



# Dietary Patterns and Nutritional Quality of University Students in Iraq

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## Data of the Article

First Received: 05 August 2024 | Last Revision Received: 19 October 2024

Accepted: 23 November 2024 | Published Online: 31 December 2024

DOI: <https://doi.org/10.5281/zenodo.15041559>

## Keywords

Dietary Patterns,  
BMI,  
Nutritional Quality,  
University Students,  
Nutrient Intake

The study aimed to evaluate the nutritional and qualitative status of students at Al-Qasim Green University. Importance of studying dietary patterns and nutritional status can give a clear view of qualitative and quantitative deficiencies compared to standard recommendations and increase the knowledge of students on healthy diets. A descriptive cross-sectional study was conducted for 11 months. The study included 256 students, 137 males and 119 females. According to our findings, students' average BMI was 22.9; a high percentage of students (67.3%) had a normal BMI, while (22.2%) and (3.9%) were overweight and underweight, respectively. 38%, 44.12%, and 5.73% of students ate two meals, three meals, or more than three meals, respectively. 50.10% of students ate breakfast, while 28.71% skipped breakfast. Male students are more likely than female students to skip breakfast. 51.53% and 66.56% of students, respectively, ate lunch and dinner, while the students who did not eat lunch and dinner were 8% and 21.85%, respectively. More than a quarter of students ate snacks. 8.30% of students did not eat snacks, while more than half of the students ate snacks sometimes. 27.4% of males and 39.7% of females ate meat daily, while 42.6% of males and 41.7% of females ate meat  $\geq 3$  times. As for fish and seafood, it is noted that a high percentage of males (62.5%) and females (72.4%) eat  $< 3$  Times. A high percentage of males and females ate vegetables and fruit daily. More than half of males and females ate fast food  $< 3$  Times. Vitamin A intake for males and females was slightly less than the RNI, while the amount of other vitamins consumed was higher than the RNI. The amount of minerals consumed by males and females is higher than the RNI.

## 1. Introduction

Unhealthy eating habits are one of the main risk factors for developing chronic conditions like diabetes, obesity, dyslipidemia, and cancer later in life, particularly if they are adopted in early adulthood (Nasreddine et al., 2012; Rinaldi et al., 2012). Eating habits are primarily formed in late adolescence and early adulthood (Phagava et al., 2019). Dietary patterns are a broad description of the typical eating habits and daily food and nutrient consumption.

A more thorough picture of a population's eating habits

can be obtained by analyzing dietary patterns. The synergistic effect of many nutrients may enhance the prediction of disease risk compared to the analysis of solo nutrients or diets (Hu, 2002). Additionally, certain dietary patterns are frequently linked to nutrient intake (Kant et al., 1991; Randall et al., 1990). University students' eating habits are developing at a critical point, as evidenced by their high consumption of ultra-processed foods, frequent meal skipping, eating in between meals, and limited eating time (Cediel et al., 2018; Schnettler et al., 2015). Research indicates that university students exhibit a low prevalence of healthy eating, with low intakes of fruits,



vegetables, and milk and high intakes of fat, carbs, and added sugar (Bede et al., 2020; Musaiger, Al-Khalifa, & Al-Mannai, 2016). These behaviors, which are linked to a low level of physical activity, could be a factor in the rising obesity prevalence in this demographic (Mohammed, 2020). Other research has connected students' lifestyle choices, particularly their breakfast intake, to their cognitive capacities, which are mirrored in their academic achievement (Lisa, 1998; Pollitt, Watkins, & Husaini, 1997). New social relationships and the adoption of new habits (Brumboiu et al., 2018), such as smoking, physical activity, and eating habits, are brought about by entering a university setting. These changes can disrupt the group's physical, social, and biological development and increase their susceptibility to health issues (Van den Berg et al., 2012). Skipping breakfast increases the likelihood that university students will struggle to focus by mid-morning and perform worse intellectually (Keski-Rahkonen et al., 2003; Nicklas, O'Neil, & Myers, 2004). To boost their daily energy intake, they are also likely to eat snacks that are rich in fat, salt, and sugar at other times of the day (Resnicow, 1991). Chronic diseases like diabetes, dyslipidemia, obesity, cardiovascular disease, and cancer may result from this. Therefore, in the university stage, it is essential to support and foster a nutritious dietary pattern (Ogunkunle & Oludele, 2013).

