



## Revista Española de Nutrición Humana y Dietética

Spanish Journal of Human Nutrition and Dietetics

### INVESTIGACIÓN- versión *post-print*

Esta es la versión revisada por pares aceptada para publicación. El artículo puede recibir modificaciones de estilo y de formato.

### **The relationship between body image and anthropometric measurements among adolescent girls during menstrual and non-menstrualtime periods: a cross-sectional study.**

### **La relación entre la imagen corporal y medidas antropométricas en adolescentes durante el período menstrual y no menstrual: un estudio transversal.**

Perim Fatma Türker<sup>a</sup>, Hilal Çalışkan<sup>a,\*</sup>, Sinem Bayram<sup>a</sup>

<sup>a</sup>Baskent University, Faculty of Health Sciences, Department of Nutrition and Dietetics. Ankara, Turkey.

\* [hilalc@baskent.edu.tr](mailto:hilalc@baskent.edu.tr)

Assigned editor: Miguel Angelo dos Santos Duarte Junior. Facultad de Medicina, Universidad Autónoma de Madrid, Madrid, Spain.

Received: 30/06/2022; Accepted: 26/10/2022; Published: 30/09/2022.

**CITA:** Türker PF, Çalışkan H, Bayram S. The relationship between body image and anthropometric measurements among adolescent girls during menstrual and non-menstrualtime periods: a cross-sectional study. Rev Esp Nutr Hum Diet. 2022; 26(4). doi: <https://doi.org/10.14306/renhyd.26.4.1712> [ahead of print]

La Revista Española de Nutrición Humana y Dietética se esfuerza por mantener a un sistema de publicación continua, de modo que los artículos se publican antes de su formato final (antes de que el número al que pertenecen se haya cerrado y/o publicado). De este modo, intentamos poner los artículos a disposición de los lectores/usuarios lo antes posible.

*The Spanish Journal of Human Nutrition and Dietetics strives to maintain a continuous publication system, so that the articles are published before its final format (before the number to which they belong is closed and/or published). In this way, we try to put the articles available to readers/users as soon as possible.*

## ABSTRACT

**Introduction:** In recent studies, it has been suggested that anxiety about body image increases during menstruation in adolescents and may affect nutritional status. This study aimed to evaluate the relationship between adolescents' body images, body perceptions and anthropometric measurements during menstrual and non-menstrual time periods.

**Methods:** This cross-sectional study was carried out in a private high school between September-November 2021. Participants were adolescent girls aged 14-18. The questionnaire included information about menstruation, anthropometric measurements, and the Body Cathexis Scale (BCS) and Stunkard Figure Rating Scale.

**Results:** The mean age (total=291) was 15.9(1.13) years, body mass index (BMI) was 21.13(3.33) kg/m<sup>2</sup>, waist circumference was 70.48(8.87) cm and the BCS was 97.39(24.59). The majority of students have normal BMI. However, according to waist circumference 28.5% of the them were obese ( $\geq$  90th percentile). Difference between actual BMIs and body image in the menstrual period was significant ( $p < 0.001$ ), the agreement with each other was slight ( $K = 0.172$ ). There was a significant difference ( $p < 0.001$ ) between actual BMIs and body image in the non-menstrual period and the agreement with each other was moderate ( $K = 0.474$ ). During non-menstrual periods, 79.7% of students with normal BMI perceived their body images as normal, and 70.5% of overweight students perceived as overweight.

**Conclusions:** Since the menstruation is a period in which body image is perceived differently than it is, special consideration of adolescent girls in terms for eating disorders should be encouraged.

**Keywords:** Menstruation; Adolescent; Body Image; Body Mass Index

## RESUMEN

**Introducción:** En estudios recientes, se ha sugerido que la ansiedad por la imagen corporal aumenta durante la menstruación en las adolescentes y puede afectar el estado nutricional. Este estudio tuvo como objetivo evaluar la relación entre las imágenes corporales, las percepciones corporales y las medidas antropométricas de adolescentes durante los períodos menstruales y no menstruales.

**Metodología:** Este estudio transversal se realizó en un colegio privado entre septiembre-noviembre de 2021. Las participantes eran chicas adolescentes de 14 a 18 años. El cuestionario incluía información sobre la menstruación, las medidas antropométricas y la Escala de catexis corporal (BCS) y la Escala de calificación de la figura de Stunkard.

