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The Effects of Dietary Habits on Body Mass Index in Young College Adults from Southern Governorates, Palestine

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ABSTRACT:

Introduction: Palestinian college students have been undergoing a dietary transition from a traditional dietary style to a fast-food dietary style in latest years. As a result, college students are becoming increasingly overweight and obese. Nutritional awareness of college students may serve as a deterrent to the unhealthy eating habits that are strongly linked to a variety of ailments. We aim to determine the prevalence of obesity in a sample of college students from the southern governorates, together with finding out their dietary practices, and the relationship between dietary practices and obesity among them. **Methods:** An analytical descriptive survey of 200 college students (100 males and 100 females), aged 20 ± 2 years were selected randomly from the University College of Sciences and Technology – Khan Yunis between October 2018 to January 2019. Data related to the eating habits of students were collected using an interview questionnaire. The survey comprised three sections: demographic information, health-related information, and lifestyle patterns. Also, anthropometric indices of the students were measured (weight, height), and the BMI was computed. The statistical analysis of data was outright by the Statistical Package for Social Sciences program (ver. 22). **Results:** The prevalence of obesity was more common among male students compared to females (10.0% vs. 5.0%). Further, regular breakfast and lunch consumption was reported in 53.0% and 75.5% of students respectively, although most of them (60.5%) have dinner irregularly. The majority of the participants (67.5%) eat two meals every day. Snacking and fried foods consumption was a frequent habit among students, where 34.5 % and 12.0% respectively usually consume it every day. Moreover, the percentage of students who eat vegetables and fruits once or twice weekly was 42.5%, and those who drink Carbonated beverages per week were 78.0%. Moreover, BMI had significant direct correlations with intake of lunch meal regularly ($r=0.171$, $P = 0.015$), the frequency of fried food intake ($r= 0.127$, $P = 0.047$) and the frequency of Carbonated beverages drinking per week ($r=-0.229$, $P = 0.030$). **Conclusion:** Despite the low incidence of obesity among the participants, the findings suggest that college students should receive nutrition education programs to minimize the propensity of obesity among them and improve their eating behaviors.

Keywords: Eating habits, BMI, Students, Southern Governorates.

Introduction

Obesity is a disorder characterized by excessive fat deposition in fat tissue, which adversely affects human health (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010). Obesity is becoming more prevalent in all countries around the world at an astounding level where it is predicted to be the world's fifth-largest cause of death (Amin, Al-Sultan, & Ali, 2008). Obesity and overweight in combination with an unhealthy lifestyle, such as smoking, physical inactivity, and unhealthy eating habits are risk factors for a variety of disorders, including coronary heart, disease, hypertension, diabetes mellitus, metabolic syndrome, and dyslipidemia (Altaher & Zabut, 2013; Jebril et al., 2020). Many researchers have reported that consuming too much dietary saturated fat, particularly cholesterol increases the risk of cardiovascular disease (Altaher et al., 2020). Saturated fats, particularly those originating from animal sources like milk fat and tallow, have been a significant threat to health in societies that rely heavily on animal products because it adheres to the inside walls of blood vessels, causing blocking regular blood flow (Ye & Kwiterovich, 2000). Nutritional awareness may serve as a barrier to the fast-food tendency and dietary patterns with elevated calories among young adults (Altaher & Zabut, 2013). However, by encouraging healthy eating practices, universities and colleges may be able to make a substantial contribution to lowering the prevalence of overweight and obesity helping to reduce cardiovascular diseases risks among Palestinian students. Universities and colleges may be an appropriate venue for contacting out to a lot of the young individuals through carried out nutrition education that advocates for the implementation of healthier food choices, which may have a positive impact on students' eating patterns (Kolodinsky et al., 2007). There have been no past studies on this topic in Southern governorates of Palestine, so this is the first time this research has been conducted among college students. Several studies were conducted in numerous nations across the world, including Saudi Arabia, the United Arab Emirate, Lebanon, Niger, and others (Al-Rethaiaa et al., 2010; Samaha et al., 2017; Yahia et al., 2008). However, due to differences in food intake and dietary patterns from one country to another, these studies have come up with partial, ambiguous, or contradictory results. This could be related to particular eating habits due to cultural diversity from one country to another (Rajib et al., 2019). However, this study aimed to assess the prevalence of obesity in a sample of college students from the southern governorates (Khan Yunis Governorate and Rafah Governorate) based on body mass index (BMI), find out their dietary practices, and the effect of their dietary practices on their BMI.

