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Level of nutritional knowledge and its relationship with fat consumption among students of Maragheh university of medical sciences

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ABSTRACT

Introduction: Healthy nutrition is fundamental to preventing and managing obesity, as dietary patterns directly influence energy balance, metabolic health, and adipose tissue accumulation. In particular, excessive consumption of unhealthy fats is a major contributor to the development of obesity. Making healthy dietary choices is largely dependent on an individual's understanding of nutrition. The present study aimed to assess the level of nutritional knowledge and its relationship with fat consumption among students at Maragheh university of medical sciences.

Methods: The current cross-sectional study was conducted on 108 university students aged 18-26 years, in Maragheh University of Medical Sciences. Demographic characteristics, anthropometric indices, physical activity level, and nutritional knowledge were collected via face-to-face interview.

Results: Based on body mass index (BMI), the majority of the students were normal (55.1%) or overweight (34.6%). The mean nutritional knowledge of the population was 59.46 ± 10.66. Accordingly, the majority of the students had moderate to high nutritional knowledge. Additionally, significant differences in protein and cholesterol intake between male and female students were observed. Assessing the association between dietary intake and nutritional knowledge adjusted for age, gender and BMI, exhibited significant associations for BMI and energy, fat, protein, carbohydrate, and saturated fatty acid intake.

Conclusion: Given the findings that students exhibited good nutritional knowledge and acceptable fat intake yet still faced a moderate prevalence of overweight, future studies should focus on bridging the gap between knowledge and practice through targeted interventions.

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Introduction

Chronic disorders, particularly obesity, have become a major global health concern due to their significant impact on both individuals and healthcare systems. Obesity is not just a cosmetic issue; it is a complex disease linked to numerous serious health conditions, including type 2 diabetes, cardiovascular diseases, hypertension, and certain cancers. According to the World Health Organization (WHO), in 2022, 43% of adults aged 18 years and over were overweight, while 16% were living with obesity (1).

Overweight and obesity result from an imbalance between energy intake (diet) and energy expenditure (physical activity). In most cases obesity is a multifactorial disease attributable to obesogenic environments, unhealthy eating habits, psychosocial factors and genetic variants.

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This complexity makes its prevention and management a significant challenge (2, 3). Healthy nutrition is fundamental to preventing and managing obesity, as dietary patterns directly influence energy balance, metabolic health, and adipose tissue accumulation. Evidence indicates that diets emphasizing whole foods—such as fruits, vegetables, lean proteins, and fiber-rich whole grains—promote satiety and reduce excessive calorie intake, thereby mitigating obesity risk (4). In contrast, the overconsumption of ultra-processed foods, refined sugars, and unhealthy fats (e.g., trans fats and excess saturated fats) is strongly associated with weight gain, metabolic syndrome, and chronic inflammation (5).

Excessive consumption of unhealthy fat is a major contributor to obesity, a condition which in turn significantly increases the risk of cardiovascular diseases (6). Diets high in saturated and trans fats—commonly found in processed foods, fried items, and fatty meats—promote visceral fat accumulation, dyslipidemia, and systemic inflammation. These factors are all key drivers of both obesity and metabolic dysfunction (7). Conversely, replacing unhealthy fats with unsaturated fats (e.g., omega-3 fatty acids from fish, nuts, and olive oil) has been shown to improve lipid profiles, reduce arterial plaque formation, and lower cardiovascular mortality (Estruch et al., 2018). Thus, moderating fat intake and prioritizing healthier fat sources are critical strategies in breaking the cycle between obesity and cardiac disorders. This underscores the essential role of dietary interventions in public health initiatives (8). Thus, a balanced diet focusing on unsaturated fats is the cornerstone of long-term health and is a powerful tool for preventing and managing obesity and chronic diseases. Emerging evidence suggests that the type of dietary fat consumed is more critical health than the total amount. Unsaturated fats (e.g., from olive oil, nuts, and fish) reduce inflammation, improve cholesterol levels, and lowering the risk of chronic diseases like heart disease and type 2 diabetes. Conversely, industrial trans fats are unequivocally harmful, sharply increasing the risk of heart disease. Saturated fats, commonly found in red meat and full-fat dairy products should be limited, as high intake can raise low density lipoprotein (LDL) cholesterol and increase cardiovascular risk (9). Dietary behavior is strongly influenced by to understanding of nutrition which is essential for making healthy food choices. A study by Yahia et al. demonstrated that college students with greater nutritional knowledge consumed less unhealthy fats and cholesterol (7).

