Evaluation of the Amount and Type of Beverages Consumed by University Students

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ABSTRACT

Objective: This study aims to evaluate the effect of beverage consumption amount and type on body composition of the university students. **Materials and Methods:** A questionnaire form that contains beverage consumption questions was applied to 201 students studying at the Department of Nutrition and Dietetics, Faculty of Health Sciences, Istanbul Kültür University. The research data were evaluated using the SPSS 25th version program. **Results:** Of students participated in this study, 91.5% were female and 8.5% male. All 201 students who participated in this study were the students of Nutrition and Dietetics Department. The average age of these students was 20.5±2.1 years. Anthropometric measurements of the students were done, and the mean height was 166.1±7.6 cm, body weight was 59.7±11.3 kg, BMI was 21.54±3.1 kg / m², and hip circumference was 93.6±8.9 cm. In the study, significant relationship was found between BMI and beer types (p=0.028), wine (p=0.019), hard drinks (p=0.016), mineral water and soda (p=0.030) consumption amounts. A very weak statistically significant positive correlation was found between the daily sugared tea consumption and the body weight of university students (rs=0.149; p=0.035). It was observed that there was a statistically positive and weakly significant relationship between daily energy drink consumption and the body weight (rs=0.202; p=0.004). A very weak statistically significant positive correlation was found between the daily consumption of energy drinks and the BMI value (rs=0.163; p=0.021). **Conclusion:** It was concluded that depending on the consumption amount and variety of the beverages, beverage consumption has a relationship with body weight and BMI.

Keywords: Beverage Consumption, Beverage Amount, University Students, Body Weight.

Üniversite Öğrencilerinde İçecek Tüketim Miktarı ve Türünün Değerlendirilmesi

ÖZ

Amaç: Bu çalışmanın amacı üniversite öğrencilerinin içecek tüketimi miktarları ve türünün vücut kompozisyonuna olan etkisinin değerlendirilmesidir. **Gereç ve Yöntem:** İstanbul Kültür Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü'nde öğrenim gören 201 öğrenciye anket formu ve içecek tüketim anketi yapılmıştır. Araştırma verileri SPSS 25. versiyon programıyla değerlendirilmiştir. **Bulgular:** Çalışmaya %91.5'i kadın, %8.5'i erkek olmak üzere 201 Beslenme ve Diyetetik Bölümü öğrencisi katılmıştır. Öğrencilerin yaş ortalaması 20.5 ± 2.1 yıldır. Öğrencilerin antropometrik ölçümleri incelendiğinde ortalama boy uzunluğu 166.1±7.6 cm, vücut ağırlığı 59.7±11.3 kg, BKİ 21.54±3.1 kg/m², kalça çevresi 93.6±8.9 cm olarak saptanmıştır. Çalışmada BKİ ve bira çeşitleri (p=0.028), şarap (p=0.019), sert içkiler (p=0.016), maden suyu ve soda (p=0.030) tüketim miktarları arasında anlamlı ilişkiye rastlanmıştır. Üniversite öğrencilerinin günlük şekerli çay tüketimi ve vücut ağırlığı arasında istatistiksel açıdan pozitif yönde çok zayıf anlamlı bir ilişki bulunmuştur (rs=0.149; p=0.035). Günlük enerji içeceği tüketimi ile vücut ağırlığı arasında istatistiksel açıdan pozitif yönde zayıf anlamlı bir ilişki olduğu (rs=0.202; p=0.004) görülmüştür. Günlük enerji içeceği tüketim miktarı ile BKİ değeri arasında ise istatistiksel açıdan pozitif yönde çok zayıf anlamlı bir ilişki olduğu saptanmıştır (rs=0.163; p=0.021). **Sonuç:** İçeceklerin tüketim miktarına ve çeşitliliğine bağlı olarak vücut ağırlığı ve BKİ ile ilişkisinden söz edilebileceği sonucuna varılmıştır.

Anahtar Kelimeler: İçecek Tüketimi, İçecek Miktarı, Üniversite Öğrencileri, Vücut Ağırlığı.

