

Eating Habits Among Medical Students at King Abdulaziz University, Jeddah, Saudi Arabia

This article was published in the following Dove Press journal:
International Journal of General Medicine

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Background: Eating habits are a major concern with regard to the health status of university students. This study aimed to identify patterns of eating habits among undergraduate medical students and to investigate their relationship to sociodemographic, socioeconomic, and psychological factors.

Methods: This cross-sectional study included 378 undergraduate medical students aged 19–26 from the Faculty of Medicine at King Abdulaziz University, Jeddah, Saudi Arabia. Students were in their second through sixth academic year. Data were gathered with a self-administered questionnaire encompassing questions on sociodemographics, eating habits, and psychological factors.

Results: Eating habits score was much lower among students who were smokers, lived in rented places, lived alone, had separated parents, and did not exercise regularly. In multivariate analysis, multiple psychological factors, such as living alone and stressed, were found to be associated with eating patterns.

Conclusion: A majority of undergraduate medical students had unhealthy eating patterns, and socioeconomic and psychological elements were significantly affecting eating patterns.

Keywords: nutrition, survey, dietary habits, psychological factors, sociodemographic factors

Introduction

Healthy eating is one of the most substantial means of enhancing health. A healthy diet includes a balance of natural and fresh foods, a lot of fruits and vegetables, and foods containing minerals and vitamins.¹ It also involves behaviors and eating habits that are consistent, which is beneficial for supporting and maintaining both physical and psychological health.² Healthy eating is affected by various individual and collective (social and environmental) factors.³ In Saudi Arabia, eating patterns have altered considerably during the past few decades because of a fast-rising socioeconomic status at government and population levels. These marked lifestyle changes have affected different age groups, especially children and youth.⁴ Previous studies showed high levels of consumption of refined foods and animal products as compared to fruits and vegetables among Saudi populations.^{5,6}

Adult students transitioning from schools to universities experience difficulties adhering to healthy eating habits due to lack of time and stressors, and instead, they skip meals, eat unhealthy snacks, dine out, and consume fast food.⁷ There is a deficit of knowledge about healthy diet options that might passively influence eating patterns and nutrition.⁸ Medical students are expected to possess good eating patterns and have a healthy lifestyle because they have more medical knowledge

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regarding healthy eating patterns. As such, they are expected to act as role models for their peers in terms of the application of healthy eating patterns. A study in China showed that medical students had risk factors for chronic diseases due to bad eating patterns.⁹ Although medical students possess enough knowledge about healthy dietary patterns, they appear incapable of putting this knowledge into practice.¹⁰ The stress of university life and medical studies negatively affects their dietary patterns.¹¹ Medical education is considered the most academically and emotionally demanding training program. The time and emotional commitments medical students must devote to their training are extensive, and such stress has a negative impact on students' psychological health.¹² Healthy dietary habits among medical students are important because they are the future physicians, and students who personally ignore adopting a healthy lifestyle are more likely to fail to establish health-promoting opportunities for their patients.⁹

There is a paucity of studies that focus on the effects of psychological factors on eating patterns among medical undergraduate students in Saudi Arabia. Therefore, this study aimed to assess eating patterns and the risk factors for poor eating habits, with a focus on the demographic, socioeconomic, and psychological factors among medical students at King Abdulaziz University (KAU), Jeddah, Saudi Arabia.

Subjects and Methods

Study Setting and Population

This questionnaire-based cross-sectional study was carried out between January and March of 2019 and included 378 undergraduate medical students in any of the second to sixth years of study at the Faculty of Medicine, KAU, Jeddah, Saudi Arabia. The strategy adopted for this study was a double sampling for stratification technique. After arrangements were made with the medical college administration of KAU, students in each of the academic years were randomly approached by phone. Students were excluded if they were pregnant or athletes. After potential participants agreed to participate in this study, the aims and advantages of the research were described to them verbally and they were given a guarantee that the information gained would be confidential and would have no affect on their course progress. The biomedical ethics committee for human research at KAU, Jeddah, Saudi Arabia, approved this study (257–140).

