

Evaluation of obesity in university students with neck circumference and determination of emotional appetite

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Summary. *Objective:* In this study, it was aimed to evaluate obesity in university students with neck circumference and other anthropometric measurements and to determine their emotional appetite. *Method:* The study was conducted within the scope of Scientific Research Projects Coordination Unit of Kırıkkale University in June-December 2017 in June-December 2017 term and 4873 students were reached. A questionnaire consisting of descriptive information and emotional appetite scale was applied to students and their obesity status were determined by taking anthropometric measurements. *Results:* Students consist of 56.3% females and 43.7% males. Mean body mass index (BMI) is 23.62 ± 3.03 kg/m² in males and 21.66 ± 3.08 kg/m² in females ($p < 0.001$). Mean neck circumference is 37.50 ± 2.49 cm in males and 32.18 ± 3.51 cm in females ($p < 0.001$). According to students' BMI, 18.5% are overweight and obese, to neck circumference 36.6% are obese, and to waist circumference 22.4% are in the risk and high-risk group. 65.8% of males and 19.4% of females are obese according to neck circumference ($p < 0.001$). Waist circumference/height ratio of males is 0.478 ± 0.054 while that of females is 0.452 ± 0.053 . Central obesity was observed in 30.2% of males and 16.3% of females ($p < 0.001$). A positive correlation was found between body weight, BMI, waist circumference, wrist circumference, waist/height ratio and neck circumference. Emotional appetite status of students and values of total positive scores are different from others in at least one of BMI groups ($\chi^2 = 14.503$; $p = 0.002$). Total positive scores of thin students are higher than those who are overweight and obese ($p < 0.001$). Total score in negative emotions/conditions is high in students who are obese according to neck circumference ($Z = 4.539$; $p < 0.001$). In negative and positive emotions/conditions, median score of total emotional appetite scale of males is higher than that of females ($p < 0.001$). *Conclusion:* According to neck circumference, it is determined that obesity more common in males than females, males' appetites increase more than females' in positive and negative situations, and overweight and obese students exhibit more eating behaviour when they experience negative emotions.

Key words: neck circumference, obesity, emotional appetite, university students

Introduction

The university period is a period in which young individuals have intense positive and negative feelings due to various environmental and social factors and ex-

amination anxiety (1). In this period, nutritional preferences may change with the orientation towards family-independent eating habits, risky behaviours related to nutrition, decrease in physical activity and insufficient and unbalanced nutritional states can be seen,

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symptoms of eating disorders can occur in students, due to emotional eating behaviour and incorrect body perception (2-5). It is stated that the emotional eating behaviour, carried out by various researchers, in order to cope with negative emotions has been examined in individuals with different body weights and that food consumption of individuals is affected by positive and negative emotions and conditions (6-7).

In determining obesity, many simple and practical methods such as height, body weight, BMI, waist circumference, waist circumference/hip circumference ratio are used (8). Among these methods, BMI is the most frequently used method to distinguish underweight, normal, overweight and obese individuals (9). In addition to determining overweight and obesity, the measurement of neck circumference shows a strong correlation with visceral obesity and today, determining abdominal obesity is seen as an optimal measurement instrument in the diagnosis of metabolic diseases and other chronic diseases associated with obesity (10, 11).

The aim of this study was to evaluate obesity with neck circumference and other anthropometric measurements in students of Kırıkkale University and to determine the emotional appetite of the students.

Materials and Methods

The research was conducted at Kırıkkale University in the 2016-2017 spring /2017-2018 fall semesters with the support of the Scientific Research Project Coordination Unit (BAP:2017/45). The sampling size of the study was calculated as at least 2976 students and 4873 students were reached at the end of the study. Foreign students (having different eating habits) and students of the Department of Nutrition and Dietetics (because they have knowledge of nutrition) are not included in the study. The number of sampling was determined by stratified cluster sampling method and the students were taken into the study based on volunteerism. The students who participated in the study were informed about the study and their written consent was obtained. Students were asked questions about their own identifying-information about general characteristics and eating habits with a questionnaire developed by Nolan et al. (7) consisted of an emotion-

