



Assessment of Students Nutritional Consumer Preferences and Behavior

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Abstract

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BACKGROUND: Malnutrition is an important risk factor for the development of many diseases. Medical examinations reveal that 80–85% of students have health disorders. The incidence of sickness among students has increased by 35% over the past 10 years, which is due to the malnutrition of students of higher educational institutions.

AIM: The objective of the study was to study the peculiarities and socio-organizational aspects of students' nutritional consumer preferences.

MATERIALS AND RESEARCH METHODS: The assessment of the characteristics of students' eating behavior was carried out on the base of the questionnaire survey data among students ($n = 333$) at the age of 18–24 years. Data were presented as arithmetic mean and standard deviation ($M \pm SD$). The distribution normality was determined by the Kolmogorov – Smirnov test. The Mann – Whitney test was used to compare the groups ($p < 0.05$).

RESULTS: About 77% of students save money on food. Only about 22% of students receive the desired food, 64% of men have to save money on food, while the share of women was 78%. 67% of the surveyed group regularly and at least 1–2 times a week visit catering establishments. Assessed by type of food service, 24% of students gave their marks to a fast-food establishment, while only 12% of students gave marks to a traditional canteen. Men consume fast food per day 1.6 times more than women. The relationship between material well-being and nutritional quality was analyzed ($r = 0.72$). Evaluation of nutritional status showed that 25% of girls and 17% of boys were underweight, overweight and obesity – in 10 and 18% respectively.

CONCLUSIONS: More than 50% of the participants do not have an idea of a rational and balanced diet; do not have the skills of preliminary planning and organization of meals. Therefore, we propose to improve the organizational and economic mechanisms of the public catering system of universities to solve the problem of nutrition improving in students.

Introduction

Nutrition is an important component of human health. In recent years, there are many problems in respect to nutrition, including shortcomings in the organization and planning of daily meals, consumer preferences in the choice of foods, and it cannot be said that the diet is satisfactory.

The growing popularity among students of fast food products with various flavors, dyes, and modified components causes the greatest concern among nutritionists. In addition, the rise in prices for food products leads to a rise in prices for products from public catering enterprises. In recent years, the decline in the population's ability to pay has exacerbated the already difficult situation with the nutrition of students. The entrepreneurs often use low-quality food in order to save money. Moreover, this process is not controlled

by anyone. Unfortunately, statistics of recent years show a sharp increase of young people suffering from obesity, diseases of the gastrointestinal tract, diseases of the cardiovascular system, and diabetes mellitus [1], [2], [3], [4], [5], [6], [7].

The work of Karabinskaya [8], Karelin *et al.* [9] Kuznetsov *et al.* [10] showed a direct correlation between indicators of eating disorders and the presence of complaints of deviations in the conditions of the gastrointestinal tract ($r = 0.49–0.67$). The reliable relationship was established between the time of study at the university and the morbidity of the gastrointestinal tract, as well as the number of students in need of dietary nutrition.

Gauss *et al.* [11], when assessing food preferences, revealed that persons complaining of various gastrointestinal symptoms, as a rule, have any taste preferences. In most cases, people with symptoms of irritable bowel syndrome

have cravings for starchy foods, fatty, salty, or sugary foods. Addition to spicy food also influenced the presence of abdominal pain ($2l = 7.76$, $p < 0.001$).

Difficult socio-economic conditions of a student's life, constant intensification of the educational process, reorganization of the higher education system, low material income, and frequent rise in food prices negatively affect the health of the future with their culture of rational nutrition [12], [13], [14].

According to the World Health Organization, the level of general morbidity among young people has increased by 35% over the past 10 years due to the low culture of nutrition, lack of awareness of young people in matters of healthy nutrition [15], [16].

Objective

To study the peculiarities and socio-organizational aspects of students' nutritional consumer preferences.

Research Methods

A one-stage cross-sectional study was carried out by questioning 333 students aged 18–24 years. All the respondents were students of the 2–5 courses of Karaganda Medical University. A self-developed questionnaire with a certificate confirming ownership (property registration No. 6823) was used. The questionnaire consisted of 4 blocks: Demographic characteristics, questions for eating behavior and consumer dietary preferences determining questions for analyzing the structure of costs for the purchase of various food products, and the last block of questions concerning the socio-economic status of a student. During the survey, two technologies were used: Paper and electronic using the Internet. 58% of survey participants were women and 42% were men.

Ascientifically grounded document of physiological norms of food consumption was applied to compare the norms of physiological need: The order of the Minister of National Economy of the Republic of Kazakhstan No. 503 dated December 9, 2016 "Calculation of average daily energy and macronutrient intake versus "scientifically based physiological food intake." The deviation of values from the average daily group norm by 15% was allowed.