Sample Size

The participants were randomly selected from students of the Faculty of Medicine, KAU. During the study period, there were 2410 medical students comprising 1184 males and 1226 females in the preclinical and clinical phases of the curriculum, including the second year (n=609; 278 males and 331 females), third year (n=491; 244 males and 247 females), fourth year (n=507; 257 males and 250 females), fifth year (n=424; 217 males and 207 females), and sixth year (n=379; 188 males and 191 females). The Raosoft software package (Raosoft, Inc., Seattle, WA) was used for sample size calculation, with the single proportion method. When assuming that 50% of medical students will have sufficient knowledge of and a positive attitude toward the questionnaire, the required sample size was 380 students at a 95% confidence interval and a 5% margin of error. The proportional allocation of the students was performed using a stratified sampling technique as follows: 25.1% were students in the second year, 18.5% in the third year, 16.7% in the fourth year, 21.2% in the fifth year, and 18.5% in the sixth year. The total number of students completing the study was 378 because 22 students did not complete the questionnaire.

Study Instruments

The instrument used was an adapted English-language questionnaire used in previous studies.^{13,14} The questionnaire's reliability was assessed, and the Cronbach's alpha was 0.715. There were three sections in the survey, where the first section consisted of questions about demographic information such as age, gender, nationality, academic year, marital status, residence, living arrangement, monthly household income, chronic illnesses, medications being taken, education level of parents, whether the parents were separated, if the mother worked, and other questions regarding the student's lifestyle, such as those about exercise and smoking habits. The second section consisted of 12 questions dealing with eating and drinking patterns and types of meals (12 items). For example, the questionnaire probed habits related to regular meals; daily breakfast; meals with or without snacks in between; the frequency of meals; snacks, vegetables, fruits, and fried food consumption; daily water intake; eating with friends and family; consuming fast food; consuming food with balanced nutrition; and type of foods most frequently eaten. The third section consisted of six questions about psychological items that could affect the eating patterns of students. Questions were

chosen from the validated compulsive eating scale (CES),¹⁵ which was used to assess uncontrolled eating habits among the college students, exploring factors like eating due to feelings of being lonely, upset or nervous, bored or happy, and completely out of control regarding food, along with eating so much until getting a stomachache. The answers to these questions were “never,” “often,” or “sometimes.” This questionnaire was developed to be administered online.

Statistical Analysis

The Statistical Package for Social Science version 21 (SPSS Inc. Chicago, IL) was used to analyze the data for this study. Data were expressed as numbers (%) for categorized variables or mean + / – standard error of mean (minimum–maximum) for continuous variables. Eating habit scores were calculated based on 12 questions, where healthy habits were given a score of 1 and non-healthy habits were given a score of 0. Therefore, the maximum possible score was 12. The score of eating habits was compared between different demographic groups, groups of social factors, and psychological factor grouping using the unpaired Student’s *t*-test between two groups and one-way ANOVA (least significant difference) between more than two groups. The significance level was set at *P*-value ≤ 0.05 .

Results

Socioeconomic Characteristics

Among the 378 medical students who participated in this study, the mean age was 21.6 years with a range from 19 to 26. Half of them were females (50.8%), and most of the participants ($n=367$, 97.1%) were Saudi. Most of them were in the second year (25.1%), and the fewest were from the fourth year (16.7%). Most of the participants were single (93.7%) and living in owned homes (70.6%) with their families (88.9%). Almost half of the participants (48.4%) had a monthly income of more than 10,000 Saudi Reals (SR) per month. Current smokers made up 23.5%, and 4.2% were ex-smokers. A total of 8.5% indicated they had a chronic illness, and 13.8% were taking medications. The mother’s education levels were university degree, 37%; secondary school, 30.2%; diploma, 13.5%; master’s degree, 11.6%; no formal education, 5.6%; and others, 2.1%. The father’s education levels were university degree, 36.8%; master’s degree, 27.2%; secondary school, 15.9%; diploma, 14.3%; PhD, 3.2%; no formal education, 1.3%; and others, 1.3%. The parents were separated for

12.4% of respondents, and the percentage of respondents who had working mothers was 37%. Most of the respondents who played sports (59.3%; see [Table 1](#)).