**Resultados:** La edad media (total=291) fue de 15,9(1,13) años, el índice de masa corporal (IMC) de 21,13(3,33) kg/m<sup>2</sup>, el perímetro de cintura de 70,48(8,87) cm y el BCS de 97,39(24,59). La mayoría de los estudiantes tienen un IMC normal. Sin embargo, según el perímetro de cintura el 28,5% de ellas eran obesas ( $\geq$  percentil 90). La diferencia entre los IMC reales y la imagen corporal en el período menstrual fue significativa ( $p < 0.001$ ), la concordancia entre ellas fue leve ( $K = 0,172$ ). Hubo una diferencia significativa ( $p < 0.001$ ) entre los IMC reales y la imagen corporal en el período no menstrual y la concordancia entre ellas fue moderada ( $K = 0,474$ ). Durante los períodos no menstruales, el 79,7% de las estudiantes con IMC normal percibían su imagen corporal como normal y el 70,5% de las estudiantes con sobrepeso percibían sobrepeso.

**Conclusiones:** Dado que la menstruación es un período en el que la imagen corporal se percibe diferente de lo que es, se debe fomentar la consideración especial de las adolescentes en términos de trastornos alimentarios.

**Palabras clave:** Menstruación; Adolescente; Imagen corporal; Índice de Masa Corporal

## KEY MESSAGES

- Body Cathexis Scale (BCS) points of thin students are significantly lower than slightly overweight and obese students.
- There was a significant difference between the adolescent girls actual BMIs (Body Mass Index) and their body perceptions in the menstrual period.
- There was a positive weak correlation between BMI and BCS score, a positive moderate correlation with the body image in the menstrual period, and a positive strong correlation with the body image in the non-menstrual time periods.

## INTRODUCTION

Adolescence is the phase of life between childhood and adulthood<sup>1</sup>. According to Turkey Demographic and Health Survey 2018, 16.4% of Turkey's population are adolescents<sup>2</sup>. Adolescence is a period in which nutritional habits and food preferences change, as well as unhealthy eating behaviors. Adolescents continue the nutritional behaviors which have acquired in this period in their later stages of life<sup>1</sup>.

Body image is defined as the degree of satisfaction of people reports about their body<sup>3</sup>. Body image problems involve misperceptions, those who suffer tend to over or underestimate the size of body parts or entire bodies<sup>4</sup>. Although the differences in body perception continues throughout life, increments in dissatisfaction with appearance and body shape causes nutritional problems<sup>5,6</sup>.

The menstrual cycle is an important source of physical and psychological variation experienced by women from menarche to menopause due to edema, pain, negative mood, and increased appetite, and the beginning of the menstrual cycle is associated with increased body dissatisfaction<sup>7</sup>. Also body image concepts have been linked with various psychological illnesses, such as depression and eating disorders<sup>8</sup>. Therefore, body dissatisfaction is higher in adolescent girls with the onset of the menstrual period<sup>9,10</sup>. In this time period, body dissatisfaction, body image anxiety and changes in eating habits are observed as a result<sup>6</sup>.

Girls usually start dieting at the age of 13-14<sup>11</sup>. It has been reported that dieting is applied among thin and normal individuals as well as those with body dissatisfaction with overweight. Hence they attach great importance to the benefits of appearance and maintaining ideal body weight<sup>10</sup>. In a study conducted with 14-18 years old girls, it was found that while 62% of the individuals had a normal body mass index (BMI), 83% of them had body dissatisfaction and wanted to lose weight<sup>12</sup>.

Recent studies mostly focus on non-menstrual time periods of adolescents. This study aimed to evaluate the relationship between and body perceptions during menstrual and non-menstrual time periods.

## **METHODS**

### **Participants and type of study**

This cross sectional study was carried out with 291 girls aged 14-18, who were studying at a private high school between September-November 2021 and voluntarily agreed to participate.

### **Ethical aspects**

The study was approved by Baskent University Institutional Review Board and Ethics Committee (Project no: KA20/420). The students were included after obtaining permissions (themselves and caregiver), "Informed Voluntary Consent Form for Research in Children" was read and signed. Data were obtained from students in the sampled schools. All data included in this study obtained face to face interview by paying attention to the pandemic conditions.