Investigating university students' eating patterns can yield valuable insights into nutrition and eating patterns, help identify unhealthy and risky behaviors in this population, and support the development and implementation of targeted interventions that mitigate the detrimental health effects of an unhealthy diet. Thus, the objectives of this study were to evaluate the dietary habits and consumption of Iraqi university students, raise awareness of healthy eating practices among students, and enhance academic performance.

## 2. Materials and Methods

### 2.1. Study Population

Over 11 months, a cross-sectional study design was carried out at Al-Qasim Green University. Participants were chosen at random from a variety of socioeconomic backgrounds, with the majority being from urban areas. Undergraduate students between the ages of 19 and 22 who signed a consent form and consented to participate in the study were included in the study population. Two hundred fifty-six students from various faculties and academic years were invited to participate in the sample; 137 of them were male, and 119 were female.

The researchers provided a brief explanation of the study's goals and how to fill out the survey form to the participants before the questionnaire was distributed. The number of meals eaten each day, meal patterns, snacking habits, meal source, and weekly food frequency consumption were all recorded (FAO/WHO). The World Health Organization's recommendations served as the basis for the assessment of the quantity of meals ingested daily. A 24-hour recall (based on three days in a row) and food frequency questionnaires were given to each participant as part of a dietary survey based on the food history method (Hall et al., 2009). The participant can remember and report all of the food and drinks they have consumed over the past 24 hours using a 24-hour recall technique. The food frequency questionnaire was used to minimize any potential errors that might have occurred from the initial questionnaire because it depends on the respondent's memory (Mohammed, 2020; Shaneshin, Jessri, & Rashidkhani, 2014). Comprehensive details regarding the questionnaire's validity and reliability have already been published elsewhere (Musaiger et al., 2011). The raw and cooked food composition tables were used to transform the foods eaten into nutrients (Boutros, 1988). Saturated fatty acid (SFA), macronutrient and micronutrient intake (minerals, vitamins, and trace elements), total spontaneous energy intake, and analysis of 100 g samples for all nutritional compositions are included in these tables. Included in the questionnaire were brief inquiries concerning eating habits, food preferences, and the intake of fruits, vegetables, and beverages. A scale was used to measure weight with a tolerance of  $\pm 0.5$  kg (Ambrosini et al., 2009). The scale was recalibrated using a standard weight after every ten measurements to ensure accuracy. A non-flexible plastic measuring rod was used to measure height in a fully standing position to the closest 0.1 cm (Peltzer et al., 2014). To ensure that their backs, shoulders, pelvis, and knees all lie in a straight line, the students were told to stand on a level surface with their heads up, their shoes off, and their feet together to measure their height. To determine the student's BMI, the weight (in kilograms) was divided by the square of their height (in meters) after their weights and heights were measured. The resulting BMI values were then categorized as underweight (BMI  $\leq 18.5$ ), normal (18.5-24.9), overweight (25-29.9), and obesity ( $> 30$ ) based on the WHO 2000 classification criteria (Al-Rethaiaa, Fahmy, & Al-Shwaiyat, 2010).

At the time of the study, none of the females under investigation were nursing or pregnant. In addition, students who were on a diet to lose weight or who had conditions like diabetes, hypertension, gluten enteropathy,

etc., were not allowed to participate in the study. Every student said they didn't smoke or drink alcohol.

### 3. Results

The dietary pattern and nutritional quality of undergraduate students in Al-Qasim Green University were evaluated for a total of 256 students, comprising 137 males and 119 females, encompassing the 19–22 age

range. Table 1 displays the students' BMI classification; the mean BMI ranged from 17.33 to 33.91 kg/m<sup>2</sup>, with a mean of 22.93 kg/m<sup>2</sup>. There were 172 (67.3%) students with a normal BMI, 57 (22.2%) who were overweight, 10 (3.9%) who were underweight, and 17 (6.6%) who were obese. According to our findings, a slightly higher proportion of women than men are underweight, while a larger percentage of men are overweight or obese.