Eating Habits

Around 30.7% of the students thought that they had healthy eating habits. Almost half of the participants (50.5%) ate meals regularly, but only 34.7% had breakfast on a daily basis, and 18.5% had breakfast rarely. Only 17.7% of the participants reported that they ate meals without snacking in between, and 26.5% ate snacks daily, while 27.8% rarely had snacks. Around 20.4% of the participants consumed vegetables daily, while 14.3% ate vegetables only rarely. About 11.9% of the respondents consumed fruits on a daily basis, while 20.4% ate fruit rarely. Around 9.5% ate fried food on a daily basis, while 15.6% ate fried foods rarely. Relatively few (10.1%) of the participants drank more than 2 liters of water per day. A majority of the participants (50.8%) ate meals with family and friends one to four times per week, while 44.2% ate with their family and friends on a daily basis, and 5% reported that they always ate alone. About two-thirds of the students (65.9%) went to fast-food restaurants “sometimes,” followed by 28.0% of students eating fast food “often,” and 6.1% never ate fast food. More than half (53.7%) of the students knew that they should eat a variety of foods for balanced nutrition, although 32.0%, 7.1%, and 5.6% of the students thought that “mainly vegetables,” “mainly meat,” or “mainly carbohydrates,” respectively, was sufficient for balanced nutrition. Most of the participants typically ate a variety of foods (43.1%), but 38.1% admitted to consuming predominantly meats. The mean of healthy habits score was 4.2, from a range of 0–10 ([Table 2](#)).

Psychological Factors Affecting Eating Behavior

There were some participants who reported that they often ate because they felt lonely (10.1%). Around 15.9% often felt completely out of control when it came to food, while 48.9% sometimes felt that way. In terms of overeating, 11.4% said they often ate until their stomach hurt, 55.3% exhibited that same behavior sometimes, and the remaining third 33.3% had never eaten till their stomach hurt. When the respondents were asked if they eat when they are upset or nervous, most of them (43.1%) answered “never.” A majority of the participants said that they “sometimes” eat because of being bored (51.1%) and “sometimes” because of being happy

Table 1 Sociodemographic Characteristics of Participants (n=378)

Demographic Data	Value
Age (years)	21.6±0.1 (19.0–26.0)
Gender	
Female	192 (50.8%)
Male	186 (49.2%)
Nationality	
Saudi	367 (97.1%)
Non-Saudi	11 (2.9%)
Academic years	
Second	95 (25.1%)
Third	70 (18.5%)
Fourth	63 (16.7%)
Fifth	80 (21.2%)
Sixth	70 (18.5%)
Marital status	
Single	354 (93.7%)
Married	21 (5.6%)
Divorced	3 (0.8%)
Residence	
Own	267 (70.6%)
Rent	111 (29.4%)
Living arrangement	
Living alone	42 (11.1%)
Living with family	336 (88.9%)
Monthly household income (SR)	
<3000 SR	124 (32.8%)
3000–10,000 SR	71 (18.6%)
>10,000 SR	183 (48.4%)
Smoking	
Never smoked	273 (72.2%)
Ex-smoker	16 (4.2%)
Current smoker	89 (23.5%)
Smoking duration (years)	4.1±0.3 (1.0–13.0)
Chronic illness	
No	346 (91.5%)
Yes	32 (8.5%)
Taking medications	
No	326 (86.2%)
Yes	52 (13.8%)
Number of family members	6.2±0.1 (1.0–13.0)
Mother's education level	
University degree	140 (37.0%)
Secondary school	114 (30.2%)
Diploma	51 (13.5%)

(Continued)

Table 1 (Continued).

Demographic Data	Value
Master's degree	44 (11.6%)
No formal education	21 (5.6%)
Others	8 (2.1%)
Father's education level	
University degree	139 (36.8%)
Master's degree	103 (27.2%)
Secondary school	60 (15.9%)
Diploma	54 (14.3%)
PhD	12 (3.2%)
No formal education	5 (1.3%)
Others	5 (1.3%)
Parents separated	
No	331 (87.6%)
Yes	47 (12.4%)
Mother works	
No	238 (63.0%)
Yes	140 (37.0%)
Plays sports	
No	154 (40.7%)
Yes	224 (59.3%)
Number of days with regular exercise per week	
Once	43 (11.4%)
Twice	63 (16.7%)
More than twice	118 (31.2%)

Note: Data were expressed as mean +/- standard error of mean (minimum–maximum) or number (%) as appropriate.

Abbreviation: SR, Saudi Real, 1 Dollar=3.75 SR.

(56.6%). Boredom and happiness were not found to be associated with eating for 27.5% and 24.6% of respondents, respectively (Table 3).