### **Data collection**

A questionnaire form was applied to students, in which descriptive information about general characteristics, information about menstruation period, and mood during the menstruation period were questioned. Height (cm) and waist circumference (cm) measurements were taken with a non-stretchable tape measure. Body weight (kg) was determined with a portable scale. For waist circumference, the midpoint between the lowest rib bone and the crista iliac was found, the circumference was measured<sup>13</sup>. BMI values for age were evaluated according to the criteria of the World Health Organization Multicenter Growth Reference Study (WHO-MGRS)<sup>14</sup>. According to this classification, standard deviation score was considered  $<-2$  as "underweight",  $\geq-2$ - $<+1$  as "normal",  $\geq+1$  -  $<+2$  as overweight and  $\geq+2$  as obese<sup>14</sup>. Waist circumference values was evaluated by Hatipoğlu et al.<sup>15</sup> waist circumference percentile values for Turkish children.

The Body Cathexis Scale (BCS) consists of 40 items was developed by Secord and Jourard in 1953<sup>16</sup>. The Turkish validity and reliability study of this scale was conducted by Hovardaoğlu<sup>17</sup>. The participant is asked to choose the most suitable option for different parts of body, such as 'I don't like it at all' (5 points), 'I don't like it very much' (4 points), 'I am undecided' (3 points), 'I like it quite a bit' (2 points), 'I like it very much' (1 point). High total score indicates low body image satisfaction<sup>16,17</sup>.

Students were asked to mark how they perceived themselves during menstruation and non-menstruation periods with the Stunkard Figure Rating Scale. The figure rating scale was

developed by Stunkard et al.<sup>18</sup> as an easy-to-apply self-report scale for body image perception. This scale consists of nine figures ranges from underweight (value 1) to obese (value 9). Figures are classified according to BMI status. Figure 1 means thin, figures 2,3 and 4 are normal, figures 5,6,7,8 and 9 are obese<sup>18</sup> ([See supplementary Material](#)).

### **Statistical analysis**

Statistical analyses were performed using Statistical Package for the Social Sciences Version 20. Qualitative variables are given as numbers and percentages. Continuous variables are given with mean and standard deviation (SD) values. Chi-Square ( $\chi^2$ ) tests were used to evaluate categorical variables. One way Anova and independent sample t-test were used to evaluate the independent variables. Kendall Tau-b Test was used to determine the relationships between binary and ordinal scaled variables. Statistical analyses included Cohen's kappa test (K). Alpha level of <0.05 was used to determine statistical significance.

### **RESULTS**

A total of 291 students were involved in the study with a mean age of 15.9(1.13) years. The mean BMI of the students was 21.13(3.33) kg/m<sup>2</sup>, and the waist circumference was 70.48(8.87) cm. BCS was found to be 97.39(24.59) (Data not shown).

BCS scores of the students were compared according to sociodemographic characteristics and knowledge about the menstrual period. During the menstrual period, while there was no change in body weight in 56.3% of the students, an increase in 36.1%. The students felt aggression (39.9%) and fatigue (29.2%). The mean body perception score was found to be higher in those who felt sad and aggressive during the menstrual period (102.78(23.43), 100.59(24.14), respectively) (Table 1)).

**Table 1.** Body Cathexis Scale scores averages of the participants according to their knowledge about sociodemographic characteristics and menstrual periods.

	n	%	Body score Mean(SD)	Cathexis p
<b>Grade</b>				
9th	90	30.9	90.90(27.44)	0.163 <sup>□</sup>
10th	48	16.5	98.38(18.44)	
11th	110	37.8	97.54(21.69)	
12th	43	14.8	93.15(28.20)	
<b>Menstruation Frequency</b>				
< Every 21 days	45	15.5	90.97(27.44)	0.781 <sup>□</sup>
Every 21-27 days	130	44.7	94.98(22.33)	
Every 28-35 days	91	31.2	96.60(24.97)	
> Every 35 days	25	8.6	96.55(24.01)	
<b>Menstruation Period</b>				
2-6 days	171	58.8	93.21(24.01)	0.110 <sup>¥</sup>
≥ 7 days	120	41.2	98.02(24.07)	
<b>Changes in Body Weight</b>				
My body weight increases	105	36.1	97.26(25.99)	0.556 <sup>□</sup>
My body weight decreases	22	7.6	91.62(25.82)	
There is no change in my body weight	164	56.3	96.38(21.92)	
<b>Mood in Menstrual Period<sup>□</sup></b>				
Sad	49	16.8	102.78(23.43)	0.047 <sup>□*</sup>
Tired	85	29.2	93.53(24.92)	
Joyful	10	3.4	93.60(28.10)	
Aggressive	116	39.9	100.59(24.14)	
Painful	13	4.5	90.77(28.28)	

