

THE IMPACT OF THE EDUCATIONAL PROCESS ON THE DIET AND EATING BEHAVIOR OF MEDICAL STUDENTS

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The problem of inadequate nutrition among students is especially significant at medical universities, where the academic workload is high. It is particularly important because the years spent in higher education are when long-term eating habits are formed, and the body undergoes its final stages of development. In this work, we aimed to assess how the intensity of the educational process affects daily diet and eating behavior of students, and suggest substantiated preventive measures. The cross-sectional study involved 199 second-year students (114 women and 85 men; mean age 19.5 ± 1.5 years), who completed a questionnaire; the results were then processed using descriptive statistical methods. We assessed the caloric and macronutrient composition of the diet, dietary regime, and behavioral factors. The mean dietary energy intake was 1597.3 ± 27.1 kcal; the diet was calorie-deficient for 122 participants (61.3%) and adequate for 59 (29.6%) ($p < 0.001$). By nutrient, 122 participants (61.3%) did not consume enough protein, 117 (58.8%) lacked sufficient fat, and 100 (50.3%) had insufficient carbohydrate intake. Young men consumed more energy than young women (1701.6 ± 31.8 vs. 1520.4 ± 25.3 kcal; $p < 0.001$). Only 44.4% of the respondents ate three meals a day, while 24.2% ate two or less. Regular consumption of fast food products was admitted by 157 students (78.9%). The resulting data indicate systemic nutritional deficiencies and the need to implement preventive measures in educational settings.

Keywords: health, nutrition, daily ration, educational process, student

Author contribution: the authors have made equal contributions to this publication.

Compliance with ethical standards: the study was consistent with the principles of biomedical ethics. The survey was anonymous, which ensured confidentiality of the information provided. Each participant submitted a signed informed consent form before the survey.

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ВЛИЯНИЕ УЧЕБНОГО ПРОЦЕССА НА СУТОЧНЫЙ РАЦИОН И ПИЩЕВОЕ ПОВЕДЕНИЕ СТУДЕНТОВ МЕДИЦИНСКОГО ВУЗА

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Проблема нерационального питания студенческой молодежи приобретает особую актуальность в условиях высокой учебной нагрузки медицинского вуза, поскольку в студенческие годы формируются устойчивые пищевые привычки, завершается развитие физиологических систем. Целью исследования было изучить влияние интенсивности образовательного процесса на структуру суточного рациона и пищевое поведение студентов с последующим обоснованием профилактических мер. Проведено поперечное исследование с участием 199 студентов 2-го курса (114 девушек и 85 юношей, средний возраст $19,5 \pm 1,5$ лет), предполагавшее анкетный опрос и применение методов описательной статистики. Оценены калорийность и макронутриентный состав рациона, режим питания и поведенческие факторы. Средняя энергетическая ценность рациона составила $1597,3 \pm 27,1$ ккал; дефицит калорийности выявлен у 122 человек (61,3%) против 59 (29,6%) с нормальными показателями ($p < 0,001$). Недостаточное потребление белка отмечено у 122 студентов (61,3%), жиров — у 117 (58,8%), углеводов — у 100 (50,3%). Юноши потребляли больше энергии, чем девушки ($1701,6 \pm 31,8$ против $1520,4 \pm 25,3$ ккал; $p < 0,001$). Лишь 44,4% респондентов придерживались трехразового питания, 24,2% питались два раза в день и реже. Регулярное употребление фастфуда отмечено у 157 обучающихся (78,9%). Полученные данные свидетельствуют о системной нутритивной недостаточности и необходимости организации профилактических мероприятий в образовательной среде.

Ключевые слова: здоровье, питание, суточный рацион, учебный процесс, студент

Вклад авторов: все авторы внесли равный вклад в подготовку публикации.

Соблюдение этических стандартов: исследование соответствовало принципам биомедицинской этики. Анкетирование было анонимным, что обеспечивало конфиденциальность предоставленной информации. Каждый участник дал информированное согласие на участие в исследовании до начала опроса.

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A healthy lifestyle is a key factor in maintaining and improving population health, and proper nutrition is one of its main components. For young people, especially those in higher education, nutrition is particularly important because student years are when physiological systems finish developing and lifelong eating habits form [1, 2].