Relationship Between Eating Patterns and Sociodemographic Factors

The total eating score was compared throughout the categorical variables and found to be significant for the following factors: different academic years, with the highest scores in the sixth year and the lowest score in the fifth year ($P<0.0001$). Those who lived in an owned place had higher scores than those who lived in a rented place (4.46 ± 0.12 versus 3.73 ± 0.19 , $P<0.001$). Living arrangements were another significant factor and showed that students who lived with their families had higher scores than the students who were living alone (4.35 ± 0.11 versus 3.43 ± 0.28 , $P=0.005$). Another significant factor was smoking,

Table 2 Eating Habits Among Respondents (n=378)

Characteristics	Value
Healthy eating habits	
No	262 (69.3%)
Yes	116 (30.7%)
Q1. Regular meals	
Yes	191 (50.5%)
No	187 (49.5%)
Q2. Frequency of having daily breakfast	
1–2 times per week	78 (20.8%)
3–4 times per week	99 (26.2%)
Daily	131 (34.7%)
Rarely	70 (18.5%)
Q3. Frequency of having meals without snacks in between	
1–2 times per week	98 (25.9%)
3–4 times per week	108 (28.6%)
Daily	67 (17.7%)
Rarely	105 (27.8%)
Q4. Frequency of having snacks	
1–2 times per week	81 (21.4%)
3–4 times per week	128 (33.9%)
Daily	100 (26.5%)
Rarely	69 (18.3%)
Q5. Weekly consumption of vegetables	
1–2 times per week	134 (35.4%)
3–4 times per week	113 (29.9%)
Daily	77 (20.4%)
Rarely	54 (14.3%)
Q6. Weekly consumption of fruits	
1–2 times per week	155 (41.0%)
3–4 times per week	101 (26.7%)
Daily	45 (11.9%)
Rarely	77 (20.4%)
Q7. Weekly consumption of fried food	
1–2 times per week	140 (37.0%)
3–4 times per week	143 (37.8%)
Daily	36 (9.5%)
Rarely	59 (15.6%)
Q8. Water intake (liters/day)	
<1 liter	101 (26.7%)
1–1.5 liter	156 (41.3%)
1.5–2 liter	83 (22.0%)
> 2 liters	38 (10.1%)
Q9. Meals with family and friends	
1–2 per week	63 (16.7%)
3–4 times per week	129 (34.1%)
Always alone	19 (5.0%)

(Continued)

Table 2 (Continued).

Characteristics	Value
Daily	167 (44.2%)
Q10. Fast food in restaurants	
Never	23 (6.1%)
Often	106 (28.0%)
Sometimes	249 (65.9%)
Q11. Food type with balanced nutrition	
All of them	1 (0.3%)
All types but not fried	1 (0.3%)
Balanced nutrition needs to be contained with carbs, proteins, and fats	1 (0.3%)
Carbohydrate (rice, bread)	21 (5.6%)
Cover your requirements from macros	1 (0.3%)
Daily needs of carbs, proteins, and fats	1 (0.3%)
Fruits	1 (0.3%)
Mainly meat	27 (7.1%)
Mainly vegetables	121 (32.0%)
Variety of foods	203 (53.7%)
Q12. Type of food most often ordered	
Pasta, French fries	7 (1.9%)
Carbohydrates (rice, bread, etc.)	48 (12.7%)
Chicken	1 (0.3%)
Fatty food, ketogenic diet	1 (0.3%)
Predominantly meat	144 (38.1%)
Predominantly vegetable	14 (3.7%)
Variety of food	163 (43.1%)
Healthy habits score	4.2±0.1 (0.0–10.0)

Note: Data were expressed as mean +/- standard error of mean (minimum–maximum) or number (%), as appropriate.

where students who had never smoked had higher scores (4.56±0.12) than the ex-smokers (4.50±0.63) and current smokers (3.23±0.19), with $P<0.0001$ for all. The score was significantly higher among students whose parents were not separated as compared to those whose parents were separated (4.33±0.11 vs. 3.62±0.27, $P=0.023$) and for students playing sports versus those did not play a sport (4.55±0.14 vs. 3.80±0.14, $P=0.0001$). For all other factors, including gender, nationality, academic year, marital status, father's and mother's education levels, and mother's working status, there were no significant differences found in the scores between the groups (Table 4).