al appetite scale was applied. The emotional appetite scale (Emotional Appetite Questionnaire (EMAQ)) is a 22-item likert-type 9-point scoring system designed to evaluate emotional eating. The validity and reliability of the scale of Turkish version were conducted by Demirel et al. (12), and it was shown to be a reliable measurement instrument. It is based on Likert type 9 point scoring system. Participants score less (1-4), the same (5) and more (6-9) as the effect of the expressions on their appetite in each item. The presence of emotional eating is evaluated in negative/positive emotions (14 items) and negative/positive conditions (8 items). The sum of negative emotions and negative conditions scores state total negative EMAQ score and the sum of positive emotions and positive conditions scores state total positive EMAQ score. There are no cut-off point related to emotional eating. The scale assesses the presence of emotional eating negative and positive emotions and conditions.

Anthropometric measurements of students (height, body weight, waist circumference, neck circumference, wrist circumference) were determined. Waist circumference (WC), neck circumference (NC) and waist-to-height ratio (WHtR) were used in determining abdominal obesity. BMI was evaluated as follows; <18.5 kg/m² underweight, 18.5-24.9 kg/m² normal, 25.0-29.9 kg/m² overweight, ≥30.0 kg/m² obese (13). Waist circumference was considered as risk when ≥80 cm in females and ≥94 cm in males; as high risk when ≥88 cm in females and ≥102cm in males (14). The neck circumference was evaluated as obesity when ≥37 cm in males and ≥34 cm in females (15). Height to wrist circumference ratio (H/WrC) was evaluated to body frame as small when <10.9 in females, <10.4 in males, as medium when 10.9-9.9 in females, 10.4-9.6 in males, as large when <9.9 in females, <9.6 in males (16). For waist-to-height ratio, 0.5 was considered as threshold value, >0.5 was considered as central obesity (17). All measurements were made in accordance with the technique (18).

For statistical analysis and calculations, the IBM SPSS Statistics 21.0 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) program was used. Statistical significance level was accepted as $p < 0.05$. The distribution of continuous variables in the study such as age,

BMI, EMAQ scores etc. were examined by normality graphs and Shapiro Wilk test. These variables are expressed as mean \pm standard deviation (mean \pm sd) and median (minimum-maximum). Categorical variables such as gender and parents' educational status are shown in numbers and percentage (%). In the analyses, Mann Whitney U test was used to compare gender and neck circumference according to the number of groups while Kruskal-Wallis analysis was applied in comparison of EMAQ scores according to BMI groups and breakfast frequency. After Kruskal-Wallis test, Bonferroni-Dunn correction was applied as post-hoc test. The correlation between categorical variables was analysed by chi-square tests. The relation between neck circumference and some anthropometric measurements in gender subgroups was evaluated by Spearman rho coefficient.

Results

In this study, 56.3% (n=2742) of the students were female, 43.7% (n=2131) were male, 50.1% stayed at dormitories and 48.4% allocated a monthly budget of <200 Turkish liras (TL) for nutrition. It was determined that 31.9% of the students exercise and 6.0% did not have breakfast (Table 1).

The mean age of the students was 20.58 ± 1.86 years, the mean BMI was 23.62 ± 3.03 kg/m² for males and 21.66 ± 3.08 kg/m² for females (p<0.001). The mean NC is 37.50 ± 2.49 cm in males, 32.18 ± 3.51 cm in females and the NC of males is higher than females (p<0.001). 65.8% of males and 19.4% of females are obese according to their NC (p<0.001). According to WC measurements, while 10.3% of male students are at risk and 4.6% are at high risk, 12.3% of female students are at risk and 7.0% are at high risk (p<0.001). According to the H/WrC, 43.8% of the students have medium body frame and 30.2% of the males and 16.3% of the females have central obesity (p<0.001) (Table 2).

In male and female students, there was a positive correlation between neck circumference measurement and body weight, BMI, waist circumference, wrist circumference, waist/height (Table 3).

