doi.org/10.1080/07448481.2020.1851695>.
- Baydemir, C., Ozgur, E. G., & Balci, S. (2018). Evaluation of adherence to Mediterranean diet in medical students at Kocaeli University, Turkey. *Journal of International Medical Research*, 46(4), 1585–1594. <https://doi.org/10.1177%2F0300060518757158>.
- Bolton, K. A., Jacka, F., Allender, S., Kremer, P., Gibbs, L., Waters, E., & de Silva, A. (2016). The association between self-reported diet quality and health-related quality of life in rural and urban Australian adolescents. *Australian Journal of Rural Health*, 24(5), 317–325. <https://doi.org/10.1111/ajr.12275>.
- Bujtor, M., Turner, A. I., Torres, S. J., Esteban-Gonzalo, L., Pariente, C. M., & Borsini, A. (2021). Associations of dietary intake on biological markers of inflammation in children and adolescents: A systematic review. *Nutrients*, 13(2), 356. <https://doi.org/10.3390/nu13020356>.
- Çağiran, Y. F., Çağiran, D., & Özçelik, A.Ö. (2019). Adolescent obesity and its association with diet quality and cardiovascular risk factors. *Ecology of Food and Nutrition*, 58(3), 207–218. <https://doi.org/10.1080/03670244.2019.1580581>.
- Cardel, M. I., Atkinson, M. A., Taveras, E. M., Holm, J. C., & Kelly, A. S. (2020). Obesity treatment among adolescents: A review of current evidence and future directions. *JAMA Pediatrics*, 174(6), 609–617. <https://doi.org/10.1001/jamapediatrics.2020.0085>.
- Demir, G. T., & Cicioğlu, H.I. (2019). Attitude scale for healthy nutrition (ASHN): Validity and reliability study. *Gaziantep Üniversitesi Spor Bilimleri Dergisi*, 4(2), 256–274. <https://doi.org/10.31680/gaunjs.559462>.
- Esteban-Gonzalo, L., Turner, A. I., Torres, S. J., Esteban-Cornejo, I., Castro-Piñero, J., Delgado-Alfonso, Á., ... Veiga, Ó. L. (2019). Diet quality and well-being in children and adolescents: The UP&DOWN longitudinal study. *British Journal of Nutrition*, 121(2), 221–231. <https://doi.org/10.1017/S0007114518003070>.
- Giménez-Legarre, N., Flores-Barrantes, P., Miguel-Berges, M. L., Moreno, L. A., & Santaliestra-Pasías, A. M. (2020). Breakfast characteristics and their association with energy, macronutrients, and food intake in children and adolescents: A systematic review and meta-analysis. *Nutrients*, 12(8), 2460. <https://doi.org/10.3390/nu12082460>.
- Gümüş, A. B., & Yardımcı, H. (2019). The evaluation of adherence to mediterranean diet among students by their habits of main meal consumption outside the home and anthropometric measurements. *Sted/Süreklî Tip Eğitimi Dergisi*, 28(6), 397–403. <https://doi.org/10.17942/sted.629541>.
- Haines, J., Haycraft, E., Lytle, L., Nicklaus, S., Kok, F. J., Merdji, M., ... Hughes, S. O. (2019). Nurturing Children's healthy eating: Position statement. *Appetite*, 137, 124–133. <https://doi.org/10.1016/j.appet.2019.02.007>.
- Hamulka, J., Wadolowska, L., Hoffmann, M., Kowalkowska, J., & Gutkowska, K. (2018). Effect of an education program on nutrition knowledge, attitudes toward nutrition, diet quality, lifestyle, and body composition in polish teenagers. The ABC of healthy eating project: Design, protocol, and methodology. *Nutrients*, 10(10), 1439. <https://doi.org/10.3390/nu10101439>.
- Hossain, M. M., Sultana, A., & Purohit, N. (2020). Mental health outcomes of quarantine and isolation for infection prevention: A systematic umbrella review of the global evidence. *Epidemiology and Health*, 42 Article e2020038. <https://doi.org/10.4178/epih.e2020038>.
- Hu, Z., Lin, X., Kaminga, A. C., & Xu, H. (2020). Impact of the COVID-19 epidemic on lifestyle behaviors and their association with subjective well-being among the general population in mainland China: Cross-sectional study. *Journal of Medical Internet Research*, 22(8) Article e21176. <https://doi.org/10.2196/21176>.