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INTRODUCTION

Water is a necessary resource for the continuation of life functions (Drewnowski, Rehm, Constant, 2013). The water requirement of our body is provided by three ways, by the foods we eat, water and liquid beverages consumed, and metabolic water formed by reactions in the body (Ertuğ, 2011). When the 2019 TBSA (Turkey Nutrition and Health Survey) data on consumption of water and other drinks examined, 2010 TBSA showed 1841.9 ml of consumption per day for men while 2017 TBSA data showed 1882.8 ml of consumption. For women, 2010 TBSA showed 1497.2 ml of consumption while 2017 TBSA showed 1576.3 ml of consumption per day (TBSA, 2019). Water needed by the body can be met with a variety of beverages. However, regarding the nutritional value they contain and their effects on health, they have an important role on having a healthy drinking pattern throughout the life cycle (Balaghi et al., 2011). Unhealthy beverage consumption affects the BMI of individuals (Çolak, Ergün, 2020).

A BMI value above or below the normal range indicates an increased health risk (TÜBER, 2015). This situation paves the way for the formation of obesity and related diseases (Yılmaz, Özel, 2016). Excessive consumption of sugary drinks increases the risk of obesity by causing an increase in total energy intake, As the consumption of sugary drinks increases, the rate of overweight and obesity increases with the increase in BMI values (Köksal, Karaçil, 2021). Replacing sugary and high energy drinks with water and other beverages will have positive effects on obesity in the long term (Eroğlu, 2018). Young adulthood is defined as the age of 18-24 (Kalkan et al., 2018). It is important in the formation of the diet since it is the years that the lifestyle changes and starts to be shaped (Arslan, Daşkapan, Çakır, 2016). Correct orientation of habits in this period is one of the first steps in preventing future diseases (Kalkan et al., 2018).

The aim of this study is to evaluate the effect of the amount and type of beverage consumption of university students on their body composition.

MATERIALS AND METHODS

Study type

This research is a cross-sectional study that was conducted on students (n =201) studying at Istanbul Kültür University Faculty of Health Sciences Department of Nutrition and Dietetics in the 2020-2021 academic year. All students who continue their education in the nutrition and dietetics department in the 2020-2021 academic year participated in the study.

Data collection

In the research of this study, online survey method was used as the data collection tool. The questionnaire form consists of five sections: demographic characteristics, anthropometric assessment, habits, general health status, and nutritional status. Anthropometric measurements were taken by the participants. In order to standardize the anthropometric measurements of the students, the researchers interviewed the students online via the Microsoft teams application, and how the anthropometric measurements should be taken was explained practically

with the video interview. While taking the waist circumference measurement, the lowest rib bone located on the right side of the person to be measured gets marked while the person is standing. On the hip, the hip bone prominence (iliac) gets marked. The midpoint between the two marks' measure gives the waist circumference measurement. Hip circumference is measured from the widest circumference of the hip when viewed from the side while the individual is standing (TÜBER, 2015). Inelastic tape measure was used for waist-hip circumference measurements. The body weight and height of the students were noted according to their own statements. In the week of the survey for body weight, they were asked to measure their body weight twice in a row in the morning on an empty stomach and with light clothes and record the average in the questionnaire.

A liquid consumption questionnaire including 21 types of beverages was conducted to determine the amount and type of beverage consumption of university students. In this survey, the drinks consumed by university students and frequency of consumption were questioned.

Statistical analysis

The research data were evaluated using the SPSS (Statistical Package for Social Sciences) 25th version package program. Analytical and descriptive statistics were used in the analysis. The qualitative data obtained were evaluated with numbers and percentages. Numerical variables; mean, standard deviation, lower and upper values , and categorical variables; shown with numbers and percentages. In the comparison of quantitative data, in case of more than two groups, one-way Anova test was used for comparing parameters between groups. In all analyzes, the confidence interval was determined as 95%, and the results for $p<0.05$ were considered statistically significant. Spearman Correlation test was used to compare ordinal and numerical data. Correlation coefficients (rs); 0.00-0.19 no or negligible relationship, 0.20-0.39 weak (low) relationship, 0.40-0.69 moderate relationship, 0.70-0.89 strong (high) relationship, 0.90-1.00 very strong relationship.

