

CHANGING NUTRITION HABITS: SNACK CONSUMPTION, MEAL SKIPPING AND ANTHROPOMETRIC PARAMETERS OF UNIVERSITY STUDENTS IN TURKEY

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Abstract. Obesity in young adults is an important public health problem. Due to irregular lifestyle; eating snacks, skipping meal and obesity has increased in developing countries during the past decades. This study examined eating snacks and skipping meal, obesity and anthropometric parameters of university students in Turkey. A total of 892 (27%) participating students were skipping of meals and consumption of snacks were found in 41% of students. Consumption of snacks and skipping of meals are significantly related with obesity, body mass index, waist circumference, waist:hip ratio and waist:height ratio ($p < 0.05$). Significantly more female students consume snacks than males. The results indicate poor eating habit was a major contributing factor in overweight and obesity among university students in Turkey.

Keywords: body mass index, obesity, overweight, skipping of meal, snack, university student

INTRODUCTION

Obesity is a current important worldwide public health problem. In recent years, obesity and regional lipodosis have frequently been observed among new generation (WHO, 2000; Ilgaz, 2001). Consumption of snack foods, skipping meals, uncontrolled dietary intake and

irregular physical activity are some of the major risk factors responsible for the rapid increase in obesity among the young population (Lytle *et al*, 2000). There is a general concern younger people eat less at regular meal time if they frequently consume large amounts of snack food of low nutritional quality between meals (De Vet *et al*, 2015). However, the prevalence of consuming snack food and skipping meals among young adults varies worldwide (Kelishadi *et al*, 2017).

Frequent consumption of snack food is significantly associated with android and gynoid obesity (Keast *et al*, 2010). A number of cross sectional studies highlighted the association of snack food consumption with high indices of body

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mass index (BMI), waist circumference (WC), waist:hip ratio (WHR), waist:height ratio (WHtR), total blood cholesterol, blood LDL level, and plasma glucose (Cusatis and Shannon, 1996; Field *et al*, 2004; Chapelot, 2011; Júnior *et al*, 2012). Skipping breakfast is associated with increase in incidence of risk factors for cardio-vascular disease (Lytle, 2000; WHO, 2000), and more recently Kelishadi *et al* (2017) reported eating of snack food is associated with skipping of meals.

Adoption of an unhealthy lifestyle after becoming a university student is due to such factors as moving away from home, poor cooking skill, low income, preference for snack foods and skipping regular meals (Brunt and Rhee, 2008). Such lifestyle changes lead to weight gain and an increase in body fat composition during university life. Such eating behavior can become the norm among university students and other young adults. High prevalence of overweight/obesity among university students is noted in Africa (10-24%), Asia (2.9-52.6%), Latin America (12.4-31.6%), and the Middle and Near East (12.4-47.9%), including Turkey (10-47.4%) (Sanlier and Yabancı, 2007; Kutlu and Memetoglu, 2013).

Hence, this study examined consumption of snacks, skipping of meals and specific obesity anthropometric parameters among university students in Turkey, with the objective of providing data for developing educational programs to improve better eating behavior in these young adults, thereby minimizing future risks of diabetes and cardiovascular disease.

MATERIALS AND METHODS

Study protocol

This research was a cross-sectional

descriptive study and data were collected at health stands within the campus of a state university in a city of eastern Turkey during university spring fest (15 to 30 May 2013) organized annually by the social, sport, health, cultural affairs and students activity. There were 3,656 students enrolled at the university and all students have access to the organized activities.

Participations

Data were collected in two stages from 892 voluntarily participating students. In the first stage students were interviewed by a researcher and in the second stage students were requested to undertake a number of anthropometric measurements. A structured interview form was used for collection of data, namely, 25 questions on descriptive features (socio-demographic and nutrition behavior). For collection of anthropometric data, two researchers measured participants' weight, height, hip (HC) and waist circumference (WC), from which WHtR, WHR and BMI were calculated (WHO, 2000; WHO, 2008). Weight, without jacket and shoes, was measured using a standard medical-type weighing machine. Height, without shoes, was measured using a wall-mounted stadiometer. HC was measured using a tape at the level of maximum posterior extension of the buttocks; two measurements were taken and the average of the two was calculated. WC was measured in a relaxed position, with evenly distribution on both feet, at a level of the narrowest part of the waist and the average of three measurement was calculated. BMI [weight (kg)/height (m²)] is divided into four categories as follows: <18.5 kg/m²: underweight; 18.5-24.9 kg/m²: normal; 25.0-29.9 ≥30 kg/m²: pre-obese or overweight; and ≥30 kg/m²: obese (WHO, 2008).