Relationship Between Eating Patterns and Psychological Factors

There was a significant difference found between groups for the scores on each of the questions regarding psychological

Table 3 Psychological Factors Related to Eating Behavior (n=378)

Psychological Factors	Answer Level		
	Never	Often	Sometimes
Eat because of feeling lonely	171 (45.2%)	38 (10.1%)	169 (44.7%)
Feel completely out of control when it comes to food	133 (35.2%)	60 (15.9%)	185 (48.9%)
Eat so much until stomach hurts	126 (33.3%)	43 (11.4%)	209 (55.3%)
Eat because of feeling upset or nervous	163 (43.1%)	56 (14.8%)	159 (42.1%)
Eat because of feeling bored	104 (27.5%)	81 (21.4%)	193 (51.1%)
Eat because of feeling happy	93 (24.6%)	71 (18.8%)	214 (56.6%)

Note: Data were expressed as number (%).

factors. The students who answered “never” to the questions had higher scores than those who answered “often” or “sometimes.” The mean score for those who never ate because they felt lonely was higher than those who ate often or sometimes (4.65 ± 0.16 vs. 3.23 ± 0.26 and 4.04 ± 0.15 , $P < 0.0001$). The mean score for the students who never felt completely out of control when it comes to food was 4.85 ± 0.19 , while for those who did often feel out of control with food was 3.75 ± 0.22 , and for those who sometimes felt out of control was 3.97 ± 0.14 , with significant differences between them ($P < 0.0001$). The mean score for the respondents who had eaten until their stomach hurt was 4.90 ± 0.12 , while for those who did that often was 3.84 ± 0.29 and those who sometimes did was 3.93 ± 0.12 with significant differences between them ($P < 0.0001$). The mean score of the respondents who ate because they were upset or nervous was 4.52 ± 0.16 , while for those who did that often and sometimes were, respectively, 3.79 ± 0.24 and 4.13 ± 0.16 ($P = 0.041$). The score for students who never ate because they were bored was 4.89 ± 0.22 , while for those who often ate because they were bored was 3.75 ± 0.18 , and those who only ate out of boredom sometimes was 4.10 ± 0.14 ($P < 0.0001$) (Table 5).

Discussion

The present study aimed to evaluate eating habits and investigate the relationships between sociodemographic, socioeconomic, and psychological factors with eating habits among medical students at a Saudi Arabian university. Most of the participants were Saudi (97.1%), single (93.7%), lived with family (88.9%), and were non-smokers (72.2%), which may be a good representative

Table 4 Association Between Eating Habits and Sociodemographic Factors (n=378)

Characteristics	Mean \pm SE	P-value
Gender		0.165
Male	4.10 \pm 0.14	
Female	4.39 \pm 0.15	
Nationality		0.107
Saudi	4.22 \pm 0.0	
Non-Saudi	5.09 \pm 0.65	
Academic year		<0.0001
Second	4.08 \pm 0.22	
Third	4.54 \pm 0.23	
Fourth	4.22 \pm 0.23	
Fifth	3.35 \pm 0.19	
Sixth	5.20 \pm 0.23	
Marital status		0.254
Single	4.25 \pm 0.12	
Married	4.33 \pm 0.52	
Divorced	2.33 \pm 0.88	
Residence		<0.001
Own	4.46 \pm 0.12	
Rent	3.73 \pm 0.19	
Living arrangement		0.005
Live alone	3.43 \pm 0.28	
Live with family	4.35 \pm 0.11	
Monthly household income (SR)		0.069
<3000	4.19 \pm 0.20	
3000–10,000	3.80 \pm 0.22	
>10,000	4.45 \pm 0.14	
Smoking		<0.0001
Current smoker	3.23 \pm 0.19	
Ex-smoker	4.50 \pm 0.63	
Never smoked	4.56 \pm 0.12	
Mother's education level		0.484
Secondary school	4.16 \pm 0.20	
Diploma	4.718 \pm 0.31	
University degree	4.16 \pm 0.15	
Master's degree	4.84 \pm 0.33	
No formal education	4.10 \pm 0.46	
Others	4.38 \pm 0.42	
Father's education level		0.614
Secondary school	4.23 \pm 0.24	
Diploma	4.35 \pm 0.28	
Degree	3.99 \pm 0.18	
Master's	4.52 \pm 0.20	
No formal education	4.20 \pm 0.73	
PhD	4.50 \pm 0.51	
Others	4.20 \pm 0.86	

(Continued)

Table 4 (Continued).

Characteristics	Mean ± SE	P-value
Parents separated		0.023
No	4.33±0.11	
Yes	3.62±0.27	
Mother works		0.955
No	4.25±0.13	
Yes	4.24±0.17	
Plays sports		0.0001
No	3.80±0.14	
Yes	4.55±0.14	

Notes: Data were expressed as mean + / - standard error of mean. Significance was determined by either an unpaired Student's *t*-test or one-way ANOVA test, as appropriate.

