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Abstract

Background: Weight disorders, including obesity and overweight, are major global public health concerns, particularly in developing countries where underweight and obesity coexist. These conditions lead to serious health problems like diabetes, heart disease, hypertension, and cancer. University years are critical for forming lifelong health habits, yet data on obesity prevalence and student awareness remain limited.

Aim: To assess the prevalence of overweight and obesity among university students and evaluate their awareness of these conditions and related health risks.

Methods: A cross-sectional study was conducted among 756 students selected from eight colleges at Sulaimani University, using a stratified random sampling method. Data were collected through direct interviews, anthropometric measurements (weight, height, waist, and hip), and a structured questionnaire assessing socio-demographic factors, dietary habits, and knowledge about obesity. Statistical analyses were performed using SPSS version 25, with significance set at $p < 0.05$.

Results: The prevalence of overweight and obesity was 27.5% and 8.6%, respectively. BMI was significantly associated with age, gender, marital status, college, father's education, and family history of obesity ($p < 0.05$). Poor dietary habits, such as large fast-food portions and low fruit consumption, were also linked to higher BMI. Over half of the students (54.8%) demonstrated good knowledge about obesity, which was significantly associated with healthier BMI categories ($p = 0.003$).

Conclusions: Over one-third of students were overweight or obese, with BMI significantly linked to demographic and familial factors. Despite adequate knowledge among many students, overweight and obesity remained prevalent, indicating that awareness alone is insufficient. Comprehensive interventions addressing lifestyle and environmental factors are required.

Keywords: Overweight, Obesity, University Students, BMI, Sulaimani City

1. Introduction

Overweight and obesity have emerged as major global public health challenges, with prevalence rates accelerating alarmingly across both industrialized and developing nation, according to the World Health Organization (WHO) [1]. In 2022, 2.5 billion adults (18 and up) were overweight. Of these, 890 million were obese. This alarming trend is not limited to older populations; it is increasingly observed among youth—particularly university students—whose transitional life stage often involves lifestyle shifts that foster unhealthy behaviors [2]. Weight-related disorders, such as overweight and obesity, are now recognized as significant contributors to the global disease burden. These conditions are linked to numerous serious health outcomes,

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including type 2 diabetes, coronary heart disease, hypertension, gallbladder disease, psychological disorders, and various cancers [3]. The rapid and widespread increase in these disorders has reached pandemic levels, with younger populations being affected at an unprecedented rate [4].

The transition from adolescence to adulthood is a critical period for the development of health-related behaviors, and poor decisions during this stage can predispose individuals to long-term health risks [5]. Studies show that a large proportion of obesity originates in late adolescence and continues into adulthood, elevating the risk of chronic disease later in life [6]. University life presents a crucial period for establishing lifelong health habits; however, this period is frequently characterized by poor dietary practices, insufficient physical activity, and increased psychological stress [7]. These factors significantly contribute to weight gain, placing students at heightened risk for becoming overweight or obese. Limited time for physical activity, high academic demands, rising fast food consumption, and irregular sleep patterns are commonly cited causes of weight problems in university populations [8]. While research in nearby Middle Eastern countries indicates that many students are generally aware of the health risks associated with obesity, there remains a considerable gap in their personal risk perception and understanding of effective prevention strategies [9].

Data from Iraq show that the prevalence of overweight and obesity stands at 27.6% and 18.7% respectively [10], while in Kurdistan, a study conducted in Erbil reported overweight and obesity rates of 33.4% and 40.9% among adults. However, to date, no research has specifically explored these issues among university students in Kurdistan, particularly in Sulaimani [11]. This study fills the gap in the existing literature on the prevalence of overweight and among for Sulaimani University students, obesity risk factors, behaviors relevant to obesity, and knowledge and attitudes.

2. Materials and methods

This cross-sectional study was conducted among undergraduate students at Sulaimani University, Old Campus, in the Kurdistan Region of Iraq. A multistage random sampling technique was used, with colleges stratified by discipline, departments picked at random, and students drawn at random from enrollment lists. This resulted in proportionate representation of genders and academic levels.