By taking all above-mentioned statements into consideration, assessing the relationship between level of nutritional knowledge and the frequency and type of fat consumed is crucial. Hence, the present study aimed to assess the level of nutritional knowledge and its relationship with fat consumption among students at Maragheh university of medical sciences.

Materials and Methods

1. Participants and study design

This cross-sectional study was conducted on 108 university students aged 18 to 26 years at Maragheh University of Medical Sciences, Iran, 2024. The study protocol was approved by the Regional Ethics Committee of Maragheh University of Medical Sciences (IR.MARAGHEHPHC.REC.1403.036). The sample size was determined using data from a similar study (7) with a power of 80% and a significance level (α) of 0.05. Eligible students from all major disciplines (Healthcare Management, Nursing, Laboratory Sciences, Operating Room, Public Health, Medicine, and Food Science) at the Maragheh University of Medical Sciences, were invited to participate in this cross-sectional study. The inclusion criteria were being an undergraduate student (Associate and Bachelor's degree) male and female students, aged 18 to 26 years. Exclusion criteria were students studying nutrition sciences and those not willing to participate in the study. After a detailed explanation of the study protocol, a written informed consent form was completed by all eligible participants.

2. Assessments

Data on demographic characteristics of subjects including age, gender, academic field, education level, ethnicity, and dormitory residence, anthropometric indices, dietary intake, physical activity level and nutritional knowledge were collected through face-to-face interviews. Inclusion criteria were: students aged 18 to 26 years, both genders, and bachelor's students. The exclusion criterion was being a student majoring in nutritional sciences.

Anthropometric indices and body composition including weight, abdominal circumference, and body mass index (BMI), calculated as weight (kg)/height^2 (m) were assessed by body composition analyzer with slight clothes (ACCUNIQ, BC510). Participants' height was measured with a stadiometer, to the nearest 0.5 cm. A validated international physical activity questionnaire-short form (IPAQ-SF) was used to assess the physical activity level of the patients. Responses were converted to Metabolic Equivalent Task minutes per week

(MET-min/week). Individuals with physical activity level <600 MET-min/week was classified as low, >600 MET-min/week was considered as moderate and >3000 MET-min/week as sever (10).

To assess dietary intake, a food frequency questionnaire (FFQ) (147 items) was administered. The validity and reliability of the questionnaire were evaluated in a previous study (11). In order to facilitate the interpretation of data on dietary habits, all items were divided into six food groups: cereals, milk and dairy products, meats, vegetables, fruits, and oils. Students' nutritional knowledge was assessed using the K Parmenter & J Wardle nutritional acknowledge questionnaire (12). This questionnaire is designed to assess the relationship between participants' nutritional knowledge and dietary behaviors across various domains, including dietary recommendations, food sources, daily food choices, and diet-disease relationships. It encompasses key aspects relevant to nutritional knowledge and practices. The questionnaire uses a Likert-scale format and has been validated as an appropriate tool for assessing nutritional knowledge. Questions were multiple-choice, scored on a 5-point scale (1 to 5), where 1 indicated the lowest level of nutritional knowledge and 5 represented the highest. This questionnaire serves as a practical instrument for evaluating dietary choices and provides a clearer understanding of the relationship between nutritional knowledge and behaviors. The questionnaire consists of 34 questions. Total scores for nutritional knowledge were calculated by summing the correct responses from each participant during the interview. A total score ≥60 was classified as high nutritional knowledge, a score between 31 and 59 was considered moderate, and a score ≤30 was considered low nutritional knowledge (13).

