

Obesity and Its Associations with Gender, Smoking, Consumption of Sugary Drinks, and Hour of Sleep Among King Abdulaziz University Students in Saudi Arabia

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Background: This study investigated the prevalence of obesity among university students in Saudi Arabia's western region, as well as its association with gender, smoking, consumption of sugary drinks, and hours of sleep.

Methods: A cross-sectional study recruited a simple random sample of students from King Abdulaziz University (KAU) in Saudi Arabia's western region. In this study, the Arab Teens Lifestyle (ATLS) questionnaire was used. The survey was conducted between April and June 2022.

Results: In total, 659 students participated (313 males [37.3%] and 437 females [66.2%]). One-fourth of the students, 158 (24%), were overweight, and 83 (12.7%) were obese. Male participants were overweight or obese by a rate of 32.6% and 19.4%, respectively. Female overweight and obese rates were 16.2% and 6.6%, respectively. Moreover, obesity/overweight rates were 43.6% in the urban area and 36.9% in the rural area ($P=0.03$). A total of 370 participants (56.14%) slept less than 8 hours per day, 185 (28.1%) spent more than five hours per day watching television or using the internet, and 303 (46%) ate breakfast on a regular basis. Obesity/overweight was more common in smokers than in nonsmokers (59.7% vs 32.8%, $P=0.01$). The prevalence of obesity was lower among those who walked three days or more per week (28.1% vs 44.1%; $P=0.01$) and ran/jogged outside or on a treadmill three days or more per week (29.5% vs 39.8%; $P=0.03$) than among those who ran/jogged less than three days per week. Student obesity was independently predicted by being male ($P=0.01$), drinking more sugary drinks ($P=0.01$), smoking ($P=0.03$), and sleeping for fewer hours ($P=0.03$).

Conclusion: Obesity was more prevalent in male students, with a prevalence of 24%. Male gender, consumption of more sugary beverages, smoking, and sleeping for fewer hours were all independent predictors of obesity among university students.

Keywords: obesity, overweight, BMI, young adults, physical activity, dietary habits, lifestyle factors, sedentary behaviors

Introduction

Obesity prevalence has become a global pandemic and is rising daily. In 2016, 39% of adults aged 18 and up were overweight, with 13% being obese. Overweight and obese children and adolescents aged 5 to 19 years old comprise over 340 million people.¹ Young adults in the current generation have much higher BMIs than those in previous generations.²

Obesity is prevalent in all age groups and both sexes in Saudi Arabia.³ In China, children and young adults account for 67% of the total population.⁴ Obesity in young adults and children is regarded as a serious threat. Obesity affects 10.2% of young adults aged 18 to 29 years old, while 30.4% are overweight.⁵

There is a change in the social norms and a westernization of society that has taken place. Therefore, food preferences have also changed, and currently, cheese pizzas, burgers, and sandwiches are popular among Saudi youths. They enjoy chocolates and other traditional delicacies and drink more soft and energetic beverages.⁶ Additionally, their physical

activity is lower; according to the WHO, the prevalence of physical inactivity in the KSA is 58.5%.⁷ All these factors contribute to increasing body weight. Obesity is an enormous public health problem among young university students, and its high prevalence is worrisome because of its involvement in various noncommunicable diseases. Obesity in adolescence tends to persist into adulthood and increases the risk of mortality.⁸ It may cause infertility and polycystic ovary syndrome among young adults with several other complications.^{9,10} Students are frequently preoccupied with their studies and spend a significant amount of time in college/university, making them vulnerable to poor eating habits that gradually increase body weight.¹¹

High energy density diets, frequent consumption of sugar-sweetened beverages, large serving sizes of food, and eating habits are all risk factors for childhood obesity (such as meal skipping).^{12,13} Long-term cohort research among nurses emphasizes the link between obesity and poor diet, sweetened beverages, physical inactivity, and short sleep duration.¹³ Furthermore, several Saudi studies have found strong positive connections between overweight/obesity and various hazardous lifestyle practices, including poor food habits, excessive television watching, and physical inactivity among young adults.^{14,15}