The sample size ($n = 705$) was determined using this sample size formula ($n = (N \times Z^2 \times P \times (1 - P)) \div (d^2 \times (N - 1) + Z^2 \times P \times (1 - P))$ based on predicted prevalence, a 5% margin of error, and a 10% non-response adjustment. Ultimately, 756 legitimate responses were gathered, with samples in the College of Medicine (207), Pharmacy (84), Veterinary (49), Nursing (53), Dentistry (70), Islamic Sciences (72), Education (100), and Commerce (121). All participants provided oral informed consent after being fully briefed on the study's purpose, procedures, potential risks, and benefits. Data collection was carried out between January 26 and June 15, 2025, through direct interviews and standardized anthropometric measurements.

Height was measured without shoes to the nearest 0.1 cm using a stadiometer, and weight was measured to the nearest 0.01 kg in light clothing using a calibrated digital scale (TCS-200 MLA). Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2) and classified according to WHO standards: underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (≥30) [12]. Waist circumference was measured midway between the lower ribs and the iliac crest, and hip circumference at the widest point of the buttocks, using a non-stretchable tape. Waist-to-hip ratio (WHR) was calculated as waist circumference divided by hip circumference; a WHR <0.90 in men and <0.85 in women was considered healthy, while higher values indicated central obesity and elevated metabolic risk [13].

Students with chronic illnesses affecting body weight (e.g., thyroid disorders), pregnancy, eating disorders, or long-term corticosteroid use were excluded. The study received ethical approval from the Research Council of the Scientific Committee of the College of Medicine and the Ethical Committee of the Medical Colleges of Sulaimani University. Additional permissions were obtained from the administrations of all participating colleges.

To meet the study objectives, a semi-structured questionnaire was developed to collect data on sociodemographic characteristics, risk factors, and knowledge and awareness of overweight and obesity. Knowledge about overweight and obesity was assessed using a 17-item questionnaire covering definitions, risk factors, and consequences. Correct answers were scored as 1 and incorrect or uncertain responses as 0. Higher scores indicated greater knowledge. The knowledge assessment questionnaire was developed based on previously validated studies and reviewed by subject matter experts, including three academic staff members (in nutrition, pharmacology, and community health) from the University of Sulaimani. A pilot test was conducted among 60 students to evaluate the reliability of the instrument, which demonstrated good internal consistency (Cronbach's

Table 1. The distribution of BMI and WHR classification among students' genders.

	BMI categories					WHR categories		
	Underweight	Normal Weight	Overweight	Obese		Unhealthy	Healthy	
Variables	No. (%)	No. (%)	No. (%)	No. (%)	P-value	No. (%)	No. (%)	P-value
Gender								
Male	24 (7.7)	151 (48.7)	101(32.6)	34(11)	0.004	44 (14.2)	266 (85.8)	0.0001
Female	47 (10.5)	261 (58.5)	107(24.0)	31 (7)		26 (5.8)	420 (94.2)	
Total number	71(9.4)	412(54.5)	208(27.6)	65(8.6)		70(8.7)	686(92.3)	

$\alpha = 0.774$). Knowledge scores were classified using the mean score as the criterion for categorization: respondents scoring above the mean were considered to have good knowledge, while those scoring below the mean were categorized as having poor knowledge. Missing data (approximately 3%) were excluded from the calculation of the knowledge score. All data were entered and analyzed using SPSS version 25 to produce descriptive measures and for association between variables. Chi-square test was used, considering a P-value less than 0.05 as the significant limit.

3. Results

The study included 756 university students from various disciplines. Based on Body Mass Index (BMI) classification, the majority of participants were within the normal weight range at 412(54.5%), followed by 208(27.5%) who were categorized as overweight, and 65(8.6%) as obese, while a group of 71(9.4%) participants were found to be underweight. Regarding gender, there was a significant difference (P-value 0.004) among different BMI categories, where male students were more likely to be overweight 101(32.6%) or obese 34(11.0%) in comparison with females, who were more commonly underweight 47(10.5%) or normal weight 261(58.5%). Furthermore, using the Waist-Hip Ratio (WHR) measure showed similar results, revealing that an overwhelming 686(92.3%) of participants fell into the healthy category, while only 70(8.7%) students were identified as unhealthy. Similarly, the waist-to-hip ratio (WHR) showed a highly significant difference between genders ($p = 0.0001$). Most female students 420 (94.2%) had a healthy WHR, with only 26(5.8%) falling into the unhealthy category. Otherwise, the majority of male students 266(85.8%) were classified as having a healthy WHR, compared with only 44(14.2%) who had an unhealthy WHR. (Table 1)