Methods

Design and sampling

This study was a descriptive-analytical survey carried out at the University College of Sciences and Technology – Khan Yunis from October 2018 to January 2019. A sample of 200 college students (50.0% male vs. 50.0% female), aged 20 ± 2 years were selected randomly to participate in the study. Students suffering chronic ailments such as diabetes and other illnesses were not allowed to participate. A consent form for the study was given to each survey respondent, and all necessary letters of approval to perform the survey were received from the concerned authority.

Data Collection

Data related to the eating and drinking habits of students were collected by the study team using an interview questionnaire. This questionnaire was modified based on previous research that unified its

usage with college students (Yahia et al., 2008). The survey comprised three sections: demographic information, health-related information, and lifestyle patterns. Also, anthropometric indices of the students (body weight, body height, BMI) were measured, where bodyweight was determined using a commercial weighing machine (Randox type, China) in Kilograms, and body height using Meterstick (Randox type, China) in centimeters, and the BMI was computed by dividing the Kilograms of body weight on the square of the body height (in meters) (Al-Rethaiaa et al., 2010). Based on the WHO guidelines, BMI was categorized. into four classifications: BMI of <18.5 is considered as underweight, BMI of 18.5-24.9 is as considered normal weight, while BMI of 25-29.9 is considered as overweight, and BMI of 30 or more is considered as obesity (Altaher et al., 2019).

Statistical analyses of data

Data analyses were done using the SPSS software (version 22). Descriptive statistics and Chi-Square tests were used to test the differences in the BMI of students according to their dietary practices. Results were presented as means \pm standard deviation (SD). P values <0.05 were considered statistically significant at confidence level = 95.0%.

Results

The results revealed the mean \pm SD age of the male students was 21.21 \pm 1.32 years vs. 21.23 \pm 2.70 years for the female students. However, there is no significant difference in the mean \pm SD age in years between the male group and the female group (P=0.94). The findings registered that 61.5% of participants have inhabited Khan Yunis governorate, while 38.5% were inhabited Rafah governorate (Fig. 1). Moreover, about 5.0% of male students were smokers while there were no smokers' female students (Fig. 2). As in table 1, the results showed that the mean \pm SD of BMI among the male's group was 23.87 \pm 3.18 whereas, the mean \pm SD of BMI was 23.68 \pm 4.05 among the female group. However, there is no significant difference seen between participants by BMI (P=0.743) (Table 1).

Table (1) also reveals the majority of the students (52.5%) were of normal weight (53% of the male students compared to 62.0% of the female students). Based on BMI classification, the prevalence of obesity was more common among male students compared to females (10.0% vs. 5.0%). In contrast, 3.0% of female students were underweight as compared to 2.0% males (Table 1). The table following (Table 2) shows the students' responses to researchers' inquiries about their eating habits. Although regular breakfast and lunch consumption was reported in 53.0% and 75.5% of students respectively, most of them (60.5%) have dinner irregularly. Most participants (67.5%) eat two meals every day, whereas 7.5% eat three or more. Snacking was a frequent habit among students, where 34.5% of them usually consume snacks every day. Furthermore, the percentage of students who eat fried foods daily was 12.0%, and those who eat them once or twice per week was 45.5%. Moreover, the percentage of students who eat vegetables and fruits once or twice weekly was 42.5%, and those who eat them 3 or 4 times per week were 45.5% (Table 2). According to Table 2, the majority of participants (59%) consumed one or two cups of carbonated beverages a week. Table (3) shows participants' responses to inquiries regarding their eating habits according to BMI categories. It shows that most of the normal-weight students (46.0%) were taking their lunch regularly, while (19.5%) of overweight and obese students were often eat fried food daily. Also, the percent of overweight and obese students who drank carbonated beverages (1 to 2 cups per week) was 19.5%. Correlating students BMI with their dietary practices revealed that BMI had significant direct correlations with intake of lunch meal

regularly ($r = 0.171$, $P = 0.015$), the frequency of fried food intake ($r = 0.127$, $P = 0.047$) and, carbonated beverages consumption per week ($r = -0.229$, $P = 0.030$) (Table 3).