Table 5 Association Between Eating Habits and Psychological Factors (n=378)

Psychological Factors	Mean ± SE	P-value
Eat because of feeling lonely		<0.0001
Never	4.65±0.16	
Often	3.32±0.26	
Sometimes	4.04±0.15	
Feel completely out of control when it comes to food		<0.0001
Never	4.85±0.19	
Often	3.75±0.22	
Sometimes	3.97±0.14	
Eat so much until stomach hurts		<0.0001
Never	4.90±0.21	
Often	3.84±0.29	
Sometimes	3.93±0.12	
Eat because of feeling upset or nervous		0.041
Never	4.52±0.16	
Often	3.79±0.24	
Sometimes	4.13±0.16	
Eat because of feeling bored		<0.0001
Never	4.89±0.22	
Often	3.75±0.18	
Sometimes	4.10±0.14	
Eat because of feeling happy		0.065
Never	4.65±0.23	
Often	3.96±0.23	
Sometimes	4.16±0.13	

Notes: Data were expressed as mean + / - standard error of mean. Significance was determined by one-way ANOVA test.

sample of all undergraduate medical students in Saudi Arabia. In Dammam, Saudi Arabia, Al-Qahtani¹⁰ reported high numbers of single medical students (90%), although

76% of the students who lived with their families and were single were more likely to choose unhealthy foods.¹⁶

In the present study, the participants' parents were highly educated, and only 1.3% of fathers and 5.6% of mothers had no formal education. Al-Qahtani¹⁰ reported that >90% of the students' parents had high-level degrees, and that had a positive impact on their children's eating patterns;¹⁷ however, that effect was not shown in this study, where most students had unhealthy dietary patterns in spite of their parents' high education levels.

In this study, the majority of students (88.9%) lived with family, and the healthy habits score was significantly higher in students who lived with their family than those who lived alone. Living with family appeared to be a good environment to protect against bad dietary patterns.¹⁶

In this study, only 23.5% of the medical students were current smokers. The total health habit score was significantly higher for non-smokers than for current or former smokers. Abstinence from smoking was found to be positively associated with healthy eating habits in this study. In other studies, smoking was correlated with bad eating habits among Chinese university students⁹ and Malaysian medical students.¹⁴

In this study, 59.3% of the students exercised regularly, with 31.2% exercising more than twice per week. Physical activity is very important for health; in comparison to international studies, Saudi youth had more physical inactivity and sedentary lifestyles.¹⁸ In this respect, Al-Nakeeb et al¹⁹ reported that physical activity among young females and males (26%) from Al-Ahsa (Eastern region of Saudi Arabia) was low when compared to adolescents in Coventry (77.2%) and Birmingham (72.3%) in the United Kingdom.

University students experience changes in their life patterns and acquire unhealthy eating habits. This transition begins in school and university and may remain later in life.¹ Almost half of the students in this study (50.5%) ate regular meals; this finding was higher than those reported in other areas of Saudi Arabia, from the College of Health Sciences at Rass, Qassim University (36.7%)²⁰ and from Abha (31.0%).²¹ Meanwhile, this finding was lower than that documented for Chinese (83.6%),⁹ Lebanese (61.4%),²² and Malaysian medical students (57.6%).¹⁴ These habits need to be changed through educational programs aimed at enhancing healthy eating habits in Saudi Arabia.

Breakfast is widely considered to be the most important meal of the day.²³ It is defined as any food eaten

before or at the start of daily activities, within 2 hrs of waking, and typically not after 10:00 am.²⁴ Breakfast skipping was defined as eating breakfast fewer than 7 days per week.²⁵ Although medical students were expected to have this knowledge, only about one-third (34.7%) of study participants ate breakfast on a daily basis in the present study. Breakfast skipping was found in about 15% of Saudi secondary school students from Jeddah,²⁶ 49% of Saudi adolescents from Abha,¹⁸ and 10% of young males and 19% of females in the United Arab Emirates.²⁷ Our finding was slightly higher than that reported in Lebanon (31.8%).²² Meanwhile, studies from Malaysia reported a rising trend toward daily breakfast eating among female youth in Pahang (52.6%),²⁸ Malay undergraduate students in Selangor (75.6%),²⁹ and medical students in private university in Malaysia (43.9%).¹⁴ Regular breakfast eating is essential for medical students to have enough energy intake to get over the malaise caused by a rigorous program of daily studies.³⁰ Commonly reported causes for skipping breakfast were lack of time, oversleeping, lack of appetite, disliking eating early in the morning, concerns about excess body weight, living alone, and lack of parental control.^{25,31} Breakfast consumption is associated with several advantages for behavioral, cognitive, and affective aspects.³² Furthermore, skipping breakfast is a risk factor for obesity due to overeating at the next meal, leading to high serum cholesterol levels and type 2 diabetes mellitus.³³