The distribution of students' sociodemographic characteristics among overweight and obesity categories revealed that; among students age the majority of overweight 127(28.6%) and obese 39(8.8%) students aged 20–22 years, and a notable increase in obesity among those older than 22 years 15(12.2%) also a highly statistically significant difference (P-value 0.001) between BMI categories and students age groups.

Also, the students' marital status showed a significant difference (P-value 0.008). Married or separated students were more represented among the overweight 18(47.4%) and obese 5(13.2%) groups.

About parents' education, the father's level of education had a significant difference with students' BMI (P-value 0.003), overweight 29(43.9%) and obese 11(16.7%) students were more likely to have fathers who were illiterate. Other variables, such as mother's level of education (P-value 0.261) did not show statistically significant differences with BMI categories. (Table 2)

The distribution of students from different colleges among overweight and obesity categories revealed that; students from the College of Islamic Sciences constituted the highest proportion of those who were overweight 25(34.7%) and obese 14(19.4%), while had the lowest proportion in the overweight from college of nursing was 7(13.2%), obese group from the College of Education was 5(5.0%) with a significant difference (P-value 0.009) between BMI and students' College. Also, a highly significant difference (P-value 0.0001) was found between those student's had a family history of overweight/obesity with the students' current statuses among the overweight 109(40.9%) and obese 44(16.5%) BMI groups compared with those who did not. (Table 3).

Analysis of students' dietary behaviours to BMI categories revealed that students who consumed larger portions were more likely to be overweight 25(32.9%) or obese 14(18.4%) compared to students who consumed smaller portions, with a highly significant difference between fast food portion size and BMI categories (P-value 0.0001). In contrast, there was a non-significant (P-value 0.757) difference between fast food eating frequency and BMI categories.

For daily the fruit consumption, students who consumed fruits 3-5 times per week had a higher

Table 2. The distribution of students' demographic characteristics with their BMI categories.

	BMI categories			
	Total number	Overweight	Obese	
Variables	No. (%)	No. (%)	No. (%)	P-value
Age groups				
17–19	189 (25)	38 (20.1)	11 (5.8)	0.001
20–22	444(58.7)	127 (28.6)	39 (8.8)	
>22	123(16.3)	43 (35)	15 (12.2)	
Marital status				
Single	716(94.7)	190 (30.9)	60 (9.8)	0.008
Married or separated	40(5.3)	18 (47.4)	5 (13.2)	
Mother's level of education				
Illiterate	154(20.4)	40 (31.7)	18 (14.3)	0.261
Primary and Secondary School	388(51.5)	99 (27.8)	31 (8.7)	
University and Postgraduate	212(28.1)	69 (38.8)	16 (9)	
Father's level of education				0.003
Illiterate	74(9.9)	29 (43.9)	11 (16.7)	
Primary and Secondary School	387(51.5)	87 (23.3)	30 (8)	
University and Postgraduate	290(38.6)	92 (36.5)	22 (8.7)	

Table 3. BMI association with different colleges and family history of overweight and obesity.

	BMI categories			
	Total number	Overweight	Obese	
Variables	No. (%)	No. (%)	No. (%)	P-value
Colleges				
Pharmacy	84(11.1)	25 (29.8)	5 (6)	
Medicine	207(27.4)	63 (30.4)	12 (5.8)	
Veterinary	49(6.5)	14 (28.6)	7 (14.3)	0.009
Nursing	53(7)	7 (13.2)	6 (11.3)	
Dentistry	70(9.3)	16 (22.9)	4 (5.7)	
Islamic sciences	72(9.5)	25 (34.7)	14 (19.4)	
Education	100(13.2)	23 (23)	5 (5)	
Commerce	121(16)	35 (28.9)	12 (9.9)	
Family history				
Yes	319(42.25)	109 (40.9)	44 (16.5)	0.0001
No	366(48.48)	82 (24.0)	16 (4.7)	
Not sure	70(9.27)	16 (23.9)	5 (7.5)	