Ethic approval

Informed consent was obtained from the students who participated in the study. Ethics committee permission for this study was obtained from the Ethics Committee of Istanbul Kültür University (Decision number: 2019.15).

RESULTS

201 students, 91.5% female, and 8.5% male, participated in this study. The mean age of the students was 20.5±2.1 years. When the students' anthropometric measurements were examined, mean height was 166.1±7.6 cm, body weight was 59.7±11.3 kg, BMI (Body Mass Index) was 21.54±3.1 kg / m², hip circumference was 93.6±8.9 cm. The mean waist-to-height ratio was found to be 0.44±0.06 cm, the mean waist-to-hip ratio was 0.78±0.09 cm.

Table 1. Means of the anthropometric data of students.

Anthropometric data	Min	Max	X±SD
Height (cm)	150	192	166.1±7.6
Body weight (kg)	40.5	105	59.7±11.3
BMI (kg/ m²)	16.56	32.85	21.54±3.1
Hip circumference (cm)	60	124	93.6±8.9
Waist circumference (cm)	55	105	73.1±10.8
Waist/Hip ratio	0.54	1.11	0.78±0.09
Waist/Height ratio	0.32	0.64	0.44±0.06

X=Mean, **SD**=Standard deviation

While 72.3% of female students were normal weight, 15.8% were underweight, 11.4% were overweight by their BMI categories, 67.7% of male students were normal, 23.5% were overweight, 11.8% of them were in the obese BMI category. When the waist/height ratios of the students were examined, 47.8% of the female and 64.7% of the male students were in the normal category.

Table 2. The relationship between university students' daily sugary tea consumption and body weight and BMI value.

	Daily consumption of tea with sugar	
	rs	p
Body weight	0.149	0.035
BMI	0.047	0.512

rs= Spearman's correlation test

In Table 2, there was a very weak statistically significant positive correlation between daily sugared tea consumption and body weight (rs=0.149; p=0.035). However, no statistically significant relationship was found between the daily sugar tea consumption and BMI value (rs=0.047; p=0.512).

Table 3. The relationship between university students' daily energy drink consumption and body weight and BMI value.

	Daily energy drink consumption	
	rho	p
Body weight	0.202	0.004
BMI	0.163	0.021

rho=Spearman's correlation test

In Table 3, the relationship between the daily energy drink consumption amount of university students and their body weight and BMI values are given. There was a statistically positive weak (low) significant relationship between daily energy drink consumption and body weight (rs=0.202; p=0.004). There was a very weak statistically significant positive correlation between the amount of daily energy drink consumption and BMI (rs=0.163; p=0.021). The average daily beverage consumption amounts of the students participating in the study according to the BMI value are given in Table 4.

Students' consumption of average beer types per day according to their underweight, normal, overweight, and obese BMI values are respectively; 38.5±102.0ml, 9.5±32.3ml, 18.3±50.5ml, and 50.7±87.8ml. As a result of the one-way analysis of variance (ANOVA) conducted to determine whether the average consumption of beer varieties of the students participating in the study differ significantly according to the BMI variable, the difference between the group averages was found to be statistically significant (F=3.097; p=0.028).

Students' average daily wine consumption according to the values of underweight, normal, overweight BMI; It was found to be 9.6±24.7ml, 1.6±5.7ml, and 24.0±90.5ml. As a result of the one-way analysis of variance (ANOVA) conducted to determine whether the average consumption of wine (Red, White, etc.) of the students participating in the study shows a significant difference according to the BMI variable, the difference between the group averages was found to be statistically significant (F=3.390; p=0.019).