- Jiao, W. Y., Wang, L. N., Liu, J., Fang, S. F., Jiao, F. Y., Pettoello-Mantovani, M., & Somekh, E. (2020). Behavioral and emotional disorders in children during the COVID-19 epidemic. *The Journal of Pediatrics*, 221, 264–266.e1. <https://doi.org/10.1016/j.jpeds.2020.03.013>.
- Kabaran, S., & Gezer, C. (2013). Determination of the Mediterranean diet and the obesity status of children and adolescents in Turkish republic of northern Cyprus. *Turkish Journal of Pediatric Disease*, 1, 11–20. <https://doi.org/10.12956/tjpd.2013.1.03>.
- Kafkas, M., & Özen, G. (2014). The Turkish adaptation of the obesity awareness scale: A validity and reliability study. *İnönü Üniversitesi Beden Eğitimi ve Spor Bilimleri Dergisi*, 1(2), 1–15.
- Kartal, F. T., Burnaz, N. A., Yaşar, B., Sağlam, S., & Kıymaz, M. (2019). Investigation of the effect of nutrition knowledge levels of adolescents on their nutritional and exercising habits. *CBÜ Beden Eğitimi ve Spor Bilimleri Dergisi*, 14(2), 280–295. <https://doi.org/10.33459/cbuesbd.590620>.
- Keeley, B., Little, C., & Zuehlke, E. (2019). *The state of the world's children 2019. Children, food and nutrition: Growing well in a changing world*. New York: United Nations Children's Fund Retrieved from: <https://www.unicef.org/media/60811/file/SOWC-2019-Exec-summary.pdf>.
- Khan, M. A., & Smith, J. E. M. (2020). "Covibesity," a new pandemic. *Obesity Medicine*, 19, 100282. <https://doi.org/10.1016/j.obmed.2020.100282>.
- Koca, T., Akcam, M., Serdaroglu, F., & Dereci, S. (2017). Breakfast habits, dairy product consumption, physical activity, and their associations with body mass index in children aged 6–18. *European Journal of Pediatrics*, 176(9), 1251–1257. <https://doi.org/10.1007/s00431-017-2976-y>.
- Kutlu, N., Ekin, M. M., Aslıhan, A. L. A. V., Ceylan, Z., & Meral, R. (2021). A research on determining the change in the nutritional habit of individuals during the covid-19 pandemic period. *International Journal of Social, Political and Economic Research*, 8(1), 173–187. <https://doi.org/10.46291/ijospervol8iss1pp173-187>.
- Lee, J. (2020). Mental health effects of school closures during COVID-19. *The Lancet Child & Adolescent Health*, 4(6), 421. [https://doi.org/10.1016/S2352-4642\(20\)30109-7](https://doi.org/10.1016/S2352-4642(20)30109-7).
- Marques, A., & de Matos, M. G. (2016). Trends in prevalence of overweight and obesity: Are Portuguese adolescents still increasing weight? *International Journal of Public Health*, 61(1), 49–56. <https://doi.org/10.1007/s00038-015-0758-8>.
- Mattioli, A. V., Pinti, M., Farinetti, A., & Nasi, M. (2020). Obesity risk during collective quarantine for the COVID-19 epidemic. *Obesity Medicine*, 20, 100263. <https://doi.org/10.1016/j.obmed.2020.100263>.
- Ministry of Health (June 03, 2020). What is covid-19? <https://covid19.saglik.gov.tr/TR-66300/covid-19-nedir.html> Accessed May 24, 2020.
- Moitra, P., Madan, J., & Verma, P. (2021). Impact of a behaviourally focused nutrition education intervention on attitudes and practices related to eating habits and activity levels in Indian adolescents. *Public Health Nutrition*, 24(9), 2715–2726. <https://doi.org/10.1017/S1368980021000203>.
- Naja, F., & Hamadeh, R. (2020). Nutrition amid the COVID-19 pandemic: A multi-level framework for action. *European Journal of Clinical Nutrition*, 74(8), 1117–1121. <https://doi.org/10.1038/s41430-020-0634-3>.
- Ostachowska-Gasior, A., Piwowar, M., Kwiatkowski, J., Kasperczyk, J., & Skop-Lewandowska, A. (2016). Breakfast and other meal consumption in adolescents from southern Poland. *International Journal of Environmental Research and Public Health*, 13(5), 453. <https://doi.org/10.3390/ijerph13050453>.