3. Statistical analysis

Statistical Package for Social Sciences (SPSS) (version 25.0, Chicago, IL, USA) was used for statistical analyzing of the data. Normality of data was evaluated using the Kolmogorov-Smirnov test. Continuous variables were expressed as mean (SD) and qualitative data were presented as frequency (percent). Chi-square test was used for comparison of nominal variables. Independent t-test for numerical variables. ANCOVA was used to assess the association between macronutrient intake and level of knowledge, gender and BMI and age as the covariate variable. The Cohen's d was calculated in order to observe crude associations among variables. Additionally, the Tukey Post Hoc Tests was used to assess exactly which groups were different from each other. Also, p-value<0.05 was considered as statistically significant.

Results

The general characteristics of the study population is presented in table 1(Table 1). The average age of the participants was 21.39 ± 1.92 years. According to table 1, 57% and 43% of the students were male and female, respectively. The majority of the students were unmarried (92.5%) and bachelor's students. Since Maragheh is located in the east Azerbaijan and the east north of Iran which mainly consists of Turk residence and next to Kurdistan Province. The majority of the students were Turk (94.4%) and less Kurd (5.6%). Additionally, based on the BMI category, the majority of the students were normal (55.1%) or overweight (34.6%). The mean BMI of the male population was 24.89 ± 4.76 and 23.58 (3.53) for females. Moreover, based on the standard Parmenter and Wardle Nutrition Knowledge Questionnaire, the mean nutritional knowledge of the population was 59.46 ± 10.66. Accordingly, 47.7% of the students had high and 52.3% had moderate nutritional knowledge. Table 2 represents the population's dietary intake according to gender. Findings indicated significant differences in protein and cholesterol intake between male and female students. Male students significantly consumed higher amount of protein and cholesterol, compared to female students(Table2). Furthermore, calculating the effect size of differences based on Cohen's d, also confirmed higher protein and cholesterol intake among male and female students (Table 3).

Table 1. General characteristics of the study population

Variable	Frequency (percent)
Gender	
male	61 (57)
female	46 (43)
Age group	
18-21 years	38 (35.5)
21-24 years	58 (54.2)
24-27 years	8 (7.5)

27-30 years	3 (2.8)
Marriage	
Unmarried	99 (92.5)
Married	8 (7.5)
Education level	
Bachelor's degree	106 (99.1)
Master's degree	1 (0.9)
Ethnicity	
Turk	101 (94.4)
Kurd	6 (5.6)
Dormitory residence	
Yes	96 (89.7)
No	11 (10.3)
BMI category	
Underweight	6 (5.6)
Normal	59 (55.1)
Overweight	37 (34.6)
Obese	5 (4.7)
Physical activity (MET-min/week**)**	
Low	25 (23.4)
Moderate	46 (43)
High	36 (33.6)
Variable	**mean ± SD**
BMI	24.33 (4.31)
Weight	72.7 (16.87)
AC	84.02 (11.79)

BMI; body mass index, MET; metabolic equivalent of task, AC; abdominal circumference, SD; standard deviation

Table 2. Study population's dietary intake according to gender

Variable	Male (n=61) (mean ± SD)	Female (n=46) (mean ± SD)	p-value
Fat (g)	106.93 ± 32.23	101.18 ± 33.71	0.372
Energy (Kcal)	3183.36 ± 731.50	2929.95 ± 827.29	0.097
Protein (g)	116.48 ± 32.85	101.64 ± 30.64	**0.019**
Carbohydrate (g)	458.16 ± 115.23	422.57 ± 129.77	0.137
Cholesterol (mg)	450.28 ± 398.66	274.84 ± 199.97	**0.007**
Saturated fat (g)	28.70 ± 9.19	26.24 ± 9.61	0.182

P*: t-student test, SD; standard deviation

Table 3. Effect size of differences in dietary intake among participants

Variable	Cohen's d	Point Estimate	95% CI
Fat (g)	32.87	-0.175	(-0.56, 0.21)
Energy (Kcal)	774	-0.327	(-0.71, 0.06)
Protein (g)	31.92	**-0.465**	(-0.85, -0.07)
Carbohydrate (g)	121.67	-0.292	(-0.68, 0.09)
Cholesterol (mg)	328.57	**-0.534**	(-0.92, -0.14)
Saturated fat (g)	9.38	-0.262	(-0.64, 0.12)