\*p<0.05, <sup>□</sup>One way ANOVA, <sup>¥</sup>Student t-test <sup>□</sup>multiple answers marked

The anthropometric measurements of the students are given in Table 2. BCS points of thin students are significantly lower than slightly overweight and obese students.

**Table 2.** Mean Body Cathexis Scale scores according to the anthropometric measurements.

<b>Body Cathexis Scale</b>					
	<b>n</b>	<b>Mean (SD)</b>	<b>Minimum</b>	<b>Maximum</b>	<b>p</b>
<b>BMI groups</b>					
<b>Underweight</b>	7	80.57(31.04) <sup>a</sup>	50.0	143.0	p=0.001*
<b>Normal</b>	232	95.42(24.52) <sup>ac</sup>	40.0	170.0	
<b>Overweight</b>	43	107.60(20.22) <sup>bc</sup>	56.0	149.0	
<b>Obese</b>	8	114.38(21.35) <sup>c</sup>	88.0	148.0	
<b>Waist Circumference (Percentiles)</b>					
<b>&lt;10</b>	10	88.89(27.00) <sup>ab</sup>	48.0	137.0	p=0.014* <sup>□</sup>
<b>≥10-&lt;25</b>	32	87.72(20.29) <sup>a</sup>	50.0	143.0	
<b>≥25-&lt;75</b>	121	96.77(26.40) <sup>ab</sup>	40.0	170.0	
<b>≥75-&lt;90</b>	45	95.60(24.74) <sup>ab</sup>	43.0	137.0	
<b>≥90</b>	83	104.05(21.68) <sup>b</sup>	56.0	151.0	

Different letters indicate significant differences ( $p < 0.05$ ) according to the Tukey Kramer-post-hoc test. \* $p < 0.05$ , <sup>□</sup>One way Anova, SD: standard deviation.

The relationship between the students' BMI and body image perceptions during menstrual and non-menstrual periods according to the Stunkard Figure Rating Scale is given in Table 3. There was a significant difference between the actual BMIs and their perceptions in the menstrual period ( $p=0.000$ ), and it was determined that the agreement with each other was slight ( $K=0.172$ ). While 39.6% of students with normal BMI perceived themselves slightly overweight and obese during menstrual period, 50% of slightly overweight students perceived themselves as obese. There was a significant difference ( $p < 0.001$ ) between actual BMIs non-menstrual periods and body image, their agreement with each other was moderate ( $K=0.474$ ).

The relationship between students' BMI and BCS scores and their body image perceptions in the menstrual and non-menstrual period was given in Table 4. There was a positive weak correlation between BMI and BCS score ( $r=0.208$ ), a positive moderate correlation with the body image in the menstrual period ( $r=0.447$ ), and a positive strong correlation with the body image in the non-menstrual time periods ( $r=0.631$ ).

**Table 3.** The relationship between the actual Body Mass Indexes and body image perceptions during menstrual and non-menstrual periods according to the Stunkard Figure Rating Scale.

Actual BMI Groups	Stunkard Figure Rating Scale Groups								x <sup>2</sup>	p <sup>a</sup>	K
	Underweight		Normal		Overweight		Obese				
	n	%	n	%	n	%	n	%			
<b>Which silhouette is closest to your appearance in menstrual period?</b>											
Underweight	3	42.9	4	57.1	-	-	-	-	71.712	<0,001	0.172
Normal	12	5.2	128	55.2	68	29.3	24	10.3			
Overweight	-	-	5	11.4	17	38.6	22	50.0			
Obese	-	-	-	-	3	37.5	5	62.5			
<b>Which silhouette is closest to your appearance in non-menstrual period?</b>											
Underweight	5	71.4	2	28.6	-	-	-	-	137.052	<0,001	0.474
Normal	16	6.9	185	79.7	30	12.9	1	0.5			
Overweight	-	-	6	13.6	31	70.5	7	15.9			
Obese	-	-	-	-	5	62.5	3	37.5			

<sup>a</sup>chi-square**Table 4.** The relationship between Body Mass Index and Body Cathexis Scale score during menstrual and non-menstrual periods and body image perceptions according to Stunkard Figure Rating Scale.