Numerous studies report pronounced negative trends in eating patterns and behavior among students. An analysis of the actual diet composition confirms that it is inadequate in both quality and energy value [3]. The ration was noted to shift towards excessive fat content and easily digestible carbohydrates, while the amounts of protein, vitamins,

and minerals are insufficient. In addition, this population tends to resort to fast food often [4]. Improper eating patterns caused by heavy academic workloads and limited free time, such as irregular meals, skipping breakfast, and consuming most calories in the evening, remain a serious problem [5].

The cyclical character of the educational process has a significant effect on students' nutritional status. It has been established that their diets deteriorate during the examination period: the share of simple carbohydrates grows, the number of meals a day decreases, there develops a stronger reaction to stress that increases the risk of nutrition-associated disorders [6]. Another important aspect is the educational environment itself. Medical students often exhibit deviant eating behavior, including overeating or excessive dietary restriction, which are associated with severe anxiety and dissatisfaction with their own bodies [7]. International students face additional risks rooted in the need to adapt to new social and climatic conditions [8].

Promising approaches to prevention include expanding hygiene education programs, systematically monitoring students' nutritional status, and improving the organization of university nutrition. The latter, including introduction of the principles of healthy, balanced eating into canteen operations, is a particularly promising approach, because it promotes sustainable healthy eating habits [9, 10]. Furthermore, research indicates that organized and structured nutrition can offset certain deficiencies in an individual's diet, although it demands continuous quality control and diverse menus [11].

This study aimed to assess the influence of educational intensity and the factor of educational environment on the composition of medical students' daily diets and on their eating behavior, and to propose substantiated preventive measures.

METHODS

The study involved 199 second-year VSMU students — 114 women and 85 men — from the general medicine faculty ($n = 138$) and pediatric faculty ($n = 61$). The mean age of the participants was 19.5 ± 1.5 years. The study was conducted between March and April 2025.

The study was cross-sectional and single-stage. To collect the primary data and register the actual nutrition information, we created a survey in Yandex.Forms that asked about demographic characteristics (gender, age, faculty), dietary patterns and meal frequency, meal intervals, and the frequency of consumption of certain foods, including potentially harmful items (fast food, energy drinks). The survey revealed the factors influencing eating behavior (stress, academic workload, financial constraints).

Based on the collected data, we calculated the daily diet, its macronutrient composition (protein, fat, carbohydrate), and its energy content (kcal). The resulting figures were compared with the physiological standards: for caloric content,

the range was 1900–2400 kcal, for protein — 67–84 g, for fat — 63–80 g, for carbohydrates — 266–336 g. Additionally, we evaluated the diet's structure for the inclusion of mandatory components (fruits, vegetables) and the presence of harmful products.

The resulting data were processed in MyOffice 2022 software package (New Cloud Technologies; Russia). We used descriptive statistics: continuous data were presented as mean (M) and standard deviation (σ); qualitative variables were reported as absolute and relative values (percentages).

RESULTS

Analysis of the data ($n = 199$) showed a pronounced imbalance in students' dietary patterns (Table). "Mean energy intake in the daily diet was 1597.3 ± 27.1 kcal, below the recommended dietary minimum for this age group under current mental stress levels. A caloric deficit (consumption of less than 1,900 kcal) was recorded in the majority of respondents — 61.3%. Only 29.6% of participants had the diet aligned with the norm in this respect. The proportion of students not receiving enough calories with their food was significantly higher than the proportion of those with a normal calorie intake ($p < 0.001$).

The analysis of the macronutrient composition confirmed the qualitative deficiency of the diet (Table). It was found that 61.3% of students had inadequate protein intake (mean 54.3 g; normal threshold 60 g), and 58.8% had inadequate fat intake. Carbohydrate intake was lower than normal in half of the respondents (50.3%).

We established that the diets of young men had significantly higher energy values than those of young women (1701.6 ± 31.8 vs. 1520.4 ± 25.3 kcal; $p < 0.001$). A similar trend was observed for protein, fat, and carbohydrates ($p < 0.01$).

The mean ratio of the key nutrients was 13.5% : 33.6% : 55.9% for females, and 13.8% : 34.0% : 57.8% for males. Although all macronutrients showed a deficit (Table), analysis of the participants' dietary patterns indicated a qualitative imbalance and bias toward fat: its content in the boys' diets was 4% above the recommended value, and 3.6% above that value in the girls' diets. This indicates a shift in the balance towards increased fat content with a relative deficiency of protein and carbohydrates in the total amount of food consumed.