Assessing the association between dietary intake and level of knowledge, gender and BMI category and age as the covariate variable based on ANCOVA showed significant association between fat, energy, protein, carbohydrate and saturated fatty acid (SFA) intake and nutritional knowledge among different BMI categories (Table 4). These associations are displayed in Figure 1 as well. Additionally, assessing the association between dietary intake and BMI based on ANCOVA indicated a significant relationship between fat, energy, protein, carbohydrate, and SFA intake ($p<0.001$) (Table 5). Also, based on Tukey Post Hoc Tests, it was confirmed that BMI category was a strong predictor for dietary intake for dietary intake, resembling a direct relationship ($p<0.001$). These findings indicated that as BMI category increased, so did the intake of calories, protein, carbohydrates, and fats (Figure 2). As can be seen, fat, energy, protein, carbohydrate intake was lower among underweight and normal BMI students and increased as dietary intake enhanced. Nevertheless, in case of cholesterol, it was observed that cholesterol intake was independent of BMI.

Table 4. Association between dietary intake and Nutritional knowledge

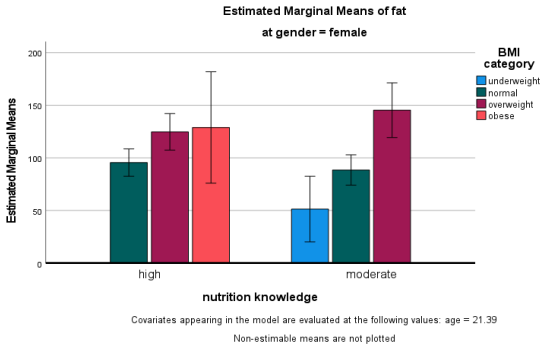
Variable	Age	gender	BMI	Nutritional knowledge
	F, (P)	F, (P)	F, (P)	F, (P)
Fat (g)	0.198 (0.658)	0.002 (0.967)	**21.83 (<0.001)**	0.24 (0.622)
Energy (Kcal)	0.14 (0.709)	0.23 (0.627)	**54.44 (<0.001)**	0.01 (0.905)
Protein (g)	1.32 (0.252)	0.18 (0.671)	**24.99 (<0.001)**	0.01 (0.905)
Carbohydrate (g)	0.10 (0.752)	0.40 (0.525)	**38.31 (<0.001)**	0.39 (0.534)
Cholesterol (mg)	1.78 (0.185)	0.70 (0.405)	0.61 (0.604)	0.01 (0.902)
Saturated fat (g)	0.21 (0.642)	0.30 (0.583)	**8.83 (<0.001)**	0.40 (0.526)

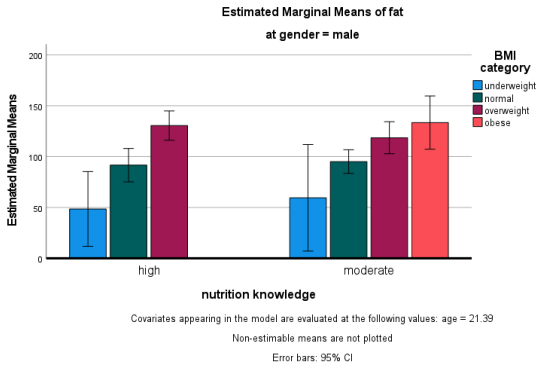
P-value based on ANCOVA, adjusted for gender and BMI and age as covariate
F=F-statistic