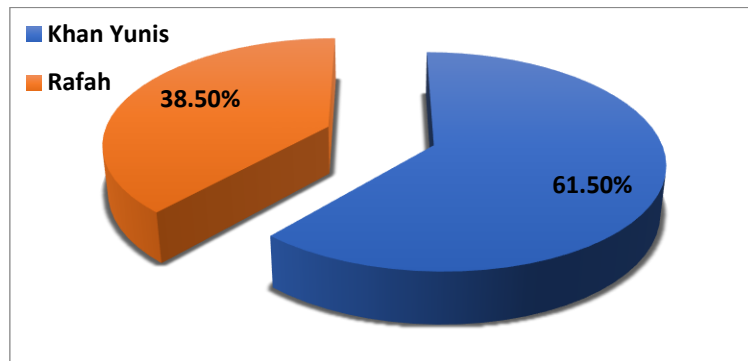


Figure 1: Percentage distribution of students by their governorate

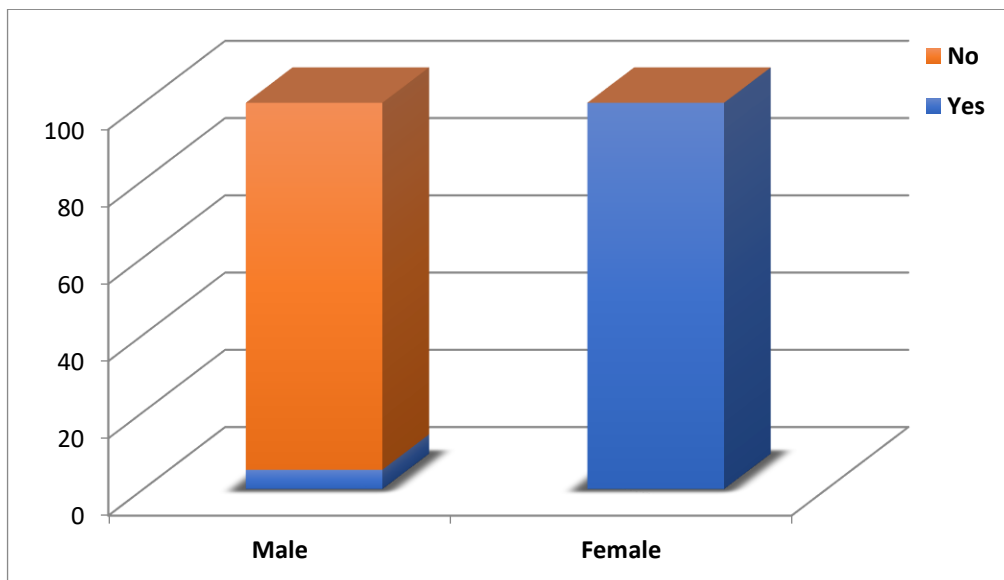


Figure 2: Percentage distribution of students by their smoking status

Table 1: Prevalence of obesity among students based on BMI by gender

Variables	Gender		Total	p-value
	Male	Female		
BMI kg/m ² (mean ±SD)	23.87±3.18	23.68±4.05	23.77±3.61	0.743
BMI categories				
Under Weight	2 (2.0%)	3 (3.0%)	5 (2.5%)	0.299
Normal	53 (53.0%)	62 (62.0%)	115 (57.5%)	
Overweight	35 (35.0%)	30 (30.0%)	65 (32.5%)	
Obese	10 (10.0%)	5 (5.0%)	15 (7.5%)	
Total	N (%)	100 (100.0%)	100 (100.0%)	200 (100.0%)

Table 2: Student's response to inquiries regarding their eating habits

Variables	Students response	
	N	%
Do you eat breakfast regularly?		
Yes	106	53.0%
No	94	47.0%
Do you take your lunch regularly?		
Yes	151	75.5%
No	49	24.5%
Do you take your dinner regularly?		
Yes	79	39.5%
No	121	60.5%
Except for snacks, how many meals do you eat per day?		
One meal	50	25.0%
2-3 meals	135	67.5%
More than 3 meals	15	7.5%
How frequently do you eat snacks in addition to your regular meals?		
Daily	69	34.5%
3 or 4 times per week	65	32.5%
1 or 2 per week	10	5.0%
rarely	56	28.0%
What kinds of foods do you say you ought to consume to maintain a balanced diet?		
meats	25	12.5%
vegetables	56	28.0%
Meats & vegetables	92	46.0%
Other	27	13.5%
Frequency of fried food consumption?		
Daily	24	12.0%
3 or 4 times per week	91	45.5%
1 or 2 per week	85	42.5%
Frequency of fruit and vegetable consumption?		
Daily	3	1.5%
3 or 4 times per week	87	43.5%
1 or 2 per week	110	55.0%
Frequency of meats (white and red) consumption per week?		
One time	77	38.5%
Two times	98	49.0%
Three times & more	25	12.5%
The number of carbonated beverages cups drank per week? (cup=330ml)		
I don't drink it	44	22.0%
1 or 2 cups	118	59.0%
3 cups or more	38	19.0%
Total	200	100.0%