The study of medical students' dietary patterns revealed a lack of a clear meal schedule (Fig. 1). Only 44.4% of respondents adhered to the optimal regimen (three meals a day), and a significant portion of the sample (24.2%) ate twice a day or less.

The qualitative features of the students' eating behavior indicate a high prevalence of harmful eating habits. The absolute majority of respondents (78.9%) mentioned regular consumption of fast food products, sugary carbonated and energy drinks. At the same time, the intake of plant fiber and micronutrients was critically low: daily diets of 80.4% of students did not include fresh vegetables and fruits in sufficient quantities.

Table. Mean daily intake of calories and macronutrients ($M \pm m$)

Indicator	Females ($n = 114$)	Males ($n = 85$)	p
Energy value, kcal	1520.4 ± 25.3	1701.6 ± 31.8	< 0.001
Protein, g	51.2 ± 1.4	58.9 ± 1.7	< 0.01
Fat, g	56.8 ± 1.6	64.3 ± 1.9	< 0.01
Carbohydrates, g	212.5 ± 4.8	245.7 ± 5.3	< 0.01

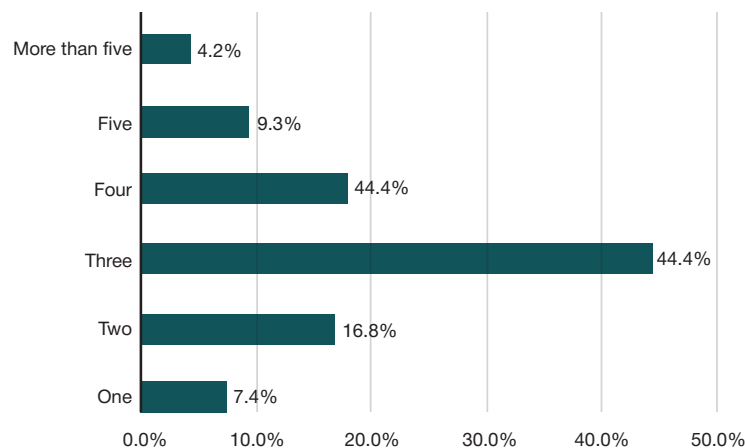


Fig. 1. Frequency of meals, %

The analysis of factors influencing eating patterns in the educational environment identified lack of time and psycho-emotional stress as the main reasons for unhealthy dietary practices (Fig. 2). The former, lack of time, was cited as the main cause of eating disorders in 31.8% of cases, stemming from the density of the academic schedule (daily routine). The latter, stress, was mentioned by more than a quarter of respondents as a factor that alters appetite.

The results generally showed that more than 60% of students chronically consumed fewer calories and less protein than needed, followed irregular eating patterns with infrequent meals, and tended to replace balanced meals with fast food due to stress and time constraints.

DISCUSSION

This study revealed an alarming picture of the nutritional status of second-year medical students: their diets tend to be energy-deficient, irregular in both timing and number of meals per day, and lacking sufficient amounts of essential macronutrients.

The data indicate that the diets of 61.3% fail to deliver the needed amount of calories (mean intake: 1597.3 kcal), which is consistent with findings from a study conducted at Pacific State Medical University, which reported a similar situation for 54.79% of students [12]. However, studies from Samara State Medical University contradict our findings; researchers there reported that students exceeded the recommended dietary energy values by 7–8% [13]. This discrepancy may be explained by differences in the design of the studies or regional specifics of food availability and cost. Regardless, all papers note that the diets of young people in higher education are imbalanced [14].

A critical aspect is the protein deficiency recorded in 61.3% of the respondents. This is consistent with findings from other researchers, who also report that medical students do not consume enough protein (male students, in particular, fall short of the recommended intake by over 20.8%) [13]. Several studies report similar trends that develop over time: from years 1 to 4, students, especially females, tend to consume progressively less protein [15]. Apparently, chronic protein deficiency against a background of high academic workload ultimately impairs the body's adaptive capabilities and promotes morbidity, which is consistent with data showing that by the end of the third year, the number of students assigned to the third health group increases significantly [16].