- Özkan, İ., Adibelli, D., İlaslan, E., & Taylan, S. (2020). Relationship between body mass index and obesity awareness of university students. *Academy of Health Sciences Journal*, 11(1), 120–126. <https://doi.org/10.31067/02020.249>.
- Paakkari, L., Torppa, M., Mazur, J., Boberova, Z., Sudeck, G., Kalman, M., & Paakkari, O. (2020). A comparative study on adolescents' health literacy in Europe: Findings from the HBSC study. *International Journal of Environmental Research and Public Health*, 17(10), 3543. <https://doi.org/10.3390/ijerph17103543>.
- Qiu, J., Shen, B., Zhao, M., Wang, Z., Xie, B., & Xu, Y. (2020). A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: Implications and policy recommendations. *General Psychiatry*, 33(2) Article e100213. <https://doi.org/10.1136/gpsych-2020-100213>.
- Ribeiro, K. D. D. S., Garcia, L. R. S., Dametto, J. F. D. S., Assunção, D. G. F., & Maciel, B. L. L. (2020). COVID-19 and nutrition: The need for initiatives to promote healthy eating and prevent obesity in childhood. *Childhood Obesity*, 16(4), 235–237. <https://doi.org/10.1089/chi.2020.0121>.
- Schneider, B. C., Dumith, S. D. C., Lopes, C., Severo, M., & Assunção, M. C. F. (2016). How do tracking and changes in dietary pattern during adolescence relate to the amount of body fat in early adulthood? *PLoS One*, 11(2) Article e0149299. <https://doi.org/10.1371/journal.pone.0149299>.
- Serra-Majem, L., Ribas, L., Ngo, J., Ortega, R. M., Garcia, A., Pérez-Rodrigo, C., & Aranceta, J. (2004). Food, youth and the Mediterranean diet in Spain. Development of KIDMED, Mediterranean diet quality index in children and adolescents. *Public Health Nutrition*, 7(7), 931–935. <https://doi.org/10.1079/phn2004556>.
- Silva, F. A., Candiá, S. M., Pequeno, M. S., Sartorelli, D. S., Mendes, L. L., Oliveira, R., ... Cândido, A. P. C. (2017). Daily meal frequency and associated variables in children and adolescents. *Journal de Pediatria*, 93(1), 79–86. <https://doi.org/10.1016/j.jpeds.2016.04.008>.
- Stavridou, A., Kapsali, E., Panagouli, E., Thirios, A., Polychronis, K., Bacopoulou, F., ... Tsiatsika, A. (2021). Obesity in children and adolescents during COVID-19 pandemic. *Children*, 8(2), 135. <https://doi.org/10.3390/children8020135>.
- Todisco, P., & Donini, L. M. (2021). Eating disorders and obesity (ED&O) in the COVID-19 storm. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, 26, 747–750. <https://doi.org/10.1007/s40519-020-00938-z>.
- Wimpenny, E. M., van Sluijs, E. M., White, M., Klepp, K. I., Wold, B., & Lien, N. (2018). Changes in diet through adolescence and early adulthood: Longitudinal trajectories and association with key life transitions. *International Journal of Behavioral Nutrition and Physical Activity*, 15(1), 1–9. <https://doi.org/10.1186/s12966-018-0719-8>.
- World Health Organization (2020a). Stay physically active during self-quarantine. Retrieved from: <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/technical-guidance/stay-physically-active-during-self-quarantine>.
- World Health Organization (2020b). Coronavirus disease (COVID-19) pandemic. Retrieved from: <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/novel-coronavirus-2019-ncov>.
- World Health Organization (2020c). Obesity and overweight. Retrieved from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
- Yuce, G. E., & Muz, G. (2021). Effect of COVID-19 pandemic on adults' dietary behaviors, physical activity and stress levels. *Cukurova Medical Journal*, 46(1), 283–291. <https://doi.org/10.17826/cumj.794585>.
- Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., ... China Novel Coronavirus Investigating and Research Team (2020). A novel coronavirus from patients with pneumonia in China, 2019. *New England Journal of Medicine*, 382, 727–733. <https://doi.org/10.1056/NEJMoa2001017>.