This study revealed that only 17.7% of the students ate meals on a daily basis without having snacks in between, while a majority (56.3%) had snacks between meals at least three times per week, and 26.5% had snacks daily. Daily consumption of snacks was also a common habit (35.96%) among the Saudi students in Abha,²¹ and being a staple food in this region, dates were eaten by students typically around four times per week (29.21%). The findings of this study were higher compared to previous studies from various other countries, where fewer Syrian (53%),³⁴ Lebanese (53.20%),²² and Malaysian (42.4%)¹⁴ students consumed snacks regularly. Frequent eating of snacks is a common habit among young people.^{2,35} Further, in both lean and obese people, frequent snacking may lead to slower weight loss or even weight gain.³⁶

This study revealed that the proportion of medical students who consumed vegetables and fruits daily was 20.4% and 11.9%, respectively. A prior study conducted in Saudi Arabia among university students showed that 22% of them consumed at least five servings of vegetables per day.³⁷ In

Abha, Saudi Arabia, the reported prevalence of fruits and vegetables intake among Saudi youth were 50.8% and 62.4%,⁴ respectively, and for fruit intake among Saudi university students, it was 31.46%.²¹ About Azm and Elebiary³⁸ reported that 30% of female nursing students in Saudi Arabia ate fruits and vegetables daily. Research in other countries have reported that 26.3% of Bahrain students ate five servings of fruits and vegetables daily,³⁵ while 20% of Pakistani female university students ate two servings of fruits and vegetables daily.³⁹ Moreover, vegetable and fruit consumption more than three times per week for adolescent males and females in the United Arab Emirates was reported to range from 49% to 69%.²⁷ Western countries such as the United States,³ Germany,⁴⁰ and Great Britain⁴¹ revealed between 66% and 95% of university students did not meet recommendations for daily vegetable and fruit consumption. Chourdakis et al⁴² revealed that more than half of students reported consumption of vegetables and fruits at least three times per week among medical students in northern Greece. Meanwhile, a study from Malaysia revealed 19% of university students ate vegetables more than three times per week.⁸

The World Health Organization recommendations are that adults should eat a minimum of five servings, or 4000 g, of vegetables and fruits daily.⁴³ In Saudi Arabia, dietary recommendations that originate from the Ministry of Health as the Healthy Palm Saudi dietary guidelines (Alnakhala Elgethaiya), aimed at enhancing the consumption of healthier diets recommend eating three to five servings of vegetables and two to four servings of fruits on a daily basis.⁴⁴ Adequate consumption of vegetables and fruits protects against chronic diseases like cardiovascular diseases, obesity, and some cancer types.⁴⁵

Students usually choose fast food due to its availability, taste, convenience, and low costs.⁴⁶ This study showed that 37% of students ate fried food one to two times per week, and 37.8% eat it three to four times per week. This study also showed that most of respondents (65.9%) ate fried foods at restaurants, which concurs with other studies.²² In Riyadh, the average frequency of fast-food consumption was 4.5 times per week among youth.⁴⁷ A Malaysian study revealed that 73.5% of medical students consumed fast food more than two times per week.¹⁴

In Damascus, Syria, only 14% of adolescents ate fast foods more than four times per week.² Chin and Nasir²⁸ revealed that only 4.7% of students went to fast-food restaurants in Pahang, Malaysia. Westernization, which has resulted in nutrition changes, has had a major effect on the increased risk of unhealthy lifestyles in Arab

countries.⁴⁸ Fast food rich in fat and physical inactivity were found to be risk factors for coronary heart disease among Saudi male university students at Dammam City⁴⁹ and in clinical years male medical students at KAU.⁵⁰

Most of the participants of the present study ate their meals with family and friends on a daily basis (44.2%), which was slightly higher than that reported for Lebanese university students (42.7%),²² but lower than what has been reported for Malaysian medical students (81.80%).¹⁴