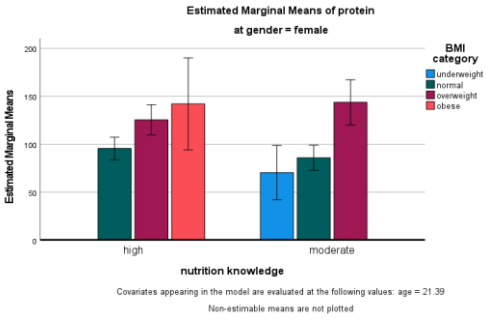
Table 5. Association between dietary intake and BMI among study population

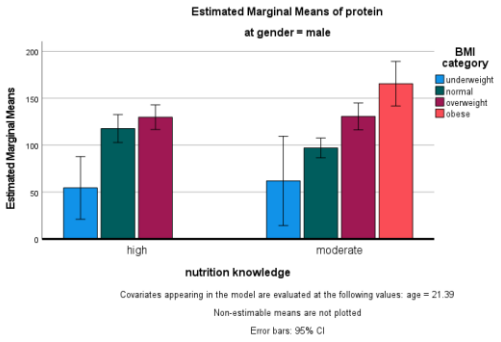
Variable	BMI (mean ± SD)				p-value
	underweight	normal	overweight	obese	
Fat (g)	51.20 ± 11.03	93.16 ± 26.38	127.29 ± 25.54	132.66 ± 22.75	**<0.001**
Energy (Kcal)	1627.17 ± 264.61	2718.62 ± 526.62	3713.56 ± 394.17	4279.94 ± 188.14	**<0.001**
Protein (g)	62.29 ± 8.96	97.65 ± 23.24	130.81 ± 27.1	161.12 ± 26.14	**<0.001**
Carbohydrate (g)	238.77 ± 38.49	389.08 ± 83.21	535.03 ± 78.63	640.24 ± 81.35	**<0.001**
Cholesterol (mg)	236.36 ± 114.76	339.33 ± 286.02	439.22 ± 435.36	484.03 ± 162.73	0.322
Saturated fat (g)	15.33 ± 5.21	25.52 ± 8.47	31.75 ± 8.16	37.15 ± 10.58	**<0.001**