The second-largest institution of higher education in Saudi Arabia is King Abdulaziz University. Based in Jeddah, it has branches spread across a sizable geographic area in the western region. Since this is a crucial and susceptible stage for negative weight and physical activity behavior change, research on students' eating habits, physical activities, and sedentary behaviors is crucial. Greater knowledge of the links between obesity and lifestyle habits would allow us to build more effective obesity prevention and management strategies. Therefore, the current study examined the prevalence of obesity and its relationships with lifestyle factors such as smoking, sleeping patterns, and eating habits among students at King Abdulaziz University in the Western Region of Saudi Arabia.

Methods

Study Design and Setting

The current investigation was carried out in Saudi Arabia's western region and included a simple random sample of students from KAU's Jeddah and Rabigh branches. The sample size required to achieve adequate statistical power was 383 when calculated using a 5% margin of error, a 95% confidence level, and a 50% response rate.¹⁶ This study was approved by King Abdulaziz University's (KAU's) Biomedical Ethics Research Committee (Reference No. 200–22). It took place between April and June 2022. The study complied with the Declaration of Helsinki. A total of 659 people completed a self-administered questionnaire distributed online in Arabic and English.

Data Collection and Inclusion and Exclusion Criteria

At the outset of the survey, informed consent was obtained; agreement was required before answering any questions. Students were informed that their participation was entirely voluntary in the consent statement, which also explained the purpose of the study and provided easy access to the principal investigators. The inclusion criterion was students from KAU, and the exclusion criterion was students who had any physical disability. The survey was divided into four sections. The first section dealt with the demographic information provided by the respondents. It included information on age, gender, social status, nationality, academic year, and household income. The second section was dedicated to self-reported anthropometric measurements (height, weight, blood pressure, and waist circumference). Body mass index (BMI) was calculated as body weight in kilograms divided by height in meters squared (kg/m^2) and was divided into four groups: underweight (BMI $18.5 \text{ kg}/\text{m}^2$), normal weight (BMI $18.5\text{--}24.9 \text{ kg}/\text{m}^2$), overweight (BMI $25\text{--}29.9 \text{ kg}/\text{m}^2$), and obese (BMI $30 \text{ kg}/\text{m}^2$ or more). The last section discussed physical activity and eating habits. The ATLS questionnaire was used with permission.¹⁷

The ATLS questionnaire collects data on the type, repetitions, and duration of various physical activities performed during a typical week. The sports covered included walking, jogging, muscle strengthening, moderate- and high-intensity exercise, and self-defense. In addition to household duties, the questionnaire provided responses ranging from 0 to 7, where 0 indicates that no activities were performed, and 7 indicates that this physical activity was performed every day. Participants who practiced three or more days per week were compared to those who practiced less than three days per

week. Sleep and screen time were investigated as sedentary behaviors. Sleep duration responses ranged from 4 to 12 hours per night. Then, the data were computed and classified into two groups: insufficient sleep (less than 8 hours per night) and sufficient sleep (8 or more hours per night). Responses to the question “How much time do you dedicate to watching TV, using a computer, and/or browsing the internet (for leisure)?” ranged from I do not use, 1–3 hours per day, <3–5 hours per day, and more than 5 hours per day. In addition to smoking, breakfast consumption was assessed (regularly, sometimes, and does not take breakfast). Smoking status was evaluated (current smoker or not).

Dietary habits included healthy habits such as eating vegetables, fruits, and dairy products and unhealthy habits such as the consumption of chocolate, sweets, sweetened beverages, energy drinks, fast foods, and fries. The responses were classified as 0 servings per week, 1–3 servings per week, and more than three servings per week. Previous research has demonstrated that the questionnaire is valid and reliable for assessing youths’ physical activity and other lifestyle habits.¹⁷

Statistical Analysis

The data were also analyzed using the Statistical Package for the Social Sciences (SPSS) version 20. A descriptive analysis was performed using frequency and percentage. Underweight and normal-weight participants were merged, as were those who were nonoverweight/nonobese, and those who were overweight and obese were combined and considered obese/overweight. Categorical data were compared using chi-square tests. The independent variables affecting obesity were predicted using binary logistic regression analyses. For all differences between obese and nonobese people, P values of 0.05 were considered significant.