Analyzing the dietary data, we revealed that less than half of students (44.4%) consume 3–4 meals a day, the optimal number; this is comparable to the results of other studies (38.93%) [12]. At the same time, the figures from our study

appear somewhat more optimistic than data collected at VSMU in previous years, when only 16.5% of boys and 14.2% of girls ate three meals a day [17]. Nevertheless, the continued high prevalence of students who eat one to two meals a day (24.2% of respondents) indicates a persistent problem with disorganized daily routines.

Qualitative deformation of the diet is a matter of special concern: 78.9% of respondents regularly consume fast food, and 80.4% tend to ignore vegetables and fruits. Similar eating behaviors have been described in the literature; some studies report that over 40% of students consume confectionery daily, and 79.25% choose it as a snack [18, 19]. Stress, reported by many respondents as a key factor influencing nutrition, creates a vicious cycle: psycho-emotional stress leads to the choice of comfort food, which, combined with physical inactivity, contributes to metabolic disorders [20].

Thus, the identified violations are systemic in nature and require the development of medical and educational models aimed at promoting healthy lifestyle values within the university environment [21]. Simply informing about the rules of nutrition is not enough. There is a need for structural changes in the university's catering system to address time constraints and ensure access to high-quality food.

CONCLUSIONS

In this study, we performed a comprehensive assessment of the nutritional status and eating behavior of medical students. The study results confirm a systemic crisis in student nutrition, characterized by a chronic deficiency in energy intake and key macronutrients (particularly protein) among most respondents. Our findings indicate that heavy academic workloads and associated psychological stress significantly disrupt dietary patterns and promote the consumption of nutritionally poor fast food.

The specifics of medical education (intense workload, lack of time) were established to directly determine the formation of deviant eating behavior and nutritional deficiencies. The identified imbalance is not episodic, but persistent, which poses risks to the health of future medical doctors.

Further investigation of this subject matter should involve a transition from the identification of violations to the development and implementation of intervention programs. The results of this study can serve as an evidence base for administrative decisions on reorganizing university catering systems (such as introducing subsidized set meals with high protein content or adjusting schedules to ensure adequate breaks). In clinical practice, these data can be used by clinicians in student

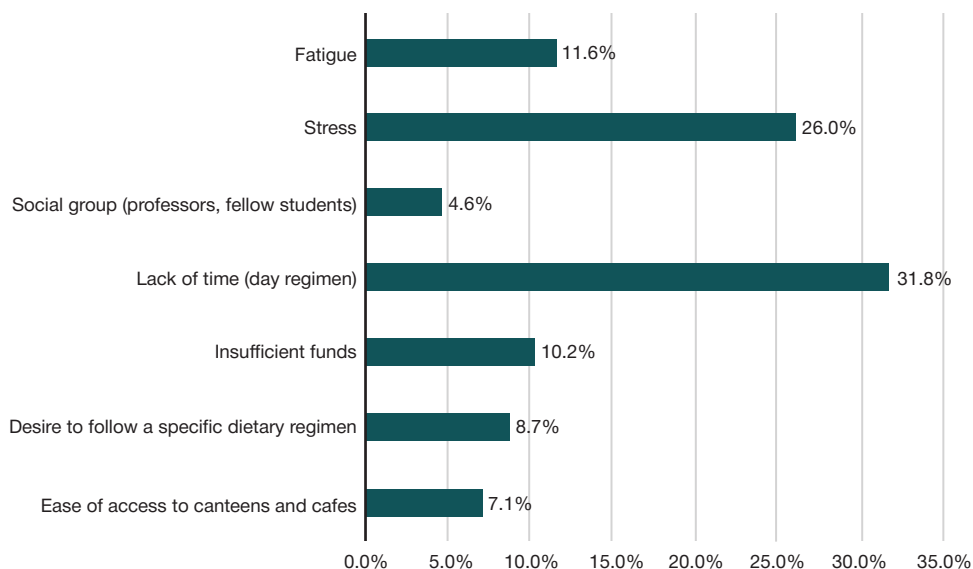


Fig. 2. The influence of various factors on students' eating behavior, %

health clinics to enable early detection of at-risk groups for gastroenterological and metabolic disorders.

A possible hypothesis for future research is that chronic protein deficiency and irregular eating patterns are significant

predictors of declines in cognitive abilities and academic achievement in later years, and that correcting dietary protein intake may improve students' stress tolerance during exam periods.

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