**Table 1:** Body Mass Index Classification of Students.

Classification	BMI (kg/m <sup>2</sup> )	Male		Female		Total	
		n	%	n	%	n	%
Underweight	18.5.<	3	2.2	6	5.0	10	3.9
Normal	18.5-24.9	81	59.1	81	68.1	172	67.3
Overweight	25-29.9	43	31.3	30	25.3	57	22.2
Obese	30 <	10	7.4	2	1.6	17	6.6

Table 2 shows the meal pattern of university students where 12.11% of the sample ate one main meal in a day, 38% ate two meals, 44.12% ate three meals, while those who ate more than three meals were 5.73%. Also, our results indicated that the usual source of food for a high percentage of samples, 42.48%, were both prepared and purchased, 31.33% were prepared only, and 26.16% purchased only. About half of the sample ate breakfast, while about 28.71% skipped breakfast. On the other hand, the percentage of male students who skip breakfast is higher than female students. The

majority of the students ate lunch 66.56% every day, and the percentage of males and females was close. As for dinner, about half of the students ate dinner, while the percentage of males 56.7% was higher than females 45.6%. More than a quarter of students ate snacks, 8.30% of students did not eat snacks, while more than half of students ate snacks sometimes. The percentage of students who drink tea 29.14%, and those who do not drink tea was 32.21% was close, while the percentage of male students who drink tea, 37.8%, was more than that of female students, 19.2%.

**Table 2:** Meal Pattern of University Students.

Variable	Frequency					
	Total (n=256)	(%)	Male (n=137)	(%)	Female (n=119)	(%)
<b>Number of Main Meals / Day</b>						
1	31	12.11	17	12.4	14	11.8
2	97	38.0	49	36.2	48	40.1
3	113	44.12	62	45.1	51	43.0
3<	15	5.73	9	6.3	6	5.1
<b>Usual Source of Food</b>						
Prepared only	80	31.33	37	27.2	43	36.1
Purchased only	67	26.16	32	23.1	35	29.7
Both	109	42.48	68	49.7	41	34.2
<b>Breakfast Skipping</b>						
yes	73	28.71	44	32.3	29	24.6
No	128	50.10	66	48.2	62	52.3
Sometime	54	12.21	27	19.5	27	23.2
<b>Lunch</b>						
yes	170	66.56	85	62.2	85	71.6
No	21	8.37	13	9.4	8	7.2
Sometime	64	25.04	39	28.4	25	21.2
<b>Dinner</b>						
yes	132	51.53	78	56.7	54	45.6
No	56	21.85	17	12.1	39	33.1
Sometime	68	26.59	43	31.2	25	21.3
<b>Eat Snacks</b>						
yes	68	26.70	40	29.5	28	23.5
No	13	8.30	7	5.3	6	5.3
Sometime	153	59.76	89	65.2	64	54.2
<b>Drink Tea</b>						
yes	75	29.14	52	37.8	23	19.2
No	90	32.21	47	34.1	43	36.5
Sometime	90	35.08	37	27.1	53	44.3

Table 3 displays how frequently students consume various food groups, where 27.4% of males and 39.7% of females ate meat daily, while 42.6 % of males and 41.7% of females ate meat  $\geq 3$  times, and 13.4 of males and 4.8 of females did not eat meat. As for fish and seafood, it is noted that a high percentage of males 62.5% and females 72.4% eat  $< 3$  Times. For vegetables and fruits, a high percentage of males and females ate them daily, while a small percentage of males and females did not eat them, and about a quarter of both males and females ate  $\geq 3$  times. A high percentage of

males 43.1% and females 50.4% ate legumes  $< 3$  Times and a smaller percentage, 38.6% for males and 34% for females who ate  $\geq 3$  times. As for fried foods, about a third of males and females ate fried foods daily, 34.7% of males and 38.2% of females ate  $< 3$  Times, 27.5% of males and 28.6% of females ate  $\geq 3$  times, and a small percentage of 5.3% of males and 5.2% of females did not eat fried food. More than half of males and females ate fast food  $< 3$  Times while 27.2% of males and 19.2% of females ate  $\geq 3$  times; on the other hand, less percentage of males 5% and females (7.7%) did not eat fast food.