Results

Student Characteristics Based on BMI Status

The characteristics of the students based on their BMI status are summarized in Table 1. A total of 659 university students (313 males [47.4%]; 346 females [52.4%]) participated in the survey. Of these, 437 were 18–21 years old (66.2%), 208 were 22–25 years old (31.5%), and 14 were 26–30 years old (2.1%). One-fourth of the students were overweight (n=158, 24%), and 83 (12.7%) were obese. Among male participants, 32.6% were overweight, and 19.4% were obese. The percentages of overweight and obese females were 16.2% and 6.6%, respectively. Additionally, obesity/overweight was 43.6% in Jeddah and 36.9% in Rabigh (P=0.03).

Table 1 Student Characteristics and Their Comparison Based on BMI Status

Characteristics	Total Number of Students (n=659)	Nonoverweight/Nonobese Students (n=392)	Overweight/Obese Students (n=241)	P-value
Gender				
Male	313(47.4%)	137(45.8%)	162(54.2%)	< 0.01
Female	346(52.4%)	255(76.3%)	79(23.7%)	
Age				
18–21	437(66.2%)	255(61.3%)	161(38.7%)	0.70
22–25	208(31.5%)	130(63.7%)	74(36.3%)	
26–30	14(2.1%)	7(53.8%)	6(46.2%)	
Marital status				
Single	621(94.1%)	365(61.3%)	230(38.7%)	0.19
Married	30(4.5%)	23(76.7%)	7(23.3%)	
Divorced	8(1.2%)	4(50%)	4(50%)	

(Continued)

Table 1 (Continued).

Characteristics	Total Number of Students (n=659)	Nonoverweight/Nonobese Students (n=392)	Overweight/Obese Students (n=241)	P-value
Nationality				
Saudi	572(86.7%)	341(62%)	209(38%)	0.92
Non-Saudi	87(13.2%)	52(61.4%)	32(38.6%)	
Academic year				
First	177(26.8%)	113(68.5%)	52(31.5%)	0.12
Second	260(39.4%)	142(56.6%)	109(43.4%)	
Third	166(25.2%)	105(64.4%)	58(35.6%)	
Fourth	42(6.4%)	25(61%)	16(39%)	
Fifth	7(1.1%)	2(33.3%)	4(66.7%)	
Sixth	7(1.1%)	5(71.4%)	2(28.6%)	
Monthly household income (SR)				
<5000 SR	460(69.7%)	259(58.9%)	181(41.1%)	0.07
5000–9999 SR	69(10.5%)	50(74.6%)	17(25.4%)	
10,000–14,999 SR	48(7.3%)	27(58.7%)	19(41.3%)	
15,000–19,999	41(6.2%)	28(70%)	12(30%)	
>20,000 SR	41(6.2%)	28(70%)	12(30%)	
Place of living				
Jeddah	318(48.3%)	174(57%)	131(43%)	0.03
Rabigh	164(24.9%)	101(63.1%)	59(36.9%)	
Other towns	177(26.9%)	117(69.6%)	51(30.4%)	
Living with				
Family	565(85.7%)	341(62.9%)	201(37.1%)	0.67
Alone	66(10%)	36(56.2%)	28(48.3%)	
Friends	20(3%)	11(55%)	9(45%)	
Other living companions	8(1.2%)	4(57.1%)	3(42.9%)	

Note: To compare the groups, the chi-square test was used. The bold font indicates statistically significant.

Abbreviations: Other towns, other towns of the western region; SR, Saudi Riyals; One SR, 0.266 USD.