	Body Cathexis Scale		Body image menstrual period		Body image non-menstrual period	
	R*	95% CI	r <sup>a</sup>	95% CI	r <sup>a</sup>	95% CI
<b>BMI</b>	0.208	0.18-0.25	0.447	0.38-0.46	0.631	0.62-0.75

\*Kendall's tau-b correlation coefficient. BMI: Body mass index

## DISCUSSION

Decreased body image, body dissatisfaction and body misperception are frequently encountered in adolescence girls especially with menarche. However, no study has been found about the effect of the menstrual period on body perception and body image in adolescents. In this study, there was a significant difference between the actual BMIs and perceptions of participants in the menstrual period. The mean body perception score which was 97.39(24.59) found lower than the other similar studies. In a study conducted with girls aged 12-14, body perception score was 153.95(24.77)<sup>19</sup>.

According to Turkey Nutrition and Health Survey 2017,18.6% of girls aged 15-18 were overweight, while 4.8% were obese<sup>20</sup>. In this study, 15.1% of students were overweight, while 2.8% were obese.

In this study, BCS scores of underweight students were found to be lower than those of overweight and obese students. Contrary to this study, in a study conducted with adolescents, no significant relationship was found between BMI and Body Image Scale score<sup>21</sup>.

Body image plays an important role in the management of body weight, especially among female adolescents<sup>22</sup>. Many adolescents with normal weight compare themselves to images of very thin people presented by the media and perceive themselves as being fat and overweight. The ideal beauty standard, defined as having a slim and/or muscular body, makes individuals vulnerable to developing body image dissatisfaction<sup>23</sup>. In this study, it was determined that the agreement between the actual BMIs of the students and their body image in the menstrual period was slight ( $K=0.172$ ), while the agreement between the body image in the non-menstrual period was moderate ( $K=0.474$ ). In a study conducted with adolescents, 66% of adolescents rightly matched their BMI-for-age category with theirself-perceived body image ( $K=0.37$ )<sup>24</sup>.

In this study, approximately 47% of the students in the menstrual period and 23% of the student in the non-menstrual period evaluate themselves differently from their actual BMI. About 30% of children and adolescents aged 8–15 years in the United States misperceive their weight status<sup>25</sup>.

According to this study, 40% of the adolescents in the menstrual period and 13.75% in the non-menstrual period were overestimated their actual weight and 6.87% in the menstrual period and 9.28% in the non-menstrual period were underestimated their actual weight. In a study of Polish adolescent girls shown that the probability of body dissatisfaction among subjects

differing by phases of the menstrual cycle was 2.4 times higher for subjects at their premenstrual cycle phase than menstrual phase<sup>26</sup>. In a study of college students, participants judged highest body size and body dissatisfaction during the menstrual phase<sup>27</sup>.

Since the effect of BMI on body image is long-term, having a high BMI in adolescence strongly predicts body dissatisfaction in young adulthood<sup>28</sup>.

There are various limitations of this study. Due to time constraints, collecting data from a single private school in sample selection is one of the limitations of the study and may not reflect the universe. Another limitation of the study is that it was conducted with students studying in private schools, which is low in generalizability due to the fact that they have children from families with middle-high socioeconomic status. Although it is thought that the use of BMI as an anthropometric measurement is not sufficient, especially in adolescents, it was used due to the difficulty of skinfold thickness measurement, time limitation, and the absence of a body analyzer, but both BMI and waist circumferences evaluated according to the standard deviations of the World Health Organization as recommended. Therefore, more studies can be conducted with similar variables in different settlements and different sample groups. Food records could not be obtained due to the fact that they could not be interviewed for a long time under pandemic conditions and extra time was required for the accuracy of the records in adolescents. Despite this, the high number of participants and face to face interview were conducted to rule out peer effectiveness while collecting questionnaires are the strengths of the study. The quality and quantity of the food groups preferred by the participants who overestimated their weight in the menstrual period may be important for the result of the study, so it is recommended to evaluate them in future studies.