Table 3: Correlation between BMI categories and dietary practices

Variables	BMI categories				Total	P-Value
	Under weight	Normal	Overweight	Obese	200 (100.0%)	
Do you take your breakfast regularly?						
Yes	5 (2.5%)	63 (31.5%)	34 (17.0%)	4 (2.0%)	106 (53.0%)	0.189
No	7 (3.5%)	47 (23.5%)	30 (15.0%)	10 (5.0%)	94 (47.0%)	
Do you take your lunch regularly?						
Yes	7 (3.5%)	92 (46.0%)	47 (23.5%)	5 (2.5%)	151 (75.5%)	0.015*
No	5 (2.5%)	18 (9.0%)	17 (8.5%)	19 (4.5%)	49 (24.5%)	
Do you take your dinner regularly?						
Yes	3 (1.5%)	51 (25.5%)	23 (11.5%)	2 (1.0%)	79 (39.5%)	0.063
No	9 (4.5%)	59 (29.5%)	41 (20.5%)	12 (6.0%)	121 (60.5%)	
Except for snacks, how many meals do you eat per day?						
One meal	3 (1.5%)	31 (15.5%)	10 (5.0%)	6 (3.0%)	50 (25.0%)	0.246
2-3 meals	9 (4.5%)	70 (35.0%)	48 (24.0%)	8 (4.0%)	153 (67.5%)	
More 3 meals	0 (0.0%)	9 (4.5%)	6 (3.0%)	0 (0.0%)	15 (7.5%)	
How frequently do you eat snacks in addition to your regular meals?						
Daily	3 (1.5%)	41 (20.5%)	21 (10.5%)	4 (2.0%)	69 (34.5%)	0.675
3 or 4 times/r week	6 (3.0%)	31 (15.5%)	24 (12.0%)	4 (2.0%)	65 (32.0%)	
1 or 2 per week	3 (1.5%)	38 (19.0%)	19 (9.5%)	6 (3.0%)	66 (33.0%)	
What kinds of foods do you say you ought to consume to maintain a balanced diet?						
Meats	4 (2.0%)	41 (20.5%)	18 (9.0%)	8 (4.0%)	71 (35.5%)	0.609
Vegetables	3 (1.5%)	35 (17.5%)	24 (12.0%)	5 (2.5%)	67 (33.5%)	
Meats & vegetables	3 (1.5%)	19 (9.5%)	13 (6.5%)	0 (0.0%)	35 (17.5%)	
Other	2 (1.0%)	15 (7.5%)	9 (4.5%)	1 (0.5%)	27 (13.5%)	
Frequency of fried food consumption?						
Daily	7 (3.5%)	45 (22.5%)	26 (13.0%)	13 (6.5%)	91 (45.5%)	0.047*
3 or 4 times/ week	3 (1.5%)	51 (25.5%)	30 (15.0%)	1 (0.5%)	85 (42.5%)	
1 or 2/week	2 (1.0%)	14 (7.0%)	8 (4.0%)	0 (0.0%)	24 (12.0%)	
Frequency of fruit and vegetable consumption?						
Daily	6 (3.0%)	62 (31.0%)	35 (17.5%)	7 (3.5%)	110 (55.0%)	0.898
3 or 4 times/ week	6 (3.0%)	47 (23.5%)	27 (13.5%)	7 (3.5%)	87 (43.5%)	
1 or 2 per week	0 (0.0%)	1 (0.5%)	2 (1.0%)	0 (0.0%)	3 (1.5%)	
Frequency of meats (white and red) consumption per week?						
One time	5 (2.5%)	36 (18.0%)	22 (11.0%)	6 (3.0%)	69 (34.5%)	0.692
Two times	6 (3.0%)	58 (29.0%)	29 (14.5%)	5 (2.5%)	98 (49.0%)	
3 times & more	1 (0.5%)	13 (6.5%)	8 (4.0%)	3 (1.5%)	25 (12.5%)	
The number of carbonated beverages cups drank per week? (cup=330ml)						