proportion of overweight 61(34.1%) and those who consumed fruits only 1–2 times per week were more often obese 30(13.9%) was a highly significant difference (P-value 0.0015) between fruit consumption variable with a student's BMI variable but there was a non-significant difference (P-value 0.216) between portion size of fruit consumption and BMI categories. For those students who consuming fresh fruits, there higher proportion of obese 56(8.9%) and those who consumed juices had more proportion of overweight 53(30.6%) was a significant (P-value 0.015) between the type of fruit and BMI categories.

Other factors, such as meal frequency (P-value 0.508), did not show a statistically significant difference. Notably, those intake more than 3 meals per day were most frequent among overweight students 31(35.6%). (Table 4)

The assessment of students' knowledge about overweight and obesity showed that more than half of the students 414(54.8%) had good knowledge, while 342 (45.2%) had poor knowledge. The mean knowledge score was 10.75 ± 2.63, with scores ranging from a minimum of 2 to a maximum of 17 (Fig. 1).

The relationship between students' knowledge about the subject and their Body Mass Index (BMI) classification revealed statistically significant differences (P-value 0.003); students with good knowledge were more likely to fall into healthier BMI categories. Specifically, normal weight consisted of 203 (49.0%) students, while a notable 131 (31.6%) were overweight, 43 (10.4%) were obese, and 37 (8.9%) were underweight. In the other hand, among those with poor knowledge, the highest proportion fell within

Table 4. The association of dietary behavior with BMI categories.

Variables	BMI categories		
	Overweight No. (%)	Obese No. (%)	P-value
Frequency of fast-food consumption			
Daily	21 (19.8)	9 (8.5)	0.757
3–5 times per week	56 (30.4)	14 (7.6)	
1–2 times per week	82 (30.5)	23 (8.6)	
1–3 times per month	27 (22.3)	11 (9.1)	
1–2 times/month and never	22 (29.3)	8 (10.7)	
Portion size of fast-food consumption			
Small	79 (24.8)	23 (7.2)	0.0001
Medium	106 (28)	29 (7.7)	
Large	25 (32.9)	14 (18.4)	
Frequency of fruit consumption			
Daily	73 (30.4)	11 (4.6)	0.0015
3–5 times/week	61 (34.1)	12 (6.7)	
1–2 times/week	50 (23.1)	30 (13.9)	
1–2 times/month	23 (29.1)	10 (12.7)	
Portion size of fruits			
Small (1 piece)	64 (29.2)	26 (11.9)	0.216
Medium (2–3 pieces)	123 (28.5)	33 (7.6)	
Large (>3 pieces)	17 (31.5)	1 (1.9)	
Type of fruits			
Fresh	191 (30.2)	56 (8.9)	0.015
Juices	53 (30.6)	10 (5.8)	
Canned and dried	12 (21.4)	3 (5.4)	
Number of meals per day			
One meal	7 (18.4)	4 (10.5)	0.508
Two meals	83 (31.3)	29 (10.9)	
Three meals	78 (25.2)	24 (7.8)	
More than 3 meals	31 (35.6)	7 (8.0)	