Students' daily average hard drink consumption according to the values of underweight, normal, overweight, and obese BMI; It was found as 0.4±2.1ml, 0.1±0.5ml, 1.3±4 ml, and 0.9±1.7 ml. As a result of the one-way analysis of variance (ANOVA) conducted to determine whether the average consumption of hard drinks (Rakı, Whiskey, etc.) of the students participating in the study shows a significant difference according to the BMI variable, the difference between the group averages was found to be statistically significant (F=3.521; p=0.016).

Students' daily average mineral water and soda consumption according to their underweight, normal, overweight, and obese BMI values were; 20.7 ± 34.9ml, 75.0±108.8ml, 88.0 ± 88.8ml, and 19.0 ± 16.5ml. As a result of the one-way analysis of variance (ANOVA) conducted to determine whether the average consumption of mineral water and soda of the students participating in the study shows a significant difference according to the BMI variable, the difference between the group averages was found to be statistically significant (F=3.054; p=0.030).

DISCUSSION
In this study, when the average BMI of the students was examined, it was seen that they were within the normal range. According to the anthropometric characteristics of the students, the average waist circumference/hip circumference ratio, which is an indicator of obesity and obesity-related chronic diseases, was at the recommended value according to the WHO (World Health Organization) criteria.

The waist circumference/height ratio was developed by Ashwell et al. to help overcome the controversy about the use of different BMI breakpoints to assess health risks in different populations (Ashwell, Hsieh, 2005). The relationship between waist/height ratio and type 2 diabetes risk of students in the nursing department was evaluated by Gezer and it was found that the waist circumference/height ratio was the measurement with the highest correlation coefficient with the risk of type 2 diabetes (Gezer, 2017).

Table 1. Beverage consumption of university students according to BMI (mL).

Drinks BMI Value	Underweight (<18.49 kg/ m²)	Normal weight (18.5-24.99 kg/ m²)	Overweight (25.0-29.99 kg/ m²)	Obese (>30.0 kg/ m²)	F	p
Water	545.8±136.5	573.4±86.4	571.4±108.8	600±-0.0	0.749	0.524
100% Fresh fruit juices	19.7±29.7	28.8±49.6	27.4±43.2	9.5±16.5	0.454	0.715
100% Fresh vegetable juices and mixes	26.6±111.7	10.7±31.9	19.4±44.9	-	0.905	0.440
Juice cocktails (Lemonade, Cappy, Tamek, Aroma, cold stewed fruit, non-alcoholic cocktails, etc.)	47.1±65.5	51.7±130.1	15.1±22.4	62.9±72	0.754	0.521
Whole milk	56.5±64.8	94.4±147.8	115.7±108.7	-	1.419	0.238
Low fat milk	45.7±70.4	45±80.1	54.4±86	34.9±60.4	0.120	0.948
Skimmed milk	12±32.6	29±89.1	23.7±69.5	-	0.467	0.705
Soft drinks (Cola, Fanta, Sprite, Soda, Fruit Soda, etc.)	92.7±184.9	67.4±141.8	24.5±33.7	110±54.4	1.184	0.317
Light soft drinks (Diet- Zero-Max vb.)	14.6±38.0	47.8±158.1	18.9±33.3	15.7±27.2	0.724	0.539
Tea with sugar (Ice tea, Fuse tea, Nestea, Didi)	30.7±66.3	33.3±77.4	32.9±96.2	11.4±19.8	0.083	0.969
Tea or coffee (with sugar and cream)	170.5±270.2	133.6±208.9	29.8±96.9	33.9±58.6	2.483	0.062
Tea or coffee (with sweetener, without sugar or cream)	169.2±189.8	174.1±174.1	238.3±155.4	71.4±75.3	1.424	0.237
Light Beer, Non-alcoholic beer, alcoholic cocktails	43.6±198.1	7.0±35.7	26.3±56.8	-	1.775	0.153
Beer Types	38.5±102.0	9.5±32.3	18.3±50.5	50.7±87.8	3.097	**0.028**
Hard liquors (Rum, Gin, Vodka, Tequila, Shots, etc.)	0.9±3.3	0.3±1.4	1.6±4.0	-	2.621	0.052
Wine (Red, white, etc.)	9.6±24.7	1.6±5.7	24.0±90.5	-	3.390	**0.019**
Hard drinks (Raki, whiskey, etc.)	0.4±2.1	0.1±0.5	1.3±4.0	0.9±1.7	3.521	**0.016**
Energy and sports drinks (Red Bull, Burn, Rockstar, Gatorade, Powerade, etc.)	9.9±41.5	13.9±63.4	25.7±100.8	71.4±123.7	0.973	0.407
Buttermilk, Kefir	78.8±116.5	70.6±94.6	81.1±90.9	76.2±43.6	0.122	0.947
Mineral Water, Soda (plain)	20.7±34.9	75.0±108.8	88.0±88.8	19.0±16.5	3.054	**0.030**
Boza, Salep, etc.	11.1±23.6	25.0±103.0	27.1±58.6	-	0.274	0.844

