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# A Cross-Sectional Study on Sugar-Sweetened Beverages Consumption Patterns and Nourish Status Among Students at Faculty of Medicine of Sarajevo University

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**Abstract:** Emerging adulthood is typically defined as 18-25 years of age. It may be a particularly important time for establishing long-term health behavior patterns. The transition between adolescence and adulthood is a period of increased risk for excess weight gain, because of shifts in activity patterns as well as declines in overall-diet quality. Sugar-sweetened beverages, a great source of added sugar to the diet, contribute to energy imbalance. A small, persistent energy imbalance of 50 calories per day could result in a 5-pound weight gain over the course of one year. This study aimed to assess the nourish status in a sample of students from Faculty of Medicine of Sarajevo University and correlate it with student consumption pattern of sugar-sweetened beverages. A cross-sectional survey of 246 students was performed during May 2018, at the Sarajevo University. Verbal informed consent was obtained from all participants before completing the self-administered questionnaire that included questions on their frequency of consumption of SSBs eating habits and anthropometrics measures, weight and height. Body mass index was used to assess students nourish status. Statistical analyses were performed using the Statistical Package for Social Sciences software (IBM, version 23.0). Results were expressed as percentages and means  $\pm$  standard deviations. This study showed that the majority of the students (69.26%) were of normal weight. One quarter of sample (26.83%) had BMI  $> 24.9$ . Intake of soda was more common among students with BMI  $\geq 25$  kg/m<sup>2</sup> than students with BMI  $\leq 24.9$  kg/m<sup>2</sup> (78.79% vs. 63.89% respectively). Among students with BMI  $\leq 24.9$  kg/m<sup>2</sup>, 73.33% reported drinking energy drink never compared to 42.42% students with BMI  $\geq 25$  kg/m<sup>2</sup>. This study gives baseline information about weight status and consumption pattern of SSBs among a sample of university students. Regulating the intake of free sugars could be used as an approach for successful body weight control.

**Keywords:** Obesity, Weight Gain, Wishnofsky's Rule, Emerging Adulthood

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## 1. Introduction

Abnormal or excessive fat accumulation defined overweight and obesity. A crude anthropometric population measure is the body mass index (BMI), a person's weight (in kilograms) divided by the square of person's height (in meters). Those with a body mass index (BMI) of greater than or equal to 25 are considered being overweight, whilst those with a BMI greater than or equal to 30 are considered being obese [1]. Obesity is associated with major causes of death

and disability. Not only in high income countries, overweight and obesity are now dramatically on the rise in low-and middle-income countries, particularly in urban settings [2].

According to intercountry comparable overweight and obesity estimation from 2008, 60.7% of the adult population ( $> 20$  years old) in Bosnia and Herzegovina were overweight and 26.5% were obese. The prevalence of overweight was higher among men (63.7%) than women (58.0%). The proportion of men and women that were obese was 23.8% and 28.9%, respectively. Adulthood obesity prevalence

forecasts predict that in 2030 19% of men and 20% of women will be obese [3].

Many causes of obesity are the result of multiple changes that have affected various aspects of contemporary life, including physical activity and food consumption patterns. There is a problem to maintain energy balance when sedentary lives are the norm and high-calorie diets are ubiquitous [2].

In recent years, there have been concerns about sugar-sweetened beverages (SSBs) consumption and its impact on health [4]. SSBs are defined to include all beverages containing added caloric sweeteners, including, but not limited to, sugar-or otherwise calorically sweetened regular sodas, less than 100 percent fruit drinks, energy drinks, sports drinks, and ready-to-drink teas and coffees, sweetened milk or milk alternatives, and any beverage to which sugar has been added (typically high fructose corn syrup or table sugar) [4, 5].

A consumption of SSBs under isocaloric conditions seems not to affect body weight, but when they are consumed in addition to the normal diet they provide excess calories. Containing the same amount of energy SSBs compared to solid food are less filling. Because of its calories contribution in the diet it is consider to have impact on the epidemic of obesity [6, 7].

Body fat, or adipose tissue, is composed of a mixture of mostly fat, some protein, and water due to Bozenrad's chemical analysis. A pound of body fat (454 g) is approximately 87 percent fat, or 395 g fat ( $454 \times 0.87$ ). Based on Bozenrad's samples the caloric equivalent of one pound of body weight lost or gained is approximately 3500 kcal ( $395 \text{ g} \times 9.3 \text{ kcal/g}$ ). It is Wishnofsky's Rule (3500 kcal per pound rule). It means that for each 3500 kcalories eaten in excess, a pound of body weight is gained; similarly, a pound of weight is lost for each 3500 kcalories expended beyond those consumed [8]. Applying Wishnofsky's Rule it can be predicted that a small, persistent energy imbalance of 50 calories per day ( $50 \text{ kcal} \times 365 \text{ days} = 18250 \text{ kcal}$ ) could result in a 5-pound weight gain over the course of one year (18250/3500).