In both negative and positive emotions and conditions, total emotional appetite median score of

Table 1. Descriptive characteristics of students

Characteristics	n (%)
Gender	
Female	2742 (56.3)
Male	2131 (43.7)
Accommodation	
With family	883 (18.0)
In dormitory	2445 (50.1)
In a house with friends	1137 (23.2)
With relatives /acquaintances	51 (1.0)
In a house alone	223 (4.6)
Other	154 (3.1)
Monthly total income (TL)	
<299	256 (5.2)
300-499	1508 (30.8)
500-999	2179 (44.5)
1000-2000	789 (16.1)
>2000	164 (3.3)
Money spared to nutrition (TL)	
<200	2366 (48.4)
201-400	1756 (35.9)
401-600	557 (11.4)
601-800	136 (2.8)
>800	78 (1.5)
Status of exercise	
Does exercise	1553 (31.9)
Does not exercise	3322 (68.1)
Frequency of exercise	
Everyday	447 (28.8)
Once in a week	220 (14.2)
Several times a week	802 (51.6)
Several times a month	84 (5.4)
Faculty	
Medical/Dental/Health Sciences /Veterinary/ Sports Sciences	922 (18.9)
Law/Economics and Administrative Sciences	1568 (32.1)
Educational Sciences/ Letters/ Islamic Sciences/Fine Arts	1487 (30.5)
Engineering	904 (18.5)
Class	
1	1169 (23.9)
2	1198 (24.5)
3	1173 (24.0)
4	1353 (27.6)
Having breakfast (day/week)	
Never	293 (6.0)
1-2	691 (14.1)
3-4	1138 (23.2)
5-6	851 (17.4)
Everyday	1924 (39.3)

Table 2. Anthropometric measurement of students

Characteristics	Male	Female	Total	Z	p
	Mean±SD Median (min-max)	Mean±SD Median (min-max)	Mean±SD Median (min-max)		
Age (year)	20.79±1.99 21 (17-37)	20.42±1.74 20 (17-34)	20.58±1.86 20 (17-37)	6.415	<0.001
BMI (kg/m ²)	23.62±3.03 23.41 (14.51-37.55)	21.66±3.08 21.30 (14.34-40.40)	22.51±3.21 22.27 (14.34-40.40)	23.641	<0.001
Neck circumference (cm)	37.50±2.49 37.7 (28-50)	32.18±2.16 32.0 (26-45)	34.51±3.51 34.0 (26-50)	52.540	<0.001
Waist circumference / height	0.478±0.054 0.474 (0.232-0.733)	0.452±0.053 0.444 (0.347-0.718)	0.463±0.055 0.463 (0.232-0.733)	18.442	<0.001
	n (%)	n (%)	n (%)	χ ²	p
BMI				290.666	<0.001
Underweight	64 (3.0)	340 (12.6)	406 (8.4)		
Normal	1465 (69.7)	2046 (75.6)	3527 (73.1)		
Overweight	512 (24.4)	267 (9.9)	780 (16.2)		
Obese	61 (2.9)	54 (2.0)	115 (2.3)		
Neck circumference				1069.515	<0.001
Normal	726 (34.2)	2194 (80.6)	2931 (60.4)		
Obese	1395 (65.8)	529 (19.4)	1924 (39.6)		
Waist circumference				18.784	<0.001
Normal	1802 (85.1)	2202 (80.7)	4019 (82.7)		
Risk	218 (10.3)	336 (12.3)	554 (11.4)		
High risk	97 (4.6)	191 (7.0)	288 (5.9)		
Height / wrist circumference				32.326	<0.001
Small	874 (41.9)	1089 (40.3)	1963 (41.0)		
Medium	837 (40.1) ¹	1262 (46.7) ¹	2099 (43.8)		
Large	376 (18.0) ²	350 (13.0) ²	729 (15.2)		
Waist-to-height ratio				130.726	<0.001
Have central obesity	632 (30.2)	442 (16.3)	1074 (22.4)		
Doesn't have central obesity	1463 (69.8)	2268 (83.7)	3731 (77.6)		

For all binary comparison results: $p < 0.05$ 1.2 $p < 0.05$

male students is higher than that of female students ($p < 0.001$) (Table 4).