Since menstruation is a period in which body image is perceived differently, it should be encouraged to evaluate especially adolescent girls in terms of eating disorders. Adolescent nutrition is crucial for proper growth and development and a prerequisite for achieving full developmental potential. In this context, it is thought that dietitian support is important to prevent the development of malnutrition or obesity. Both malnutrition and obesity in adolescence are effective factors that can be determinants of health in adulthood. In terms of public health, body image affirmation is important for healthy generations, especially for female adolescents.

## **CONCLUSION**

As a result, the menstruation period negatively affects body image satisfaction. It affects especially adolescent girls more, as it is determined that they feel heavier than they are even in non-menstrual periods. Since menstruation is a period in which body image is perceived differently than it is, it should be encouraged to specifically evaluate adolescent girls in terms of eating disorders in the early period.

## **ACKNOWLEDGMENTS**

Authors thank all the participants.

## **AUTHORS CONTRIBUTION**

P-F. T, H. Ç, S. B. contributed to the design of the study, the statistical plan, and interpreted the data. H. Ç performed the literature search, performed the analyses, and wrote the first draft with the help of P-F. T, and S. B. All authors critically reviewed that and previous versions of the document.

## **FUNDING**

The authors have no financial relationships relevant to this article to disclose.

## **CONFLICTS OF INTEREST**

The authors state that there are no conflicts of interest in preparing the manuscript.

## REFERENCES

- (1) Shaw V. Clinical Paediatric Dietetics,. 5th Edition. Willey - Blackwell; 2020.
- (2) Hacettepe University Institute of Population Studies. Turkey Demographic and Health Survey 2018. 2019.
- (3) Jourard SM, Secord PF. Body-cathexis and the ideal female figure. *The Journal of Abnormal and Social Psychology*. 1955;50:243-6, doi: 10.1037/h0041128.
- (4) Yardimci H, Hakli G, Çakiroğlu FP, Özçelik AÖ. The correlation between body conception and actual body mass index among adolescents: some variables and their role. *Progr Nutr*. 2016;18(3):222-30.
- (5) Davidsen L, Vistisen B, Astrup A. Impact of the menstrual cycle on determinants of energy balance: a putative role in weight loss attempts. *Int J Obes (Lond)*. 2007;31(12):1777-85, doi: 10.1038/sj.ijo.0803699.
- (6) Arslan M. LİSE ÖĞRENCİLERİNİN BEDEN ALGISI VE YEME TUTUMUNUN İNCELENMESİ VE BUNLARIN BKİ (BEDEN KİTLE İNDEKSİ) İLE İLİŞKİSİNİN DEĞERLENDİRİLMESİ. *Süleyman Demirel Üniversitesi Vizyoner Dergisi*. 2020;11(26):107-17, doi: 10.21076/vizyoner.651699.
- (7) Carr-Nangle RE, Johnson WG, Bergeron KC, Nangle DW. Body image changes over the menstrual cycle in normal women. *Int J Eat Disord*. 1994;16(3):267-73, doi: 10.1002/1098-108x(199411)16:3<267::aid-eat2260160307>3.0.co;2-y.
- (8) Jappe LM, Gardner RM. Body-image perception and dissatisfaction throughout phases of the female menstrual cycle. *Percept Mot Skills*. 2009;108(1):74-80, doi: 10.2466/PMS.108.1.74-80.
- (9) Levine MP, Smolak L, Moodey AF, Shuman MD, Hessen LD. Normative developmental challenges and dieting and eating disturbances in middle school girls. *Int J Eat Disord*. 1994;15(1):11-20, doi: 10.1002/1098-108x(199401)15:1<11::aid-eat2260150103>3.0.co;2-q.
- (10) Malinauskas BM, Raedeke TD, Aeby VG, Smith JL, Dallas MB. Dieting practices, weight perceptions, and body composition: a comparison of normal weight, overweight, and obese college females. *Nutr J*. 2006;5:11, doi: 10.1186/1475-2891-5-11.
- (11) Huon G, Lim J. The emergence of dieting among female adolescents: age, body mass index, and seasonal effects. *The International Journal of Eating Disorders*. 2000;28(2), doi: 10.1002/1098-108x(200009)28:2<221::aid-eat12>3.0.co;2-h.