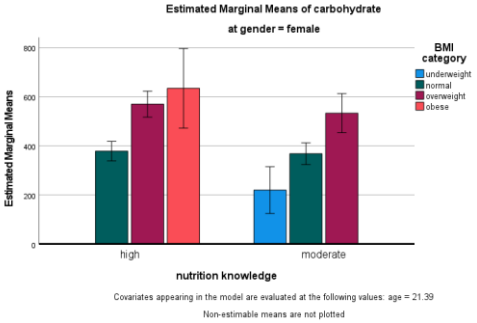
p-value based on ANCOVA

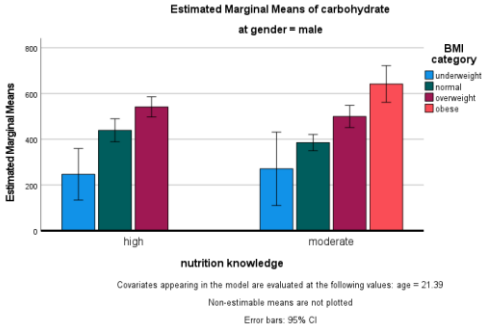












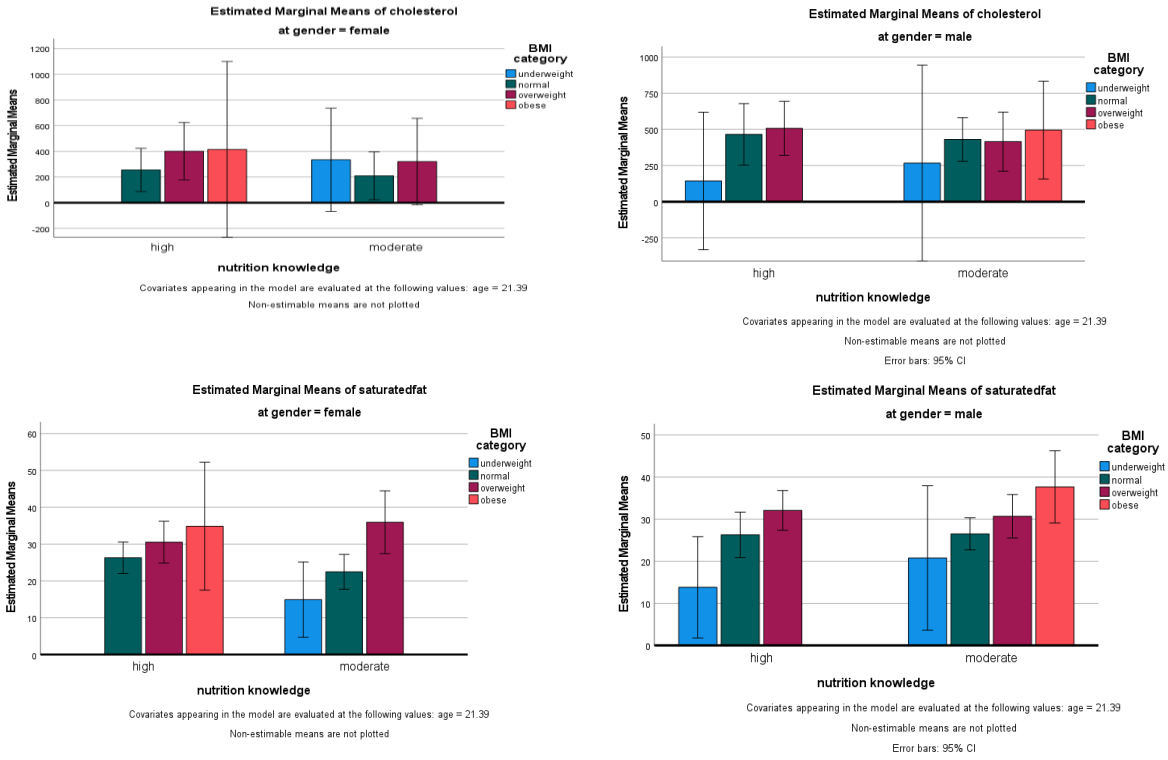


Figure 1. Association between dietary intake and gender, BMI and nutritional knowledge