The values of students' total positive scores are different from those of at least one of BMI groups ($\chi^2 = 14.503$; $p = 0.002$). Total positive scores of underweight students are higher than those of overweight and obese ($p < 0.001$). Positive conditions scores are similar in BMI groups ($\chi^2 = 6.902$; $p = 0.075$) (Table 5).

Students who are obese according to their neck circumference have a high total scores of negative emotions and conditions ($Z = 4.539$; $p < 0.001$) (Table 6).

Discussion

The university period affects the emotional appetite status of students, changes their food preferences, and causes obesity and eating disorders (19). In our country, research conducted on the nutrition habits of university students has reported that students have serious problems with nutrition in this period, they usually do not pay attention to meals, avoid meals, breakfast in particular, and do not have breakfast every day (19-21). In this study, in accordance with the literature,

Table 3. Correlation between neck circumference and other anthropometric measurements of students

	Neck circumference (cm)					
	Male			Female		
	n	rho	p	n	rho	p
Weight (kg)	2113	0.586	<0.001	2704	0.545	<0.001
BMI (kg/m ²)	2096	0.529	<0.001	2690	0.509	<0.001
Waist circumference (cm)	2109	0.573	<0.001	2715	0.533	<0.001
Wrist circumference (cm)	2100	0.421	<0.001	2706	0.502	<0.001
Waist-to-height ratio	2089	0.507	<0.001	2696	0.468	<0.001

Table 4. Emotional appetite scores of students by gender

Emotional appetite status	Gender		Z	P
	Male Median (min-max)	Female Median (min-max)		
Negative emotion	33 (9-81)	32 (9-81)	2.749	0.006
Positive emotion	30 (5-45)	29 (5-45)	5.847	<0.001
Negative conditions	15 (5-45)	13 (5-45)	7.579	<0.001
Positive conditions	16 (3-27)	16 (3-27)	3.851	<0.001
Total negative	48 (14-126)	45 (14-126)	4.743	<0.001
Total positive	46 (8-72)	45 (8-72)	5.528	<0.001

Table 5. Students' emotional appetite scores according to BMI groups

Emotional appetite status	BMI groups				χ^2	p
	Underweight Median (min-max)	Normal Median (min-max)	Overweight Median (min-max)	Obese Median (min-max)		
Negative emotion	29 (9-81) ^{a,b,c}	33 (9-81) ^{a,d}	35 (9-81) ^{b,d}	33 (9-81) ^c	57.118	<0.001
Positive emotion	30 (5-45) ^{a,b,c}	29 (5-45) ^{a,d}	29 (5-45) ^b	26 (5-45) ^{c,d}	24.630	<0.001
Negative conditions	13 (5-41) ^{a,b}	13 (5-45) ^c	15 (5-45) ^{a,c}	15 (5-45) ^b	25.327	<0.001
Positive conditions	17 (3-27)	16 (3-27)	16 (3-27)	15 (3-27)	6.902	0.075
Total negative	42 (14-115) ^{a,b,c}	46 (14-126) ^{a,d}	50 (14-126) ^{b,d}	51.5 (15-118) ^c	42.067	<0.001
Total positive	47 (8-72) ^{a,b}	46 (8-72)	45 (8-72) ^a	42 (8-72) ^b	14.503	0.002

* The groups indicated by the same letters are different.

Table 6. Students' emotional appetite scores according to neck circumference classification

Emotional appetite status	Neck circumference classification		Z	P
	Normal Median (min-max)	Obese Median (min-max)		
Negative emotion	32 (9-81)	34 (9-81)	4.539	<0.001
Positive emotion	29 (5-45)	29 (5-45)	0.138	0.890
Negative conditions	13 (5-45)	14.5 (5-45)	5.139	<0.001
Positive conditions	16 (3-27)	16 (3-27)	0.831	0.406
Total negative	45 (14-126)	49 (14-126)	4.827	<0.001
Total positive	46 (8-72)	45 (8-72)	0.693	0.488

it was determined that the students skipped breakfast and only 39.3% of the students ate breakfast every day.