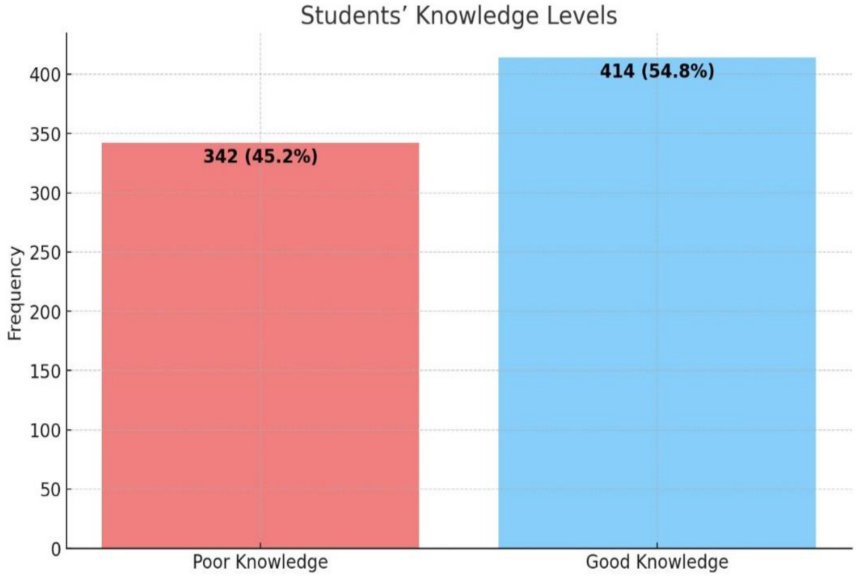

Fig. 1. Distribution of students' knowledge levels.

the normal weight category at 209 (61.1%), followed by 77 (22.5%) who were overweight, 34 (9.9%) who were underweight, and 22 (6.4%) classified as obese. (Fig. 2).

4. Discussion

This study investigated the prevalence and associated factors of overweight and obesity and knowledge among 756 undergraduate students at Sulaimani

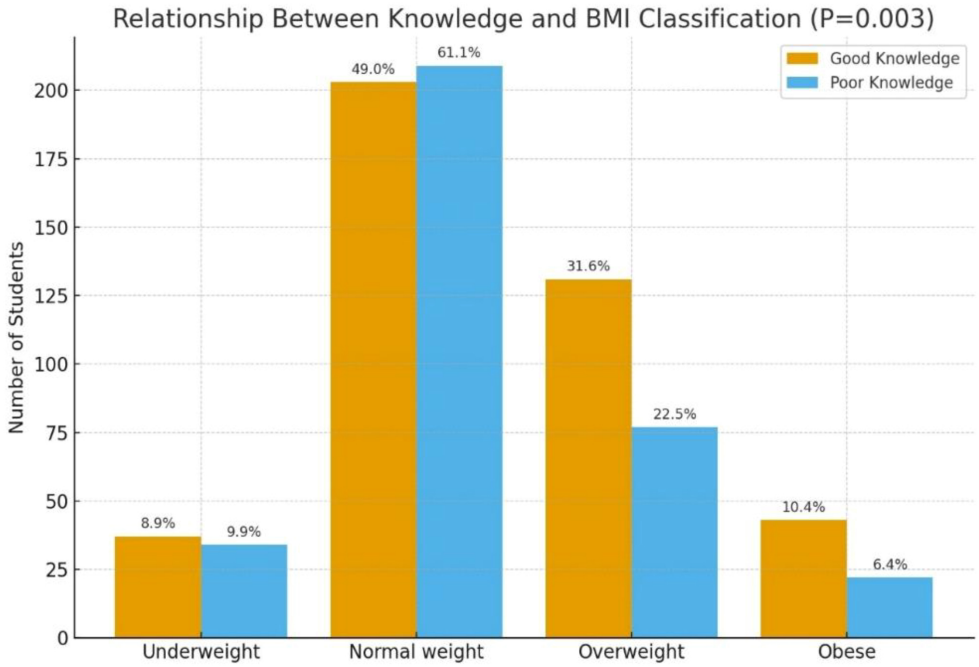

Fig. 2. The distribution of students' knowledge of the BMI categories

University, Kurdistan Region, Iraq. The findings reveal a complex interplay of demographic, socioeconomic, behavioural, and knowledge-related determinants that warrant careful interpretation, particularly given the specific sociodemographic profile of the sample: predominantly young, urban, single, and medically oriented students.