In this study definition of study terms are as follow: "skipper": one who skips

at least one meal a day in a week; "non-skipper": one who eats at least three meals a day in one week; "snack": food and drink (fast food, salty snacks, soft drinks, energy drinks, and sweetened beverages) consumed between meals; "consumer of snacks": eating snacks ≥ 2 times a day in one week; and "non-consumer of snacks": eating snacks <2 times a day in one week.

Data analysis

Data were analyzed using a Statistical Package for the Social Sciences version 22.0 (IBM, Armonk, NY). Anthropometric data are presented as mean \pm standard deviation (SD). Data were also analyzed using a chi-square test and an independent Student's *t*-test. Statistical significance is defined as *p*-value <0.05 .

Ethical considerations

The study was approved by the Institutional Review Board and Ethics Committee of Bitlis Eren University (approval no. 2013/121) and prior written informed consent was obtained from each participant. Participants were informed their personal data would be protected and they could withdraw at any time from the study.

RESULTS

There were 892 university students, 54% male, enrolled in the study, with an average age of 23.1 ± 0.2 years. For male and female students, mean body weight was 74 ± 11 and 61 ± 10 kg, mean height 176 ± 7 and 168 ± 7 cm, mean WC 78 ± 10 and 93 ± 11 cm, and HC 94 ± 11 and 88 ± 9 cm, respectively. Thus, for male and female students their calculated mean BMI, WHR and WHtR was 21.3 ± 0.2 and 23.9 ± 0.3 kg/m^2 , 0.9 ± 0.1 and 0.9 ± 0.1 , and 0.5 ± 0.5 and 0.5 ± 0.5 , respectively.

Students who skipped meals and

consumed snacks constituted 26.9% and 41.3% of the participants. Female students <21 years of age were more likely to skip meals (Table 1), but on the other hand, male students of ≥ 25 years of age were more likely to consume snacks (Table 2). Considering all participants, students who skipped meals have significantly higher BMI than those who did not (Table 1), and students who consumed snacks have significantly higher BMI and WC, resulting in higher WHR and WHtR, than those who refrained (Table 2).

According to WHO criteria (2008), a WC ≥ 95 and ≥ 80 cm for male and female, respectively and ≥ 103 and ≥ 90 cm, respectively is defined as having increased and high risk, respectively of diabetes and cardiovascular disease; WHR <0.90 and <0.85 for male and female, respectively is defined as a normal healthy fat level; and WHtR <0.42 and >0.42 for male and female are defined as markers of increased risk of chronic disease. Thus, based on WC values female students who skipped meals and male students who skipped meals and consumed snacks were considered as at a high risk of diabetes and cardiovascular disease (Table 3). However, female students who skipped meals and consumed snacks had above normal fat levels (based on WHR) while male students, irrespective of whether they skipped meals and/or consumed snacks, had normal fat levels. Based on WHtR values no male or female students who skipped meals and/or consumed snacks were at increased risk of chronic disease. According to BMI, female students who were skippers and consumers of snacks had high BMI (Table 3). In addition, male students who were consumers of snacks had high BMI. Despite these disturbing data, such students with anthropometric indices for risk of diabetes and cardiovas-

Table 1
Comparison of demographic and anthropometric parameters with skipping meals among university students in Turkey.

Demographic parameter	Total	Non-skipper	Skipper	χ^2	
	N (%)	n (%)	n (%)	p-value	
Age group (years)					
<21	339 (38)	215 (33)	124 (52) ^a	29.775 ^a	
22-24	296 (33)	244 (37)	52 (22)	0.000 ^{a*}	
≥25	257 (29)	193 (30)	64 (26)		
Gender					
Female	412 (46)	260 (40)	152 (63) ^b	38.832 ^b	
Male	480 (54)	392 (60)	88 (37)	0.000 ^{b*}	
Total	892 (100)	652 (73)	240 (27)		
Anthropometric parameter	Mean ± SD (N = 892)	Non-skipper (n = 652) Mean ± SD	Skipper (n = 240) Mean ± SD	t	p-value
Body weight (kg)	70 ± 13	70 ± 13	70 ± 13	0.943	0.787
Height (cm)	172 ± 12	171 ± 15	172 ± 10	7.435	0.117
Waist circumference (cm)	81 ± 11	81 ± 11	81 ± 11	1.402	0.117
Hip circumference (cm)	93 ± 11	94 ± 11	92 ± 11	0.255	0.799
Body mass index (kg/m ²)	24 ± 2	24 ± 0 ^c	26 ± 0 ^c	-2.474 ^c	0.001 ^{c**}
Waist:hip ratio	0.9 ± 0.8	0.8 ± 0.1 ^d	0.9 ± 1.3 ^d	2.559 ^d	0.011 ^{d**}
Waist:height ratio	0.5 ± 0.4	0.5 ± 0.8	0.5 ± 0.8	-0.876	0.381

*Chi-square test, significance at $p<0.05$. **Independent Student's *t*-test, significance at $p<0.05$. Upper suffix alphabet refers to value compared.

cular disease constituted the minority of participating students (Table 4).