Various anthropometric measurements are used to determine obesity. In a study conducted by Şanlıer, when the students' obesity status were evaluated according to BMI, it was found that 14.0% in males and 6.4% in females have obesity, and the waist circumference, hip circumference and wrist circumference of male students were higher than that of females (22). In a study conducted by Işık et al., it was found according to the BMI values of university students that 24.8% of females and 33.5% of males were overweight and obese, 40.6% of females and 20.8% of males were in risk and high-risk groups (23). In this study, on the other hand, this study shows that 24.4% of males and 9.9% of females are overweight according to BMI, 10.3% of males are at risk and 4.6% are at high risk group while 12.3% of females are at risk and 7.0% are at high risk group according to waist circumference measurement. In addition, waist circumference, wrist circumference and neck circumference measurements were found to be higher in males than in females ($p < 0.001$).

As is known, waist-to-height ratio is an indicator of central obesity, one of the cardiovascular risk factors (24). In the study conducted by Ashwell and Gibson, it was found that while the mean WHtR was 0.55 ± 0.07 in males and 0.51 ± 0.8 in females, the mean WHtR of males were higher than females (24). In a study involving 389 students at Venda University, 102 students (19.2%) were reported to have a WHtR of ≥ 0.5 ; in other words, central obesity was reported to be higher

in males (11.1%) than females (8.1%). In this study, similarly, WHtR mean of males was higher than females, and central obesity was determined in 30.2% of males and 16.3% of females. Since this study consists of young adult university students, it is thought that the incidence of central obesity was found to be lower.

Studies have shown that NC is associated with BMI, body weight, waist and hip circumference measurements (26,27). Similarly, in this study, a moderate correlation was observed between NC and body weight, BMI, WC, WrC, WHtR values. In addition, according to a study conducted by Saka et al., while 85.1% of males and 38.8% of females were obese compared to the NC (26), in this study it was observed that 65.8% of males and 19.4% of females were obese compared to the NC.

In the studies conducted, it is emphasized that "emotional eating" is one of the factors that cause obesity (28,29). Geliebter and Aversa, in their study conducted with the aim of demonstrating that not only overweight and normal individuals, but also underweight individuals also showed positive and negative emotions found that underweight individuals exhibited less eating behaviour in negative situations, and more in positive situations (6). Nolan et al., in their study to determine the structural validity of EMAQ and its relationship with BMI, reported that overweight and obese individuals exhibited negative emotions, while underweight individuals exhibited positive emotions, and showed more eating behaviour (7). In this study, similarly, it was observed that total positive scores of

underweight students were found to be higher than those who are overweight and obese ($p < 0.001$), and overweight and obese students exhibited more eating behaviour in negative situations. Also, in this study, it was determined that the median score of males was higher than the females in total scores of both negative and positive emotions and conditions ($p < 0.001$). In other words, both positive and negative cases have been seen to increase the appetite of males compared to females. The results showing that overweight and obese individuals exhibit more eating behaviours when they experience a negative emotion are explained by emotion regulation and that when they experience a negative feeling, they exhibit eating behaviour to reduce this feeling (6, 7). For this reason, it is important to understand the mechanisms of controlling emotional appetite to protect young people from obesity (30).

Conclusion

As a result of this study, it was determined that there was a moderate correlation in the positive direction between the neck circumference of university students and the other anthropometric measurements. Because of its practicality, it was found that BMI and waist circumference, neck circumference, waist circumference/height measurements as well as neck circumference measurements can be used in determining obesity in individuals with this age group. In addition, in negative state and conditions, it is seen that students' appetite can be affected, and excessive eating behaviour caused by emotional appetite may result in overweight and obesity. It is thought that training regularly provides healthy eating and it is beneficial to prevent emotional eating behaviour and obesity, and to cope with stress and negative situations.

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