Comparison of Lifestyle Habits According to BMI

A total of 370 participants (56.14%) slept less than 8 hours a day, 185 (28.1%) spent more than five hours/day watching television or using the internet, and 303 (46%) ate breakfast regularly. The two groups were not different in terms of sleep duration, breakfast consumption, or screen time. Obesity/overweight was more prevalent among smokers than nonsmokers (59.7% vs 32.8%, respectively; $P < 0.01$) (Table 2).

Table 2 Comparison of Lifestyle Habits According to Student BMI

Factors	Nonoverweight/ Nonobese N (%)	Overweight/Obese N (%)	P value
Sleep duration			
Insufficient sleep (<8 hours/day)	230(62.2%)	140(37.8%)	0.48
Sufficient sleep (8 hours and more/day)	162(61.6%)	101(38.4%)	
Using internet, watching TV for leisure			
Does not use	34(59.6%)	23(40.4%)	0.75
1–3 hours	134(64.1%)	75(35.9%)	
3–5 hours	120(62.8%)	71(37.2%)	
More than 5 hours	104(59.1%)	72(40.9%)	
Breakfast intake			
Regularly takes breakfast	187(64%)	105(36%)	0.27
Sometimes takes breakfast	158(58.7%)	111(41.3%)	
Does not take breakfast	44(67.7%)	21(32.3%)	
Smoking			
Yes	50(40.3%)	74(59.7%)	< 0.01
No	342(67.2%)	167(32.8%)	

Note: The bold font indicates statistically significant.

Comparison of Physical Activities According to Students’ BMI

The prevalence of obesity was lower among participants who walked three days or more per week than among those who walked less than three days per week (28.1% vs 44.1%; P<0.01). In addition, 29.9% of those who ran/jogged outside or on a treadmill three or more days per week were obese. Conversely, 39.9% of those who jogged less than three times per week were obese. Obesity prevalence did not differ among participants who performed less or more than three days of muscle strengthening, high- and moderate-intensity exercise, self-defense per week, or light physical activity such as household chores (Table 3).

Table 3 Comparison of Physical Activities According to Student BMI

Types of Physical Activity	Repetitions Per Week	Nonobese/Non Overweight N (%)	Overweight/Obese N (%)	P value
Walking exercise	Less than 3 days	221(55.9%)	174(44.1%)	< 0.01
	3 days or more	171(71.8%)	67(28.2%)	
Jogging	Less than 3 days	318(60.2%)	210(39.8%)	0.03
	3 days or more	74(70.5%)	31(29.5%)	
Moderate-intensity exercise	Less than 3 days	346(60.9%)	222(39.1%)	0.07
	3 days or more	46(70.8%)	19(29.2%)	

(Continued)

Table 3 (Continued).

Types of Physical Activity	Repetitions Per Week	Nonobese/Non Overweight N (%)	Overweight/Obese N (%)	P value
High-intensity exercise	Less than 3 days	374(61.8%)	231(38.2%)	0.48
	3 days or more	18(64.3%)	10(35.7%)	
Strengthening exercise	Less than 3 days	360(62.0%)	221(38.0%)	0.53
	3 days or more	32(61.5%)	20(38.5%)	
Self-defense	Less than 3 days	381(61.9%)	235(38.1%)	0.39
	3 days or more	11(68.8%)	5(31.2%)	
Household activity	Less than 3 days	257(63.0%)	151(37.0%)	0.51
	3 days or more	111(62.7%)	66(37.3%)	

Note: The chi-squared test was used to compare the groups. The bold font indicates statistically significant.

Table 4 Independent Predictors of Overweight/Obesity from Sociodemographic Factors, Physical Activity, and Dietary Habits

Characteristics	B	Exp (B)	Std Error	95% CI for Exp (B)		
				Lower	Upper	P value
Male gender	1.06	0.25	2.89	1.69	4.97	< 0.01
Smoker	0.7	0.33	2.00	1.06	3.78	0.03
Consumption of sugary drinks/soft drinks.						
0 serving/week			Reference			
1-3 servings/week	0.10	0.3	1.11	0.62	1.98	0.73
More than 3 servings/ week	1.30	0.46	3.68	1.51	8.97	< 0.01
Sleep hours	-0.15	0.07	0.86	0.75	0.99	0.03