According to the findings of the inquiry, more than half of the participating students were within the normal weight range. This indicates that most of the student population falls within the normal weight range. Following the identification of a lesser but significant fraction of the population as being underweight and obese, a sizable proportion was classified as overweight. It is consistent with findings that have been observed in past scholarly studies that this distribution is occurring. Both Yadav and Huang observed comparable rates of overweight and obesity among students [12, 13]. which further supports the generalizability of the findings of Yadav, large student groups in the current study confirmed a similar prevalence of normal BMI (73.1%), overweight (22.3%), obese (3.1%) and underweight (1.5%) among students [12]

There was a distinct and noticeable gender discrepancy when it comes to the distribution of body weight compared to the other genders. While female students were more likely to be classified as underweight or within the normal weight range, male students displayed a greater tendency to be overweight or obese than their female counterparts, similar finding like Yadav [14]. This was the case despite the fact that female students were more likely to be classified as underweight. A similar finding was reported by Minhas, who found that underweight students were more prevalent among female students (22.8%), overweight (6.1%) and obese (1.6%), but overweight (12.6%) and obese(5.4%) students were more prevalent among male students [14]. This finding is completely in line with the conclusion that they reached. There are gender-specific variances in body composition that are profoundly imprinted and may be altered by physiological, hormonal, and social factors. The occurrence of this continuous pattern is indicative of these gender-specific characteristics.

The results of the Waist-Hip Ratio (WHR) examination of central adiposity indicated that the findings of the Body Mass Index (BMI) were primarily supported by the findings of the WHR. Therefore, it was clear that the vast majority of students were classified as having a metabolic risk that was considered to be healthy. The gender gap, on the other hand, continued to be quite pronounced, with a greater proportion of male students falling into the category of having an unhealthy waist-hip ratio (WHR) than their female counterparts. Several other sources lend credence to this observation. Castillo revealed that men are more often labeled as obese based on this metric and discovered that the WHR score is typically higher in men[15]. Moreover, Lee and Eun revealed the

significance of WHR in predicting cardiometabolic risk and early atherosclerosis, highlighting the importance of WHR as a crucial health indicator. This particular research was conducted by Lee. Based on the research findings, WHR is an indication that can be helpful [16, 17]

In addition to gender, the investigation uncovered a number of sociodemographic factors that are pertinent to the topic at hand. The academic discipline of students attending specific universities was revealed to have a significant connection, like non-medical colleges of Islamic sciences, with students attending specific colleges having higher percentages of being overweight than students attending other schools. These findings are on the contrary by the findings of Gangwar's study, which observed a high frequency of obesity (3.9%) and overweight (30.2%)among medical students [18], and Habib, who revealed significant rates among dental students(29%)were overweight and (28%) were obese [19]. Therefore, it is possible that academic stress and lifestyles that are specific to the course could be contributing factors.

In addition, age was a significant predictor, with those prevalence of overweight and obesity increasing noticeably in the older than 23 years old. This pattern that mirrors established BMI-for-age trajectories throughout the lifespan Rolland-Cachera and Yuliani-Trinovita, was observed in the larger student age groups [20, 21].

Students who were married or separated had a significantly higher percentage of students who were overweight or obese. This was another substantial link found between marital status and obesity. In the study of Lipowicz, found that marital status was a significant predictor of a higher body mass index (BMI) [22]. This finding is substantially supported by their findings. The influence of family background was also easily discernible; a lower level of paternal education and a positive family history of overweight or obesity were both substantially related to a higher body mass index (BMI) in students. This conclusion is in line with the findings of Lazzeri and Kanciruk [23, 24]. But in contrast with the findings of the Liu study, which discovered that there was no significant link between a paternal family history of hypertension and child overweight. This is a striking contradiction that develops in relation to the influence of parents [25].

The results indicated that students' family history and overweight/obesity were significantly correlated, with those who reported a positive family history having larger percentages of excess weight. This is consistent with other research showing that shared family lifestyle variables and genetic predisposition significantly increase the likelihood of obesity (28, 29). Furthermore, there were higher prevalence rates among those who were unsure of their family history, which may indicate underreporting or a lack of knowledge of genetic risk. These findings highlight how crucial it is to take family history into account when developing preventative measures to reduce obesity among college students.

A statistically significant factor in this study was not the mother's level of education, which is an interesting finding. This is in contrast to the findings of Cho, who discovered that a low level of maternal education was a significant factor associated with children's overweight in their societal context [26]. In other words, this conclusion contradicts the findings of Cho. In light of this, it is important to note that the connections between these characteristics may be subject to cultural or environmental shifts.