**Table 3:** Frequently Respondents Consumed Various Food Groups in the Week before the Survey.

Food Groups	Daily %		Never %		<3 times Frequency (%)		$\geq 3$ times Frequency (%)	
	Male	Female	Male	Female	Male	Female	Male	Female
Meat	27.4	39.7	13.4	4.8	16.6	13.9	42.6	41.7
Fish/sea food	10.3	3.6	9.3	10.7	62.5	72.4	17.9	13.2
Vegetables	46.7	55.1	2.4	1.4	25.2	18.0	25.6	25.5
Fruits	51.9	59.0	3.2	2.0	20.7	17.1	24.3	22.0
Legumes	13.4	10.9	4.9	4.7	43.1	50.4	38.6	34.0
Fried food	32.4	28.1	5.3	5.2	34.7	38.2	27.5	28.6
Fast foods	17.9	8.9	5.0	7.7	49.9	64.2	27.2	19.2

Table 4 shows the total percent energy in male and female students' intake, it is noted that the percentage of energy from carbohydrates was higher than other nutrients, whether for males 47.2% or females 49.3%, and it is close to half the total energy. The second source

of energy was from fat which was 33.5% of males and 34.1% of females, On the other hand, the protein was the third source of energy where there were 18.1% and 16.6% for males and females respectively.

**Table 4:** Total Percent Energy in Student Intake.

Source	Male (n=137) mean (SD)	NDNS	Female (n=119) mean (SD)	NDNS	DRV
Protein	18.1 (4.97)	17.0	16.6 (3.87)	16.7	15.0
Fat	33.5 (5.94)	32.6	34.1 (5.46)	33.8	35.0
Saturated fat	10.8 (3.06)	11.6	11.9 (3.48)	12.2	11.0
Carbohydrate	47.2(6.93)	45.1	49.3 (6.72)	46.2	50.0
Total sugars	17.4 (5.88)	N/A	17.9 (4.96)	N/A	18.0

NDND: National diet and nutrition survey  
DRV: Daily reference value.

Table 5 shows the average vitamins intake in male and female students, when comparing these amounts of vitamins with the RNI, it is noted that the amount of vitamin A was less than the RNI, while the amount

of other vitamins consumed was higher than the RNI. On the other hand, males took a higher amount of vitamins than females.

**Table 5:** Average Vitamins Intake in Male and Female Student.

Nutrient	Male		Female	
	Intake	RNI	Intake	RNI
Vitamin A $\mu\text{g/d}$	694.1	700	573.4	600
Vitamin C $\text{mg/d}$	77.6	40	68.8	40
Vitamin D $\mu\text{g/d}$	14.9	10	13.4	10
Thiamin $\text{mg/d}$	1.2	1.0	0.9	0.8
Riboflavin $\text{mg/d}$	1.7	1.3	1.4	1.1
Niacin $\text{mg/d}$	20.1	17	16.9	13
Folate $\mu\text{g/d}$	357.4	200	271.4	200
Vitamin B12 $\mu\text{g/d}$	2.9	1.5	2.7	1.5

RNI: Reference Nutrient Intake

Table 6 shows the average minerals intake in male and female students, it is noted that the amount of most minerals consumed by males and females is higher than

the RNI, except for zinc and potassium for males, and calcium, iron and potassium for females, which were lower than the RNI.