Notes: Variable(s) entered the model include sociodemographic factors: age, gender, nationality, place of living, living companion, monthly income in Saudi Riyals, smoking status (reference is nonsmoker), academic year, and social status. Physical activities included walking exercise, jogging exercise, cycling, swimming, moderate-intensity activity, high-intensity activity, self-defense sports, strength training, household work, and traditional dancing. Sedentary behaviors include time spent on the TV/computer and average sleep hours. Dietary habits include eating breakfast; consumption of soft drinks, eg, Coke and Pepsi; eating vegetables fresh or cooked; eating fresh fruit; consuming dairy products, eg, milk/yogurt/cheese; eating fast food, eg, burgers/sausage/pizza or shawarma; eating French fries and/or potato chips; eating cakes/biscuits/donuts or similar food; and eating sweets and/or chocolates. The bold font indicates statistically significant.

Abbreviation: CI, confidence interval.

Predictors of Overweight/Obesity

In binary regression analyses, four significant predictors were identified. Being male ($p < 0.01$), drinking more sugary drinks ($p < 0.01$), smoking ($p = 0.03$), and sleeping for fewer hours ($p = 0.03$) were all considered independent predictors of obesity among university students. Independent predictors of overweight/ obesity are included in [Table 4](#).

Discussion

The survey results showed that more than one-third of the study population was overweight and obese (24% overweight and 12.7% obese). Among male students, 32.6% were overweight, and 19.4% were obese. The percentages of overweight

and obese female students were 16.2% and 6.6%, respectively. Several local^{14,18} and international studies^{19–21} reported similar rates of overweight and obesity among students.

The present study results are comparable with many studies that have reported an increased prevalence of overweight and obesity among males compared with females.^{22,23} However, two studies have reported a higher prevalence of overweight and obesity among females than males.^{24,25} Additionally, a study found no gender differences in overweight and obesity in college students.²⁶ Therefore, there is a clear discrepancy in the literature about the genderwise distribution of overweight and obesity. Two other studies from KAU have reported a higher prevalence of overweight and obesity among university students,^{6,27} but both studies' participants were only male students; therefore, this could be one of the main reasons for a different result. An imbalance of excessive caloric intake and inadequate activity may cause a higher prevalence of obesity among students.

Female students had a lower prevalence of overweight or obesity than males in our study. One probable explanation is that Saudi society's westernization is making females more concerned about their weight and body image, so they pay attention to their eating preferences and physical activities.¹⁴

Engagement in sports, extracurricular activities, and socialization tends to reduce stress, anxiety, and depression. It is recommended that students engage in daily physical exercise because it is necessary for boosting daily energy expenditure and resting metabolic processes such as fat oxidation, which helps to decrease body fat mass.²⁸

According to the current study's findings, students from rural areas had a lower percentage of obesity than those from urban areas. Our results agree with those of a Saudi study that found that obese students were less likely to attend rural schools than urban ones.¹⁴ Obesity and overweight are thought to be a result of rapid urbanization; in our study, participants were from Rabigh and other smaller towns, which were considered rural areas, as opposed to Jeddah, the second-largest city in Saudi Arabia. According to the regression findings, male sex, smoking, drinking soft drinks more than three times/week, and sleeping less during the night are associated with an increase in obesity. Our results concur with several other studies that reported that increased use of soft drinks is associated with overweight and obesity.^{14,26} Soft drinks have been linked to obesity, overweight, and diabetes worldwide, including in developing countries. In 2019, the Saudi government implemented a slew of regulations, including a 100% tax increase on soft drinks and the inclusion of calorie counts on restaurant menus. These regulations may aid in the reduction of overweight and obesity.