Variables	BMI categories				Total	P-Value
	Under weight	Normal	Overweight	Obese	200 (100.0%)	
I don't drink it	4 (2.0%)	19 (9.5%)	14 (7.0%)	7 (3.5%)	44 (22.0%)	0.030**
1 or 2 cups	8 (4.0%)	71 (35.5)	33 (16.5%)	6 (3.0%)	118 (59.0%)	
3 cups or more	0 (0.0%)	20 (10.0)	17 (8.5%)	1 (0.5%)	83 (19.0%)	

P < 0.05: Statistically Significant

Discussion

The BMI was used to evaluate a student's weight status. The results of the current study reported that the majority of students (52.5%) were of normal weight. Male students (53.0%) were less likely than females to be normal weight (62.0%), whereas, female students were less likely to be overweight or obese in comparison to male students (35% of females vs. 45% of males). In contrast, Underweighting was more common among females as compared to males in the studied population (3.0% of females vs. 2.0% of males). The lower prevalence of overweight and obesity among the female group in comparison to the male group is expected because females are more careful about their weight status than males, due to society's perceptions which induce females to be with ideal body weight. This was by the fact that underweighting was less common among males (2.0%) as compared to females (3.0%) in this studied sample. The findings of this study were in the line with many recent studies conducted on university students to determine weight status among them by gender (Arroyo et al., 2006; Bertias et al., 2003; Musaiger et al., 2003; Yahia et al., 2008). Yahia, et al. (2008) conducted a cross-sectional survey of 220 students (43.6% male and 56.4% female), aged 20 ± 1.9 years, who were chosen randomly from the Lebanese American University to determine the prevalence of overweight and obesity among them. This study reported that about 64.7% of the participants were of ideal weight (76.8% female Vs. 49% male). The occurrence of overweight and obesity was more common among males compared to females (37.5% and 12.5% vs. 13.6% and 3.2%, respectively) (Yahia et al., 2008). Likewise, another study conducted on 749 students (32% males and 68% females) was selected randomly from Basque University. This study showed that the prevalence of overweight and obesity was 13.9% among the female group as compared to 25.0% among the male group (Arroyo et al., 2006) and the results of this study were in agreement with the results of our current study. As same as, another study conducted on University of Crete medical students. About 990 medical students (527 males, 462 females) were recruited randomly. The results of this study found that approximately 40% of male students and 23% of female students were overweight and obese (Bertias et al., 2003). Moreover, another study conducted among 842 students from Kuwait University reported that around 32% of the male group and 8.9% female group had BMI more than 25 kg/m^2 (Musaiger et al., 2003). Furthermore, In another descriptive study of 300 students done in the United Arab Emirates, a high prevalence rate of overweight and obesity was also observed, where it registered that obesity was found to be prevalent in 35.7 % of male students, which was greater than that of female students (Carter et al., 2004) and this study found were in contrast with our findings. Despite the sample sizes which is a sample and the circumstance that several of the researchers employed self-reported height and weight, the outcomes nevertheless show disparities in the degree of obesity problems in students among countries. Regarding eating practices, oftentimes, university students do not eat healthily. Fast and fried foods like hamburger, falafel, sausage, luncheon meat is popular among university students since it is readily available and requires less preparation time than traditional food. Fast and fried