DISCUSSION

The present study shows among university students skipping meals and consuming snacks were associated with particular demographic and anthropometric parameters. Overall, based on their BMI values one fifth of the participating students were overweight/obese. Nur

et al (2017) reported 15.1% of university students at Sivas Province in the middle part of Anatolia are overweight/obese ($BMI > 25.0 \text{ kg/m}^2$). According to a Turkey nutrition and health research study, 30.3% of the population are obese, 20.5% among males and 41% among females (Turkey Nutrition and Health Research, 2014).

This study finds female students less <21 years of age are significantly skipping meals compared to other female students and male students ≥25 years of

Table 2
Comparison of demographic and anthropometric parameters with consumption of snacks among university students in Turkey.

Demographic parameter	Total	Non-consumer of snacks	Consumer of snacks	χ^2	<i>p</i> -value
	N (%)	n (%)	n (%)		
Age group (years)					
≤21	339 (38)	228 (44)	111 (30)	50.156 ^a	
22-24	296 (33)	192 (37)	104 (28)	0.000 ^{a*}	
≥25	257 (29) ^a	104 (19)	153 (42) ^a		
Gender					
Female	412 (46)	264 (50)	148 (40)	8.986 ^b	
Male	480 (54) ^b	260 (50)	220 (60) ^b	0.002 ^{b*}	
Total	892 (100)	524 (50)	368 (41)		
Anthropometric parameter	Mean ± SD (n = 892)	Non-consumer of snacks (n = 524)	Consumer of snacks (n = 368)	<i>t</i>	<i>p</i> -value
		Mean ± SD	Mean ± SD		
Body weight (kg)	70 ± 13	70 ± 13	70 ± 13	0.943	0.787
Height (cm)	172 ± 12	173 ± 9	171 ± 13	1.424	0.155
Waist circumference (cm)	81 ± 11	68 ± 13 ^c	71 ± 13 ^c	2.805 ^c	0.005 ^{c**}
Hip circumference (cm)	93 ± 11	91 ± 11	94 ± 11	0.255	0.799
Body mass index (kg/m ²)	24 ± 2	23 ± 0.3 ^d	25 ± 1 ^d	4.333 ^d	0.000 ^{d**}
Waist:hip ratio	0.9 ± 0.8	0.8 ± 0.8 ^e	0.9 ± 1.3 ^e	2.975 ^e	0.003 ^{e**}
Waist:height ratio	0.5 ± 0.4	0.4 ± 0.1 ^f	0.5 ± 0.2 ^f	2.490 ^f	0.003 ^{f**}

*Chi-square test, significance at $p < 0.05$. **Independent Student's *t*-test, significance at $p < 0.05$. Upper suffix alphabet refers to value compared.

age significantly consumed snacks compared to other male students. Parmar *et al* (2017) noted among >90% of men eat breakfast regularly while 25% of women skip this meal. Similarly Yager *et al* (2017) reported among first year undergraduate students' women skipping meals more than men. On the other hand, among first year teacher education university stu-

dents, Aparicio *et al* (2017) found women partake more meals per day than men, specifically, 54.4% of women have more than four meals daily. This observation merits further investigation. In Erzurum Province, eastern Anatolia, Vançelik *et al* (2007) reported 87.4% of university students skip meals, and in Niger 73% of university students do not have regular

Table 3

Comparison of anthropometric risk parameters of diabetes and cardiovascular disease with skipping meals and consumption of snacks among university students in Turkey.