- (12) Storz NS, Greene WH. Body weight, body image, and perception of fad diets in adolescent girls. *Journal of Nutrition Education*. 1983;15(1):15-8, doi: 10.1016/S0022-3182(83)80095-8.
- (13) Ma W-Y, Yang C-Y, Shih S-R, Hsieh H-J, Hung CS, Chiu F-C, et al. Measurement of Waist Circumference: midabdominal or iliac crest? *Diabetes Care*. 2013;36(6):1660-6, doi: 10.2337/dc12-1452.
- (14) de Onis M, Garza C, Victora CG, Onyango AW, Frongillo EA, Martines J. The WHO Multicentre Growth Reference Study: planning, study design, and methodology. *Food Nutr Bull*. 2004;25(1 Suppl):S15-26, doi: 10.1177/15648265040251S103.
- (15) Hatipoglu N, Ozturk A, Mazicioglu MM, Kurtoglu S, Seyhan S, Lokoglu F. Waist circumference percentiles for 7- to 17-year-old Turkish children and adolescents. *Eur J Pediatr*. 2008;167(4):383-9, doi: 10.1007/s00431-007-0502-3.
- (16) Secord PF, Jourard SM. The appraisal of body-cathexis: body-cathexis and the self. *Journal of Consulting Psychology*. 1953;17:343-7, doi: 10.1037/h0060689.
- (17) Hovardaoglu S. Body cathexis scale. *J Psychiatry Psychol Psychopharmacol*. 1993;1:26-32.
- (18) Stunkard AJ, Sørensen T, Schulsinger F. Use of the Danish Adoption Register for the study of obesity and thinness. *Res Publ Assoc Res Nerv Ment Dis*. 1983;60:115-20.
- (19) Dorak F. Self-esteem and body image of Turkish adolescent girls. *Social Behavior and Personality: An International Journal*. 2011;39:553-62, doi: 10.2224/sbp.2011.39.4.553.
- (20) Republic of Turkey - Ministry of Health. Turkey Nutrition and Health Survey (TNHS). Ankara; 2019.
- (21) Canbulat N, Gözen D, Köse D, Arda N. Effects of body mass index on adolescents' social comparisons and body cathexis in Istanbul. *Coll Antropol*. 2011;35(4):1323-6.
- (22) Pon LW, Kandiah M, Mohd Nasir MT. Body image perception, dietary practices and physical activity of overweight and normal weight Malaysian female adolescents. *Malays J Nutr*. 2004;10(2):131-47.
- (23) Latiff AAb, Muhamad J, Rahman RA. Body image dissatisfaction and its determinants among young primary-school adolescents. *Journal of Taibah University Medical Sciences*. 2018;13(1):34-41, doi: 10.1016/j.jtumed.2017.07.003.

- (24) Moehlecke M, Blume CA, Cureau FV, Kieling C, Schaan BD. Self-perceived body image, dissatisfaction with body weight and nutritional status of Brazilian adolescents: a nationwide study. *J Pediatr (Rio J)*. 2020;96(1):76-83, doi: 10.1016/j.jpmed.2018.07.006.
- (25) Sarafrazi N, Hughes JP, Borrud L, Burt V, Paulose-Ram R. Perception of weight status in U.S. children and adolescents aged 8-15 years, 2005-2012. *NCHS Data Brief*. 2014;(158):1-7.
- (26) Kaczmarek M, Trambacz-Oleszak S. The association between menstrual cycle characteristics and perceived body image: a cross-sectional survey of polish female adolescents. *J Biosoc Sci*. 2016;48(3):374-90, doi: 10.1017/S0021932015000292.
- (27) Teixeira ALS, Dias MRC, Damasceno VO, Lamounier JA, Gardner RM. Association between different phases of menstrual cycle and body image measures of perceived size, ideal size, and body dissatisfaction. *Percept Mot Skills*. 2013;117(3):892-902, doi: 10.2466/24.27.PMS.117x31z1.
- (28) Fernández-Bustos JG, Infantes-Paniagua Á, Gonzalez-Martí I, Contreras-Jordán OR. Body Dissatisfaction in Adolescents: Differences by Sex, BMI and Type and Organisation of Physical Activity. *Int J Environ Res Public Health*. 2019;16(17):E3109, doi: 10.3390/ijerph16173109.