food is usually high in saturated fat, cholesterol, simple sugars, and calories which in order causes an increase in the probability of overweight and obesity among the students (Al-Rethaiaa et al., 2010). The finding of the present study reported that the regular breakfast and lunch consumption was reported in 53.0% and 75.5% of students respectively, most of them (60.5%) have dinner irregularly. Moreover, most of the participants (67.5%) eat 2 meals every day, whereas 7.5 % eat 3 or more. A descriptive survey of students from Lebanon to find out their dietary habits came up with a similar finding. According to the survey, about 53% eat breakfast every day or three to four times each week, and about 53% of them consume two meals each day (Yahia et al., 2008). Another study reported that 63.3% of students were intake an irregular meal and 49% were intake breakfast each day (Al-Rethaiaa et al., 2010) and this result is consistent with the study findings. Moreover, the vast majority of students (87.1%) consume 2 or 3 servings every day, which was consistent with the study findings. The finding reported that snacking was a frequent habit among students, where 34.5 % of students usually consume snacks every day. Snacks are any foods or beverages consumed in between the three main meals (Shihada, 2020). These findings also in the line with a study that reported that about (31.7%) of Saudi college students take snacks daily (Al-Rethaiaa et al., 2010). When we compared our findings to those of similar studies conducted for male college students in Japan and Lebanon, we discovered a wide range of eating patterns among male college students in both countries (Sakamaki, Amamoto, et al., 2005; Yahia et al., 2008). A low percentage of the Chinese and Lebanese (18.4% and 35.4% respectively) students irregularly eat meals, while a high percentage (63.3%) of Saudi students eat meals in an irregular way (Sakamaki, Toyama, et al., 2005; Yahia et al., 2008). Snacking among college students was a daily practice for around 70% of Saudi students, 50% of Lebanese students, and 10% of students in China (Al-Rethaiaa et al., 2010; Sakamaki, Toyama, et al., 2005; Yahia et al., 2008). According to the study data, around 60.0 % of students believe that consuming meats, vegetables, and a diversity of other products will give them a balanced diet. Other studies have that most college students believe it is vital to eat meats products, vegetables, and other low-fat items to maintain a balanced diet (Birmachu & Heidelbergger, 2021; Davy, Benes, & Driskell, 2006). These are the kinds of habits that should be reinforced. As was expected, consumption of fruits and vegetables was also prevalent among the study participants, and this habit should be encouraged and enhanced. Fruits and vegetables have a low calorie content because they contain more liquid and fibers than other foods. However, providing fruits and vegetables to a student's diet reduces total energy consumption, which helps with their weight control (Mellendick et al., 2018). Fruit and vegetable consumption was a frequent practice among Lebanese and Chinese students, but not among Saudi students (Al-Rethaiaa et al., 2010; Sakamaki, Toyama, et al., 2005; Yahia et al., 2008). Moreover, Smoking was not common among the study population (2.5% of males vs. 0.0% of females). A prior study that looked at the prevalence and predictors of smoking hookah and/or cigarettes among 2443 college students from Lebanon found similar results. Their findings reported that the prevalence of smoking cigarettes only, hookah only, and both was 2.5%, 25.6%, and 6.3%, respectively (Tamim et al., 2007). In contrast, two studies reported a higher prevalence of smoking among university students (13.2% and 37.5% respectively) as compared to our findings (Al-Rethaiaa et al., 2010; Yahia et al., 2008). However, the majority of students in our study are aware of the need for a healthy diet and never smoke (Altaher, Allhaj-Yousef, et al., 2019). The unhealthy dietary habits were demonstrated by the fact that the majority of students (57.5%) consumed fried meals at least three times per week and 78% consumed at least one cup of carbonated beverages every week. Increased consumption of fried foods is frequently linked to an increased risk of overeating and

obesity (Shihada, 2020). According to one study, obesity and hyperlipidemia have been linked to the consumption of carbonated beverages among college students (Gibson, 2008). To date, there is no investigation has been conducted to investigate the association between food habits and BMI categories among college students in the southern governorates. In the current study, correlating students' BMI with their dietary practices revealed that BMI had significant direct correlations with the intake of lunch meals regularly, the frequency of fried food intake, and the frequency of carbonated beverages drinking per week. Consumption of fried foods, carbonated beverages, and snacks continuously leads to obesity and overweight. However, These habits should be changed by implementing healthcare initiatives that promote healthy eating patterns (Selvamoney & Abdalqader, 2019). Obesity and the intake of carbonated beverages are linked, according to systematic research (Gibson, 2008). Initiatives aimed at lowering the use of these beverages could assist to prevent an increase in adult obesity (Jebril et al., 2020). Increasing students' awareness of healthy eating patterns and nutrition, on the other hand, may boost their commitment to avoid poor nutrition and unhealthy eating habits, hence lowering the rate of obesity.

Conclusion

Male college students had a higher prevalence of overweight and obesity than female college students. Irregular dinner meal intake, too much snacking, and fried food and drinking of carbonated beverages together with low vegetables and fruits consumption were the most prevalent unhealthy eating practices among the study population. BMI was directly correlated with the intake of lunch meals regularly, the frequency of both fried food intake and carbonated beverages drinking per week. Despite the low incidence of obesity among the participants, the findings suggest that college students should receive nutrition education programs to minimize the propensity of obesity among them and improve their eating behaviors.

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