Reference [9] provides information about energy content of some beverages. A conventional 12-ounce serving (a 12 ounce can) of soda has between about 125 and 180 kcal. A glass (8 ounces) of fruit juice contains between about 100 and 150 kcal. Bottled tea brands can have up to 150 kcal in a 12-ounce serving. Prepackaged chocolate milk can give 140 to more than 250 kcal, depending on whether it's low-fat or whole milk. An 8-ounce serving of an energy drink gives 150 kcal. Coffee itself almost does not contain calories, but in combination with other ingredients calorie content is changed. Thus 1 cappuccino portion for 8 oz cup contains 75 kcal.

Although beverage consumption impacts health, few nationally studies on dietary intakes of SSBs have been done. SSBs are a major contributor of calories in the US diet. National dietary surveys indicate that 49.3% of US adults consumed 1 or more SSBs on a given day during 2011-2014 [10]. The studies conducted in EU have variations in design in means of reporting of SSB consumption levels. Nevertheless

Western Europe reported the highest levels of overall consumption. Netherlands and Belgium were the top SSBs consumers [11].

SSBs consumption patterns of general population, as well as of young adults, have been limited explored in Bosnia and Herzegovina. Exploring this health-related factor is necessary to implement a nutrition and health promotion program. This study aimed to assess the nourish status in a sample of students from Faculty of Medicine of Sarajevo University and correlate it with student SSBs consumption pattern.

## 2. Methods

### 2.1. Design and Sample

A cross-sectional study was conducted during May 2018 at Faculty of Medicine of Sarajevo University. The survey covered 246 students from the first to the sixth year of study, both sexes, different age groups. Simple random sampling was used to select respondents from different age groups.

The study was conducted according to the research ethics guidelines laid down in the Declaration of Helsinki [12]. Verbal informed consent was obtained from all students before completing the self-administered questionnaire.

### 2.2. Data Collection

The research instrument was a self-administered questionnaire, which was consisted of two parts. In the first part of the survey questionnaire, questions were related to age, sex, weight, and height. In the second part of the survey questionnaire, students gave data on the frequency of consumption of SSBs. There were seven possible answers according to frequency of consumption: (1) never, (2) once a week, (3) twice to three times per week, (4) four to six times per week, (5) once per day, (6) twice per day, (7) three or more times per day. These seven response categories were later merged into three categories for analysis purposes, namely: (1) never, (2) two to three times per week, and (3) consumption on daily basis-often.

Self-reported height and weight were used to calculate BMI ( $\text{kg/m}^2$ ). According to guidelines stated by the World Health Organization [1] weight status was classified into four categories: under-weight ( $\text{BMI} \leq 18.5$ ), normal weight ( $\text{BMI}$  between 18.5-24.9), overweight ( $\text{BMI}$  between 25-29.9), and obese ( $\text{BMI} \geq 30$ ).

### 2.3. Data Analysis

Statistical analyses were performed using the Statistical Package for Social Sciences software (IBM, version 23.0). Results were expressed as percentages and means $\pm$ standard deviations. All of the analyzed variables were non-parametric, so Chi-Square test was used to find whether there is any statistically significant difference between obesity and SSBs consumption pattern. Differences were considered statistically significant at  $p < 0.05$ .

### 3. Results

#### 3.1. General Information of Students Participated in the Study

A sample included 246 students, of which 164 (66.67%) were female and 82 (33.33%) were male.

The mean age of students participated in the study was 23.12±0.19 year.

The mean weight was 70.40±0.930 kg and the mean height was 173.97±0.590 cm.

The mean BMI was 23.08±0.21 kg/m<sup>2</sup> (Table 1).

Table 1. General information of students participated in the study.

Variable	Total
Number of students (%)	246 (100.00%)
Number of females (%)	164 (66.67%)
Number of males (%)	82 (33.33%)
Age (mean±SD)	23.12±0.19 year
Weight (mean±SD)	70.40±0.93 kg
Height (mean±SD)	173.97±0.59 cm
BMI (mean±SD)	23.08±0.21 kg/m <sup>2</sup>

#### 3.2. Students' Nourish Status Based on BMI Categories

It is showed by Table 2 that the majority of the students (66.26%) were of normal weight.

One quarter of sample (26.83%) had BMI > 24.9, whereas 17 (6.91%) students were underweight.

Table 2. General information of students participated in the study.