Stress is considered a general body response that affects the body's ability to maintain homeostasis. Stress is a global problem due to its negative impact on human health.⁵¹ Many researchers have stated that medical students have significant amounts of stress throughout their years of university life.^{52,53} The results of this study revealed that many students eat because of negative emotions like feeling lonely (44.7%), nervous (42.1%), or bored (51.1%). Conversely, others sometimes eat due to feeling happy (56.6%). The stressful lifestyles of medical students may be a contributing factor for negative emotions, and these rates were supported by the eating habit scores exhibited in this study, which are significantly higher for students who responded "never" to various psychological questions such as, Do you eat because of feeling lonely? Do you feel completely out of control when it comes to food? Do you eat so much that your stomach hurts? Do you eat because you are feeling upset or nervous? Do you eat because you are bored? And Do you eat because you are happy? Former studies reported that the behavioral effects of stress might influence eating patterns, where people living in a stressful environment consumed more food as a way of coping with the stress.⁵⁴

The association between stress and eating habits in medical students has previously been studied in different populations.^{10,55,56} Several researchers have shown a prevalence of stress among medical students, ranging from 28.9% to 61.4% in Saudi Arabia, Egypt, the United Kingdom, Malaysia, and Thailand.⁵⁷⁻⁶⁰ In the present study, the eating habits scores were lower for those who answered yes to the questions whether they ate because of feeling lonely, ate until their stomach hurt, ate because of feeling upset or nervous, and ate because of feeling bored. Stress in medical students may be due to workloads, the commuting distance between home and the university, and the result of incorrect homework assignments without any specific and clear solutions offered.^{14,61} In a study conducted in Kuwait, Ahmed et al revealed that stress is highly associated with unhealthy food selection.⁶² For some students, these situations can generate stress that affects the appetite and they

skip meals. They will show unhealthy eating behaviors, consuming fast food, food that are high in fats, sweets, and soft drinks.⁶² The development of new strategies in medical schools that aim at reducing stress will be positive for student health.⁶³ The eating habits modified by stress need to be reversed, with the aim of producing a positive impact and better health for the students in their studies.⁵¹

In the present study, most of the students (53.7%) reported that a balanced diet was one that contains a variety of foods. In Abha, Saudi Arabia, most of the students (65.62%) knew what constitutes a balanced diet.²¹ A study at Midwestern University in the state of Arizona in the United States among 181 female and 105 male students revealed that 94.4% of the students agreed that it is important to eat different types of food for better health.⁶⁴ In another study, healthful food was known to be foods that contain more vegetables and fruits and are low in fat content.⁶⁵

Limitations

This study design was cross-sectional, which does not allow for establishing causal relationships. Another limitation of this study is the absence of anthropometric measurements from the students. In addition, the students in this study were from just one medical college, and therefore, they may not be representative of all university medical students in Saudi Arabia.

Conclusion

Most medical students had unhealthy dietary habits and physical inactivity. The unhealthy dietary habits were irregular meals, inadequate consumption of fruits and vegetables, and eating too many fried and fast foods. Socioeconomic and psychological aspects were significantly affected by the eating habits of the students. Nutritional education for medical students should be improved to enhance healthy eating habits and lifestyles, along with adherence to healthier diets. Future studies are recommended to use larger sample sizes and include students from different medical universities in Saudi Arabia.

Statement of Ethics

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical Approval ref. No. 244-1441. The protocol of the present study was approved by the Research Ethics Committee of KAU,

Jeddah, Saudi Arabia. All participants were informed about the nature of the study and the confidentiality of their responses. Answering the online questionnaire was considered consent to participate.

Data Sharing Statement

The authors declare that they had full access to all of the data in this study, and the authors take complete responsibility for the integrity of the data and the accuracy of the data analysis. All original data are available in the Department of Family Medicine, KAU, Jeddah, Saudi Arabia. Data used to support the findings of this study are available from the corresponding author upon request.

Acknowledgment

The authors are thankful to the students of KAU for their participation in this study.

Author Contributions

All authors contributed to the study design, data collection and analysis, drafting and revising of the manuscript, and all authors gave final approval of the version to be published. In addition, all authors agree to be accountable for all aspects of the work.

Funding

This work was funded by the Deanship of Scientific Research (DSR), KAU, Jeddah, under grant No. DF-339-140-1441. The authors acknowledge DSR with thanks for their technical and financial support.

Disclosure

No authors have any conflicts of interest to declare.

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