Anthropometric parameter	Total	Non-skipper	Skipper	Non-consumer of snacks	Consumer of snacks
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Waist circumference					
(female) (n = 412)					
<80 cm	75 ± 5	75 ± 5	76 ± 7	75 ± 5	74 ± 5
80-89 cm	85 ± 2	86 ± 0	100 ± 0	84 ± 3	86 ± 1
≥ 90 cm	97 ± 7	97 ± 8 ^a	108 ± 2 ^a	96 ± 7	96 ± 2
F p-value		108.0 ^a	0.000 ^{a*}		
(male) (n = 480)					
<94 cm	77 ± 7	79 ± 8	83 ± 9	75 ± 7	80 ± 8
94-102 cm	100 ± 1	99 ± 2	98 ± 0	83 ± 2	98 ± 1
≥103 cm	104 ± 3	114 ± 5 ^b	116 ± 0 ^b	98 ± 8 ^c	116 ± 3 ^c
F p-value		37.8 ^b	0.000 ^{b*}	208.5 ^c	0.000 ^{c*}
Waist/hip ratio					
(female)					
<0.85	0.84 ± 0.03	0.80 ± 0.04	0.85 ± 0.04	0.83 ± 0.05	0.85 ± 0.03
≥0.85	0.99 ± 0.16	0.90 ± 0.05 ^d	1.05 ± 0.22 ^d	0.97 ± 0.12 ^e	1.06 ± 0.23 ^e
t p-value		83.5 ^d	0.000 ^{d*}	82.7 ^e	0.000 ^{e*}
(male)					
<0.90	0.80 ± 0.03	0.80 ± 0.05	0.78 ± 0.06	0.79 ± 0.01	0.79 ± 0.07
≥0.90	0.92 ± 0.02	0.91 ± 0.10	0.92 ± 0.04	0.91 ± 0.06	0.94 ± 0.13
Body mass index					
(female)					
18-24 kg/m ²	21 ± 1	21 ± 1	21 ± 1	21 ± 1	21 ± 1
25-29 kg/m ²	27 ± 1	27 ± 1	27 ± 1	27 ± 1	28 ± 1
≥30 kg/m ²	49 ± 1	45 ± 1 ^f	1.03 ± 1 ^f	32 ± 1 ^g	45 ± 1 ^g
F p-value		46.20 ^f	0.003 ^{f*}	17.000 ^g	0.000 ^{g*}
(male)					
18-24 kg/m ²	22 ± 1	22 ± 1	22 ± 1	21 ± 1	22 ± 1
25-29 kg/m ²	27 ± 0	27 ± 0	27 ± 2	27 ± 1	28 ± 0
≥30 kg/m ²	45 ± 0	32 ± 3	46 ± 3	32 ± 1 ^h	59 ± 1 ^h
F p-value				52.44 ^h	0.000 ^{h*}

Table 3 (Continued)

Anthropometric parameter	Total	Non-skipping	Skipper	Non-consumer of snacks	Consumer of snacks
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Waist:height ratio (female)					
<0.42	0.37 ± 0.02	0.37 ± 0.03	0.37 ± 0.02	0.36 ± 0.02	0.37 ± 0.02
0.42-0.52	0.46 ± 0.02	0.47 ± 0.02	0.46 ± 0.02	0.45 ± 0.03	0.46 ± 0.02
>0.52	0.60 ± 0.14	0.55 ± 0.05	0.62 ± 0.15	0.59 ± 0.05	0.60 ± 0.14
(male)					
<0.42	0.38 ± 0.02	0.39 ± 0.03	0.38 ± 0.02	0.38 ± 0.03	0.38 ± 0.01
0.42-0.52	0.46 ± 0.02	0.46 ± 0.02	0.46 ± 0.02	0.46 ± 0.02	0.46 ± 0.02
>0.52	0.59 ± 0.13	0.55 ± 0.02	0.62 ± 0.14	0.61 ± 0.12	0.62 ± 0.14

*One way ANOVA test, significance at $p < 0.05$. Upper suffix alphabet refers to value compared.

breakfast (Vancelik *et al*, 2007). As indicated in many studies, university students often change their dietary behavior (Peltzer and Pengpid, 2017). It has been observed that such characteristics of dietary behavior as skipping breakfast (Watanabe *et al*, 2014) and frequently consuming snacks (Murakami and Livingstone, 2015) are associated with a higher risk of being overweight/obese or having adverse metabolic consequences (Jakubowicz *et al*, 2013; Hermengildo *et al*, 2016).

Our survey reveals higher BMI were associated with students who skipped meals and both higher BMI and WC with students who consumed snacks. In this respect, several studies reported skipping breakfast is associated with increased prevalence of obesity (Berg *et al*, 2009; Watanabe *et al*, 2014; Ahadi *et al*, 2015; Kelishadi *et al*, 2017). The increasing rate of snack consumption worldwide is a nutritional problem (Jahns *et al*, 2001). One study among US children showed as a result of increasing snack consumption,

fat intake is increased (Jahns *et al*, 2001). A meta-analysis in India revealed risk of obesity increases with increasing frequency of fast food consumption (Jayawardena *et al*, 2017). However, consumption of carbonated drinks along with skipping breakfast was identified as a significant risk factor for overweight and obesity in developing countries (Jayawardena *et al*, 2017). Many studies have reported a relationship between skipping meals and consuming snacks (Jayawardena *et al*, 2017). Young adults who skip meals compensate for loss of energy intake by consuming high calorie food and snacks, a situation of concern (De Vet *et al*, 2015).