In this study, when the waist circumference/height ratio of the students of the Department of Nutrition and Dietetics was examined, which enabled us to get an idea about abdominal adiposity because they were conscious about maintaining ideal body weight and choosing healthy food, it was found that the average was within the range accepted by WHO.

In recent years, sugar-sweetened beverage intake has been in close parallel with an increase in obesity. Large epidemiological studies conducted recently show an association between sugar-sweetened beverage consumption and long-term weight gain (Hu, Malik, 2010). Today, the consumption of sugar-sweetened beverages has been studied in research. There was a very weak statistically significant positive correlation between the daily sugary beverage consumption amount and body weight in a study by Gürel to determine the relationship between the consumption of sugary beverages and obesity in adolescents (rs = 0.123; p = 0.020). However, a statistically significant relationship was not found between the daily consumption of sweetened beverages and the BMI value (Gürel, 2018). In a study conducted with 507 university students in Saudi Arabia, Beverage Frequency Questionnaire was applied and BMI was found to have a non-significant, positive, and weak relationship ($\rho = 0.44$, p> 0.05) with sugar-sweetened beverage intake (Islam et al., 2020). In a randomized controlled study of 148 nursing students to assess the effect of reducing beverage consumption, sugary drinks were prohibited. At the end of the study, it was concluded that the reduction in consumption of sweetened beverages with and without calories contributed to significant loss of both body mass index and waist circumference (Duran, Orea-Tejeda, Castillo-Martinez, Cano-Garcia, Tellez-Olvera, Keirns-Davis, 2016). In the study conducted by Bawadi et al. with 967 university students, they examined the relationship between sugar-sweetened beverage consumption and body weight, and a significant positive relationship was found with sugar-sweetened beverage consumption, BMI (p <0.006), and waist circumference (p <0.030) (Bawadi et al. , 2019). In this study, although there was no statistically significant relationship between the daily sugared tea consumption amount and BMI value of university students participated, a statistically positive and very weakly significant relationship was found between daily sugared tea consumption and body weight. The results of these studies support each other. Sugar-sweetened beverages are thought to contribute partially to weight gain with incomplete compensation for energy in subsequent meals following liquid calorie intake. The effect of sugar-sweetened beverage consumption on obesity, body weight, and BMI should be examined with more studies with different groups.

The consumption of energy drinks can cause health problems among young people. Health risks associated with energy drink consumption are primarily related to the caffeine content: excessive caffeine overdose can cause palpitations, hypertension, central nervous system stimulation, nausea, vomiting, evident hypocalcemia,