BMI	Number (%)
Underweight*	17 (6.91)
Normal**	163 (66.26)
Overweight***	62 (25.20)
Obese****	4 (1.63)

\*Underweight (BMI ≤ 18.5 kg/m<sup>2</sup>),

\*\* Normal (BMI between 18.5-24.9 kg/m<sup>2</sup>),

\*\*\* Overweight (BMI between 25–29.9 kg/m<sup>2</sup>),

\*\*\*\* Obese (BMI ≥ 30 kg/m<sup>2</sup>).

#### 3.3. Students' SSBs Consumption Habits

Frequency of SSBs consumption was correlated with nourish status (Table 3).

There were differences in consumption frequency of soda (chi-squared test: P=0.019) and energy drink (chi-squared test: P<0.0005).

Intake of soda was more common among students with BMI ≥ 25 kg/m<sup>2</sup> than students with BMI ≤ 24.9 kg/m<sup>2</sup> (78.79% vs. 63.89% respectively). Among students with BMI ≤ 24.9 kg/m<sup>2</sup>, 73.33% reported drinking energy drink never compared to 42.42% students with BMI ≥ 25 kg/m<sup>2</sup>. Consumption frequency of other SSB had no differences regarding to nourish status.

Table 3. Correlation between frequency of SSBs consumption and nourish status.

SSBs	Frequency of consumption	BMI ≤24.5 (N=180)		BMI ≥ 25 (N=66)		P
		N	%	N	%	
Flavored water	never	112	62.22	39	59.09	0.789
	weekly	56	31.11	21	31.82	
	daily	12	6.67	6	9.09	
Tea	never	83	46.11	28	42.42	0.534
	weekly	72	40.00	25	37.88	
	daily	25	13.89	13	19.70	
Cofee	never	46	25.55	18	27.27	0.790
	weekly	37	20.56	11	16.67	
	daily	97	53.89	37	56.06	
Chocolate milk	never	91	50.56	36	54.55	0.117
	weekly	60	33.33	26	39.39	
	daily	29	16.11	4	6.06	
Fruit juice	never	34	18.89	11	16.67	0.458
	weekly	117	65.00	48	72.72	
	daily	29	16.11	7	10.61	
Vitamin drink	never	92	51.11	26	39.39	0.262
	weekly	65	36.11	30	45.46	
	daily	23	12.78	10	15.15	
Soda	never	65	36.11	14	21.21	0.019
	weekly	92	51.11	47	71.21	
	daily	23	12.78	5	7.58	
Energy drink	never	132	73.33	28	42.42	<0.0005
	weekly	41	22.78	31	46.97	
	daily	7	3.89	7	10.61	

### 4. Discussion

The age group known as emerging adults, generally ages 18 to 25, is at risk for developing obesity and obesity-related conditions. Body weight continuously rises until graduation

[13]. The transition into new lifestyle is associated with disturbance in a diet, and insufficient physical activity. To establish effective intervention strategies it is important to explore factors that may contribute to this rise in obesity.

The purpose of this study was to assess the nourish status in a sample of students from Faculty of Medicine of Sarajevo

University and correlate it with student SSBs consumption pattern. A sample included 246 students, of which 164 (66.67%) were female and 82 (33.33%) were male. The mean age of students participated in the study was 23.12±0.19 year. The mean BMI was 23.08±0.21 kg/m<sup>2</sup>. A quarter of sample (26.83%) had BMI > 24.9.

Correlation between frequency of SSBs consumption and nourished status revealed differences in consumption frequency of soda and energy drink. Intake of soda was more common among students with BMI ≥ 25 kg/m<sup>2</sup> than students with BMI ≤ 24.9 kg/m<sup>2</sup> (78.79% vs. 63.89% respectively). Among students with BMI ≤ 24.9 kg/m<sup>2</sup>, 73.33% reported drinking energy drink never compared to 42.42% students with BMI ≥ 25 kg/m<sup>2</sup>.

The role of SSBs in increasing obesity was evaluated in numerous studies with opposite results [15]. Nevertheless SSBs are a leading source of added sugar to the diet in some group. It is general trend that young adults and adolescents tend to consume more SSBs than older adults [10, 11]. Some environmental interventions that reduce availability of SSBs course decline in SSBs consumption rates, but added sugars are still beyond the recommendation (less than 10% of calories per day) [5].

As college students experience weight gain they should be aware of impact of SSBs. If they plan weight loss/control calculation of energy content of SSBs is necessary. Health education programming may benefit from the use of health/fitness apps, so called mHealth.

## 5. Conclusion

The present study gives baseline information about correlation between weight status and SSBs consumption among a sample of university students. Sugar sweetened beverages may lead to weight gain through the high added sugar content, low satiety, and increased energy intake. Educating students to limit SSBs intake could improve their health. Specific health education programs, based on mHealth could motivate students and to improve their health.

## Conflict of Interests

The authors declare that they have no competing interests.

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