In this study, more female students were meal skippers than male students and BMI of such students were high. However, high consumers of snacks were male students and consumer of snacks had high BMI than other participations. Some studies show that those who self-classify themselves as having an irregular eating frequency tend to have a higher BMI.

Table 4

Comparison of anthropometric risk parameters of diabetes and cardiovascular disease with numbers of university students in Turkey skipping meals and consuming snacks.

Anthropometric parameter	Non-skipper	Skipper	Non-consumer of snack	Consumer of snack
Waist circumference (female) (n = 412)	n (%)	n (%)	n (%)	n (%)
<80 cm	304 (73)	180 (43)	124 (30)	188 (45)
80-89 cm	52 (13)	48 (12)	4 (1)	36 (9)
≥90 cm	56 (14)	32 (8)	24 (16)	40 (20)
Total	412 (100)	260 (63)	152 (37)	264 (64)
(male) (n = 480)				
<94 cm	412 (86)	336 (70)	76 (15)	212 (44)
94-102 cm	44 (11)	36 (8)	8 (2)	32 (7)
≥103 cm	24 (3)	20 (4)	4 (1)	16 (3)
Total	480 (100)	392 (82)	88 (18)	260 (54)
Body mass index (female and male)				
<18 kg/m ²	136 (15)	100 (11)	36 (4)	96 (11)
18-25 kg/m ²	584 (66)	428 (48)	156 (17)	300 (34)
>25-30 kg/m ²	124 (14)	92 (10)	32 (4)	88 (10)
>30 kg/m ²	48 (5)	32 (4)	16 (2)	4 (4)
Total	892 (100)	652 (73)	240 (27)	524 (59)
Waist:hip ratio (female)				
< 0.85	312 (76)	204 (49)	108 (26)	188 (46)
≥0.85	100 (24)	56 (14)	44 (11)	76 (18)
Total	412 (100)	260 (63)	152 (37)	264 (64)
(male)				
<0.90	208 (43)	168 (35)	40 (8)	100 (21)
≥0.90	278 (57)	224 (47)	48 (10)	160 (33)
Total	480 (100)	392 (82)	88 (18)	260 (54)
Waist:height ratio (female and male)				
<0.42	116 (13)	80 (9)	36 (4)	52 (6)
0.42-0.52	624 (70)	472 (53)	152 (17)	360 (40)
>0.52	152 (17)	100 (11)	52 (6)	112 (13)
Total	892 (100)	652 (73)	240 (27)	524 (59)
				368 (41)

Irregular eating is also considered risk factor for snacks consumption and obesity (Zimmerman *et al*, 2018). However, women known to skip meals and do not eat snacks tend to lose weight (Vançelik *et al*, 2007). Obese people have been reported to eat irregularly, skip meals and consume snacks (Jayawardena *et al*, 2017; Yager *et al*, 2017). In addition, participants with higher BMI who skip meals and consume protein-rich shakes, snacks or drink are more likely to use weight loss methods, such as a diet course and excessive exercises, than participants with lower BMI (Yager *et al*, 2017).

Obesity definitively has negative effects on health and can result in very serious complications (WHO, 2008). Obesity and increase in body fat lead to emergence of esthetic concerns during adolescence and young adulthood period, and negatively affect length and quality of life, causing psychological and psychosocial effects (Alphan, 2009). Inappropriate dietary intake, skipping meals, lack of physical exercise and sleep disorders are known factors causing obesity among young people (Rampersaud *et al*, 2005). These factors make control of obesity difficult and is thought that these factors are increased by various triggers in university students, such as living conditions in dormitory or student house or inability to find time to eat meals on a regular basis (Alphan, 2009). In this study, students with normal anthropometric parameters were still in the majority.

In conclusion, obesity is an increasingly important public health problem in young adults, especially those in university, and strong public health initiatives are needed to address the growing obesity epidemic in Turkey and elsewhere. Healthy lifestyle and proper eating behavior and diet are important measures

for prevention of obesity. It is necessary to take primary prevention measures, such as health education to ingrain healthy and regular dietary habits from childhood. Students should be provided with healthy lifestyles through the creation of health programs in universities. In addition, there should be regular studies in Turkey to monitor the prevalence of obesity and control programs in all universities.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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