**Table 6:** Average Minerals Intake in Male and Female Student.

Nutrient	Male (n=137)		Female (n=119)	
	Intake	RNI	Intake	RNI
Calcium mg/d	766.3	700	579.1	700
Sodium mg/d	2617.2	1600	1896.3	1600
Magnesium mg/d	362.4	300	303.8	270
Iron mg/d	12.8	8.7	10.2	14.8
Phosphorus mg/d	1293.2	550	1311.4	550
Copper mg/d	1.5	1.2	1.2	1.2
Zinc mg /d	9.1	9.5	8.7	7
Iodin µg/d	201.2	140	208.3	140
Potassium mg/d	2698.6	3500	2722.3	3500
Selenium µg/d	194.1	75	144.7	60

RNI: Reference Nutrient Intake

#### 4. Discussion

Our study showed that BMI was 22.93 kg/m<sup>2</sup>, ranging from 17.33 to 33.91 kg/m<sup>2</sup> and 67.3% of students had a normal BMI, These results are consistent with what was reached by Alazrak et al. (2022) and Chang et al. (2015). Compared to women, a larger proportion of men were overweight or obese. Although a slightly greater proportion of women than men are underweight, these findings are consistent with those of Yahia et al. (2008) and Tamim et al. (2004). This could be because women consistently attempt to reduce their body weight more than men do. Protein had a higher percentage of total energy than the DRV, but the percentage of total energy from fats, carbohydrates, saturated fats, and total sugars was lower. Regarding carbohydrates, these results are consistent with what was reached by Petrescu et al. (2004). However, it is less than what was reached by Allam et al. (2012). For protein intake, our results are consistent with what was found by Biró et al. (2005). However, Petrescu et al. (2004) indicated that protein intake was less, while some studies showed that protein intake was normal (Allam et al., 2012; Fredriksson, Brekke, & Ellegård, 2016). The percentage of total energy from protein was higher for males than for females, which may be due to a belief in the relationship between protein intake and muscle mass (Bradbury & Nicolaou, 2012).

Our study showed that vitamin intake by both males and females was higher than the RNI except for vitamin A, which was lower than the RNI. A high percentage of vitamin C in both genders may be due to the high consumption of fruits and vegetables, where it is noted from Table 3 that males and females ate large amounts of fruits and vegetables daily. These results are consistent

with what was reached by Martin, Pufal, & Stephenson (2022). Regarding vitamin D intake, although some studies (Fredriksson et al., 2016) have indicated a deficiency of this vitamin, our study showed that vitamin D intake was higher than RNI. High thiamin intake by both genders may be attributed to cereals and product intake (Lupi et al., 2015). As noted in Table 4, about half of the energy for both genders comes from carbohydrates.

Average mineral intake by both males and females was higher than RNI except for calcium and iron only for females, and zinc and potassium for both males and females were less than RNI. These results are consistent with what was reached by Glore, Walker, & Chandler (1993) and Mammass et al. (2004).

Most vitamins and minerals intake by both males and females in our study was higher than the RNI, which may be due to the high consumption of vegetables and fruits, where it is well known that fruits and vegetables are high in vitamins and minerals (Safi et al., 2023).

#### 5. Conclusion

Investigation of the dietary patterns and nutritional status can give a clear view of qualitative and quantitative deficiencies compared to standard recommendations. The findings of this study revealed that the majority of university students were classified into the normal BMI group, but some cases of underweight, overweight, and obesity have been recorded among university students. Therefore, it is necessary to consider these cases. Improving malnutrition includes different ways, such as modification of dietary habits and proper training and encouraging students to follow proper physical activity. Skipping breakfast can cause some problems

for university students where our results showed that more than a quarter of students skipped breakfast. Therefore, they should focus on eating breakfast and avoiding fast foods to attain proper health. According to the findings of this study, there is a need to encourage the dietary education of university students to select proper food products containing all the healthy food groups like meat, cereals, dairy products, vegetables, and fruits to avoid all types of nutrient deficiencies.

### 5.1. Recommendations

1. Additional studies are required to examine the factors that influence university students' eating habits.
2. Educational interventions based on evidence, along with health promotion programs, are essential for encouraging eat healthy diets.
3. Universities ought to promote activities during orientation weeks that motivate students to opt for healthier diets.

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