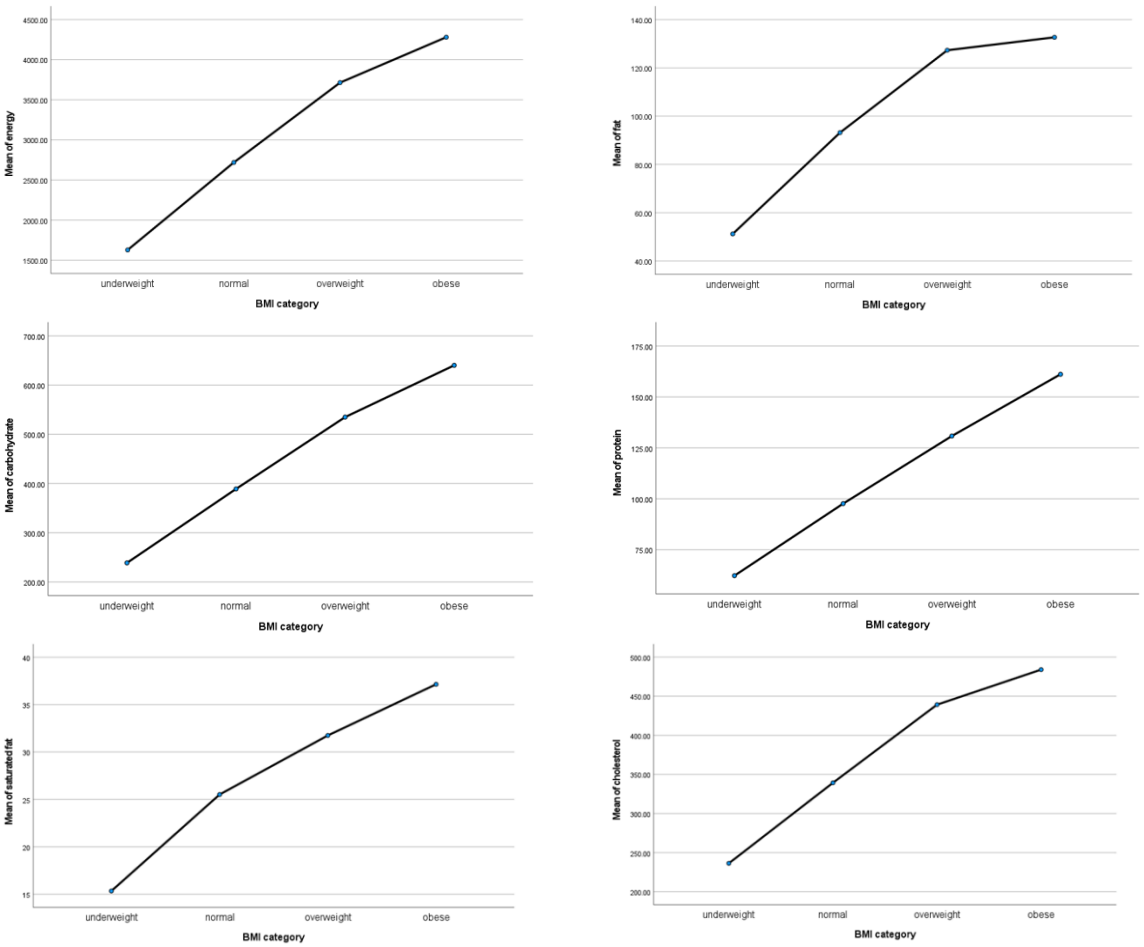


Figure 2. Association between dietary intake and BMI category

Discussion

The objective of the current study was to assess the nutritional knowledge of students studying at Maragheh University of Medical Sciences and its relationship with fat intake. According to findings, student's nutritional knowledge was acceptable. Male students consumed higher amounts of protein and cholesterol compared to female students. Furthermore, significant associations between fat, energy, protein, carbohydrate and saturated fatty acid intake and nutritional knowledge among different BMI categories were observed. Also, fat, energy, protein, carbohydrate intake had a direct association with BMI.

Although more than half of the students had a normal BMI, 34.6% of the students were overweight which is concerning. Overweight individuals (BMI 25–29.9 kg/m^2) exhibit a significantly elevated risk of progressing to obesity (BMI ≥30 kg/m^2) due to sustained positive energy balance, metabolic adaptations, and behavioral factors. Longitudinal studies indicate that without intervention, approximately 30–50% of overweight adults will develop obesity within 5 to 10 years (14). In 2023, a meta-analysis of the prevalence of overweight and obesity among university students in Iran showed that 5.1% of students were obese and 17.7% were overweight (15). Our results were inconsistent with the results of a cross-sectional study in Turkey, which 69.6% of female and 71.6% of male university students had normal BMI (16). Comparing the prevalence of overweight and obesity in the present study and previous studies declares that although the prevalence of obesity was slightly lower, the partially high prevalence of overweight is concerning. This may be due to the high prevalence of moderate level of physical activity of students. In addition, there are no facilities for exercising in the dormitory or campus and since the university campus is far from the dormitory, students are mainly transported by bus and lack regular physical activity.