The current study identified a correlation between smoking and overweight/obesity, validating prior studies that discovered a robust link between obesity and smoking.^{21,30,31} According to a previous KAU survey, 85% of smokers started smoking between 15 and 25 years old.³² Several studies have also revealed that smoking during adolescence increases the risk of male infertility and female overweight in addition to being a risk factor for adult central obesity in both males and females.^{10,33,34} Cessation of cigarette use should be incorporated into initiatives to prevent and treat overweight and obesity among college and university students.²¹

Our study finding regarding the association of male gender with obesity is supported by the relevant literature.^{35–37} One probable cause is that male students often have bad eating habits and are fond of fast food and flavored drinks, in addition to a general lack of concern for their physical appearance.

In the present study, sleeping less was also associated with obesity. A documented link exists between obesity and short sleep duration in both children and adults.^{35,36} In a 13-year prospective study including young adults, sleep duration and BMI were found to be negatively correlated.^{35,36} Insufficient sleep may result in abnormal hormonal and endocrine regulation, increasing appetite and hunger.^{35,36} Therefore, our younger generation should be well aware of the importance of quality sleep and its impacts on their daily routine and body weight.

In our study, obesity was not shown to have a significant association with age, nationality, place of living, living companion, monthly income in Saudi Riyals, academic year, or social status. Additionally, no link was observed between physical activities, including walking and jogging exercises, cycling, swimming, moderate- to high-intensity activity, self-defense sports, strength training, household work, and traditional dancing. Obesity was not associated with time spent on the TV/computer (screen time). Dietary habits, including eating breakfast, eating vegetables fresh or cooked, eating fresh fruit, consuming dairy products, eg, milk/yogurt/cheese, eating fast food, eg, burgers/sausage/pizza or

shawarma, eating French fries and/or potato chips, eating cakes/biscuits/donuts or similar food, and eating sweets and/or chocolates, were not related to obesity.

Although our study did not assess participants' knowledge of obesity risk factors, a few studies have found that having less information about dietary risks and their repercussions is associated with being overweight or obese.^{14,21} This suggests that programs aimed at preventing weight gain can benefit from incorporating dietary knowledge regarding dietary risk awareness.^{14,21}

To live a healthy life, students should maintain normal body weight and blood pressure, exercise regularly, and eliminate extra fatty and sugar-containing foods from their daily diet.

There is a need to create awareness among the young adult population about the harmful effects of obesity on their physical and mental health. Moreover, this high incidence of obesity and its consequences also have a negative impact on the health care budget. Therefore, a continual campaign is needed from the Ministry of Health regarding this issue.

The findings of this study indicate a higher rate of obesity and overweight. Obesity reduction remains ineffective despite all efforts. The findings should inform future obesity management strategies. Efforts should be standardized and targeted at vulnerable groups such as men and smokers. Obesity, smoking, and physical inactivity should all be addressed. In addition, students' nutrition knowledge and healthy eating habits need to be improved.

Limitations

There were several limitations to this study. Because data were gathered through an online survey, selection bias could be an issue. Furthermore, the sample may not be representative, so the prevalence cannot be estimated. Another limitation of this study is that self-reported weight and height may be underestimated, and gender differences in weight disclosure are possible. Additionally, inquiring about weight before other determinants could be a source of bias. Moreover, the findings cannot be generalized because the data were gathered at a single Saudi university. The study did include a comprehensive dietary history. Nevertheless, it was limited in that no questions were asked about meal amounts, food intake behaviors such as emotional eating or eating while watching TV, the number or size of portions and snacks consumed or the time of day. Despite these limitations, our study used a valid research tool and an equal gender representation. Finally, the research emphasized the potential differences between urban and rural communities.

Conclusions

We found that overweight rates were 24%, and obesity rates were 12.7%, both of which were higher among male students. Those who walk and jog more than three days per week are less likely to be overweight or obese. Men, sugary drinks, smoking, and sleeping for fewer hours are all independent predictors of obesity among university students. It is suggested that further longitudinal studies be conducted to assess the changes in dietary patterns, physical activities, sedentary behaviors, and prevalence of overweight and obesity among these students. To reduce the prevalence of overweight and obesity among youth, policy-makers and governmental organizations should control unhealthy food consumption and promote regular exercise.

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Disclosure

The authors report no conflicts of interest in this work.

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