metabolic acidosis, and, in rare cases, death (Scuri, Petrelli, Tesauro, Carrozzo, Kracmarova, Grappasonni, 2018). In a study investigating the effects of consumption of energy drink alone and in combination with alcohol on diet and lifestyle with a total of 618 women and 389 men in two different universities in Italy, 2/3 of the participants consumed energy drink at least once and it made up 65% of the sample. While the students who consume energy drinks frequently represent 15.8%, those who consume occasionally represent 84.2% (Vitiello, Diolordi, Pirrone, Donini, Balzo, 2016). In a study aiming to determine the level of knowledge and consumption habits of students at higher education level, 55% of the participants stated that they consume energy drinks while 27% of the daily consumption amount is less than 200 ml and 18% stated 250 ml or more consumption daily (Kayapınar, Özdemir, 2016). In this study, the relationship between the amount of daily energy drink consumption of university students and their body weight and BMI value was examined. It was observed that there was a statistically positive weak (low) significant relationship between daily energy drink consumption and body weight. A very weak statistically significant positive correlation was found between the daily consumption of energy drinks and the BMI value. Studies on the relationship between energy drink consumption amount and body weight and BMI are insufficient in the literature and should be supported by more studies.

Reducing consumption of sugar-sweetened beverages is recommended to reduce obesity because these beverages are linked to excess weight gain. Water is essential for body systems. It is a healthy alternative to sugar-sweetened beverages that cause childhood obesity (Yılmaz, Özel, 2016). One non-randomized controlled trial and two observational longitudinal studies in a systematic review including 13 studies involving children aged 2-19 years examining the relationship between water consumption and body weight outcomes in children and adolescents have shown that increased water consumption reduces the risk of being overweight or having high BMI scores (Muckelbauer, Barbosa, Mittag, Burkhardt, Mikelaishvili, Müller-Nordhorn, 2014). In a study investigating the effect of school-based water intervention on children's BMI and obesity, it was aimed to prevent childhood obesity by reducing the amount of caloric beverage consumption by facilitating access to drinking water. Water jets were installed in public primary and secondary schools in New York City, and annual height and body weight measurements of the students were taken to calculate their BMI scores. It was concluded that providing easy access to drinking water is associated with a decrease in BMI in students (Schwartz, Leardo, Aneja, Elbel, 2016). In this study, no relationship was found between water consumption and BMI scores of students. This can be explained by the fact that these students are nutrition and dietetics department students and the majority of them have normal BMI scores.

In all age groups, fluid intake depends not only on water but also on a variety of beverages such as tea, coffee, milk, sugar-sweetened soft drinks, fruit juices, and alcoholic beverages. In the study conducted by Çelik to examine the relationship between beverage preferences and consumption of adolescents between the ages of 12-14, no relationship was found between BMI and beverage consumption amounts of students. It was concluded that BMI values do not change only depending on the amount of beverage consumption but are affected by factors such as consumption of other food groups and physical activity (Çelik, 2011).

In this study, consumption amounts of 21 beverage types were examined according to BMI and there was no relationship between BMI and consumption amount in 17 beverage types, while BMI and consumption of beverages such as beer types, wine, hard drinks, mineral water and soda had a significant relationship. There are many conflicting epidemiological findings regarding the relationship between alcoholic beverage consumption and obesity measures such as waist circumference and body mass index. Alcoholic beverage consumption has been associated with lower nutritional quality compared to abstinence, altered dietary composition, and lower intake of soft drink groups. Butler et al. investigated the relationship between alcoholic beverages and BMI in their studies on the association of alcoholic beverage consumption with dietary intake, waist circumference, and BMI in US adults and obtained significant results (Butler, Popkin, Poti, 2018). Based on these results, depending on the consumption amount and variety of beverages, it can be said that alcoholic beverages have a relationship with BMI score.

Nonetheless, the limitation of this study is that it was conducted only on Nutrition and Dietetics students.

CONCLUSION
In conclusion, the amount of alcoholic and sugar-sweetened beverages consumed by the students was above the safe limits while water consumption was below the desired amounts. In this study, it was concluded that depending on the consumption amount and variety of beverages, it's relationship with body weight and BMI can be mentioned.

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Conflict of Interest
The author declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Plan, design: NB, IBO; **Material, methods and data collection:** NB, BK, IBO, SS; **Data analysis and comments:** NB, BK, IBO, SS; **Writing and corrections:** NB, BK, IBO, SS.

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