According to the world health organization (WHO) recommendations, the desirable total fat intake, cholesterol and SFA is 20-35%, 300 mg, <20g for women and <30g for men, respectively (17). As can be seen the amounts consumed are less than WHO recommendations. However, the student's intake was near to the maximum amounts, which explains the 34.6% prevalence of overweight among students. This is mainly because the majority of the students (89.7%) stayed in dormitory and consumed fast food or foods prepared by the dormitory restaurant which do not use healthy fat. Even the students which lived in Maragheh, had their lunch meal in the university. Moreover, fruits and vegetable are not randomly applied in the university cafeteria or dormitory and students prefer having ready to eat foods rather than fresh fruits and vegetables. However, the fat intake of the population of our study was slightly lower than other studies such as a study in Belgian university, with a mean total fat intake of 35.4 ± 7.1% (18). Similar results were also observed among United Kingdom university students (19). A study among Turkish university students showed that the daily mean intake of total fat was higher among females (92 g/day) compared to males (85.9 g/day) (P <0.001). However, SFA and cholesterol consumptions were lower for females (23.5 g/day) than males (28.9 g/day) (16). In our study, male students consumed higher amounts of protein and cholesterol compared to female students. Although students' fat intake fell within acceptable dietary guidelines, the partially high prevalence of overweight observed in this population suggests that total energy intake, rather than fat consumption alone, may be the primary contributor to excess adiposity. Several manifestations are attributed to the findings observed. First, while fat intake may be within recommended limits, excessive consumption of refined carbohydrates and added sugars (often replacing fats in "low-fat" marketed products) could lead to a positive energy balance. Second, sedentary lifestyles and insufficient physical activity likely play a critical role, as weight gain is determined by the interplay of dietary intake and energy expenditure. Additionally, methodological limitations in dietary assessment, such as underreporting of portion sizes or high-calorie snacks in FFQs, may obscure true energy intake. Genetic, metabolic, and socioeconomic factors (e.g., stress, sleep deprivation) may further predispose students to weight gain despite moderate fat consumption (1). These findings highlight the need for holistic approaches for weight management, emphasizing not only on dietary quality but also on total caloric intake, physical activity, and behavioral interventions to address the multifactorial nature of obesity.

Assessment student's nutritional knowledge showed that 47.7% of the students had high and 52.3% had moderate nutritional knowledge. Based on finding, significant associations between fat, energy, protein, carbohydrate and saturated fatty acid intake and nutritional knowledge among different BMI categories were observed. Almasi et al., mentioned a non-significant relationship between nutrition knowledge level and fat intake (16). Yahia et al, claimed that nutrition knowledge

was negatively correlated with fat and cholesterol intake (7). These findings indicate that the majority of students with acceptable nutritional knowledge had normal weight or were overweight. This suggests a potential gap between knowledge and actual eating behaviors, highlighting the need for targeted interventions to promote healthier dietary habits. This apparent paradox suggests that nutritional knowledge and dietary patterns should be purposefully strengthened and promoted in a coordinated manner. Several key explanations emerge from this finding. First, while fat intake may be controlled, excessive total caloric intake—potentially from refined carbohydrates, added sugars, or oversized portions—could lead to positive energy balance (e.g., sugary beverages, processed snacks). Second, low physical activity levels likely play a critical role; even with moderate fat intake, sedentary behavior can result in weight accumulation over time. Furthermore, underreporting of high-calorie foods or misestimating of portion sizes, may obscure true energy intake. Psychological and lifestyle factors, including stress-related eating, irregular meal patterns, and poor sleep, could further disrupt metabolic regulation and promote fat storage. Socioeconomic constraints may also limit access to fresh, whole foods, pushing students toward calorie-rich but nutritionally unbalanced options.

Conclusion

Given the findings that students exhibited good nutritional knowledge and acceptable fat intake yet still faced a high prevalence of overweight, future studies should focus on bridging the gap between knowledge and practice through targeted interventions. To address the disconnect between knowledge and weight status, future research should move beyond traditional nutrition education and instead focus on actionable, environment-based solutions. By improving access to healthy foods, teaching practical low-fat cooking skills, and fostering supportive campus policies, students may be better equipped to translate their nutritional knowledge into sustainable habits. Such interventions could serve as a model for preventing obesity in young adults.

Ethics approval and consent to participate

The ethics committee of Maragheh university of medical sciences approved this research (ethics code: IR.MARAGHEHPHC.REC.1403.036).

Consent for publication

Written informed consent was obtained from all participant at the beginning of the study.

Availability of data and materials

Further required data may be available upon reasonable request.

Competing interests

The authors declare no competing interests.

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Authors' contributions

Writing original draft: F Ghalichi, MT Khodayari, T Ebrahim Hesari and A Farajollahi
Reviewing: F Ghalichi, MT Khodayari
Conceptualization: F Ghalichi
Figure design: MT Khodayari

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