As a result of an investigation of food habits, complex relationships with body mass index (BMI) were discovered. Perhaps the most important finding that was made was the correlation between larger portion sizes at fast food and an increased likelihood of being overweight or obese. This was the most significant finding that was made. This is in excellent agreement with the research that has been done in the past; Rippin found that larger portions are related to higher calorie intake [27]. Also, Rolls demonstrated that the size of the portion is a direct driver of increased energy consumption [28].

However, the frequency of fast-food consumption did not necessarily indicate a substantial association with body mass index (BMI). This finding aligns with Alfawaz's study, which similarly found that there was no direct connection between the frequency of fast-food consumption and BMI, affirming this distinction [29]. Additionally, they found that there was no correlation between the two. Portion size and total caloric intake might have played a greater role than frequency alone, as some students who consumed fast food less often may still have chosen larger, high-calorie meals. Additionally, it was essential to take into account the type of fruit that was consumed as well as the pattern of consumption. Increased rates of obesity were shown to be associated with a reduced frequency of fruit eating, as indicated by the association. Furthermore, the type of fruit that was consumed (whole fruit as opposed to juice) led to a variety of results, which is a complexity that is portrayed in the medical literature. In their study, Vera Ponce found a correlation between drinking juice and having a higher body mass index and waist circumference [30]. This suggests that form and context are significant aspects to take into evaluation. On the other hand, Pereira and Fulgoni found that fresh fruit consumption was related to a lower risk of obesity [31].

The data of the current study did not show that there was a statistically significant overall association between the frequency of meals and the body mass index categories. There is a conflict between this conclusion and the findings of the research carried out by Larsen and Heitmann, who found that there is an inverse association between eating frequently and body mass index [32]. On the other hand, a specific pattern emerged in which overweight students were the ones who were most likely to consume more than three meals on a daily basis. This pattern is supported by Howarth, who found that overweight students were more likely to consume them [33].

The evaluation of the students' knowledge revealed that more than half of the group had a comprehensive understanding of the concepts of overweight and obesity. This was determined by the findings of the evaluation. A significant finding that implies awareness may have a preventive function is that this information is highly correlated with healthier BMI categories. This is an important discovery. Among Nigerian students, Udi found a positive correlation between nutritional knowledge and body mass index (BMI) [34]. On the other hand, it is of the utmost importance to keep in mind that knowledge is not necessarily related to desirable outcomes. This is because a large proportion of students who held a high level of knowledge were overweight or obese despite their intellectual capacity. Rahim's study has reiterated the idea that information alone is insufficient without concomitant behavioural change [35]. They believe that this is the case. They claimed that physical activity may be a more significant modulator of weight status than knowledge alone [35]. This shows that knowledge alone is insufficient. Additionally, the demographic distribution within BMI categories among those who have insufficient information is a demonstration that further demonstrates this assumption. Considering that the majority of these people were still of a normal weight, it is clear that education is not the only element that determines a person's weight status.

The specific sample population bounded generalizability, while self-reported data and the cross-sectional design introduced biases and limited causal conclusions. Nonetheless, the research captures core obesity determinants for university students who demonstrated knowledge of obesity but had high rates of overweight and obesity, particularly among males, older students, those with a family history, and those with less-educated fathers. Culturally customised, multi-layered interventions and longitudinal studies are needed to address more comprehensive behavioural and environmental factors.

5. Conclusion

This study found that more than one-third were overweight or obese. BMI was significantly associated with age, gender, marital status, college, father's education, and family history of obesity. While over half of Sulaimani University students had good knowledge about overweight and obesity, knowledge was linked to a healthier BMI overall, many knowledgeable students were still overweight or obese, highlighting that awareness alone is insufficient. These results underscore the need for targeted, multidimensional interventions at universities that address not only knowledge but also broader lifestyle and environmental factors. Universities should integrate regular health education programs, accessible physical activity facilities, and healthy food options on campus, while policymakers should support institutional policies that promote active lifestyles, regulate food environments, and encourage early screening and counseling to prevent obesity among students.

Acknowledgment

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Ethical approval

The present study, which was conducted by the authors, was approved by the local Department of College of Medicine Ethics Committee, in the meeting (No.25) on the date (23 October 2024).

Conflict of interests

The authors declare that the study has no conflict of interest.

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