The corresponding body mass (CBM) was calculated by the formula: $CBM(\text{boys}) = (BH^{4/2}, 54-128) \cdot 0.453$ and $CBM(\text{girls}) = (BH^{3.5/2.54-108}) \cdot 0.453$, where BH is body height (cm).

The index was assessed in accordance with the recommendations of WHO experts. Data were presented as arithmetic mean and standard deviation

($M \pm SD$). The distribution normality was determined by the Kolmogorov – Smirnov test. The Mann – Whitney test was used to compare the groups ($p < 0.05$).

Ethical standards

The research protocol was approved by the Bioethics Committee of the NC JSC "KMU" (dated December 23, 2019, Protocol No. 6, assigned number 25).

Results

In order to assess the socio-economic situation of students, the place of residence (Figure 1) and the amount of income were determined. The financial position of the respondents was assessed mainly in terms of receiving scholarships, 77% of participants answered that they received scholarships, only the remaining 23% answered that they did not receive scholarships (in 2019, the amount of scholarships was 20,949 tenge or 54 dollars). Undergraduate students received only scholarships, and 90% of the 4–5 year students also worked part-time.

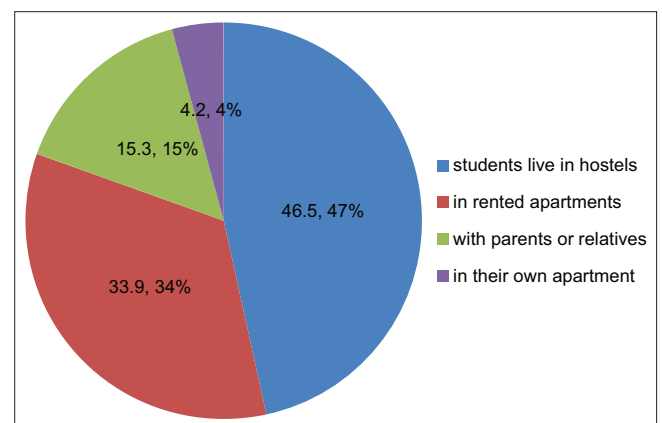


Figure 1: Structure of interviewed students by residence place

One of the leading questions for students was the estimation of catering expenses from their monthly income. It was found that 21.9% students spent 14,000–16,000 tenge per month for catering, and 19.5% students spent for this 16,000–18,000 tenge, 17.1% spent the sum of 18,000–20,000 tenge. The remaining 41.5% of students spend only a third of their monthly income for catering.

In connection with the high importance of the food cost, the survey included question about the impact of prices on the eating behavior of the respondents: "Do you save money on the purchase of food and dishes in public catering establishments?" 22.2% students answered, "I don't save money on food buying. I usually take what I want." 59.4% of students answered "Sometimes I have to save," 18.3% students answered "I always save, I choose the cheap food." Consequently, 77% of students save money on food. When analyzing respondents by sex groups, 64% men saved, and the share of women

who saved money on food was 78%. The share of men who didn't skimp on food and got the nutrition they want was 25% and the share of women – 30%.

Two questions were included in the questionnaire to assess the benefits of types of catering establishments. The first question proposed to select one or two types of public catering establishments that were visited more often than others. The next question proposed the assessment of benefits by enterprise type.

Modern students prefer fast food over traditional meals. Therefore, the positions on the most popular fast food brands were included in the questionnaire taking into account the high loyalty of students to fast food public catering enterprises. About 20% of respondents answered that they regularly visited such catering establishments as "Fast Food" and "KFC" more than 2.6 ± 0.1 per week, 47% – once or twice a week, 22% – rarely, 11% students didn't visit fast food establishments.

It turned out that 48% of survey participants took fast food, 42% – carbonated drinks 2.7 ± 0.1 times a week. At the same time, the share of students who took fast food 1–2 times a month was 34%, and students who took gas drinks – 35%. About 18% of respondents included fast food daily in their menu, 23% daily included gas drinks. The main reason for fast food eating was the time lack to visit the cafeteria or buffet, convenience, unwillingness to bring food from home. Students' assessment of the quality of manufactured food products was extremely controversial. However, 45% of surveyed students believed that fast food had negative impact on health, 54.2% believed that fast food was essential.

There was some difference in the use of fast food products between women and men. Men were more likely to consume fast food and gas drinks than women (Table 1).

Table 1: Analysis of the frequency of consumption of fast food and gas drinks (%)

Indices	Men (%)	Women (%)
Fast food every day	10	6
Gas drinks every day	30	20
Fast food at least 1–2 times a week	69	56
Gas drinks at least 1–2 times a week	42	38
Fast food at least 1–2 times a month	21	38
Gas drinks at least 1–2 times a month	28	42

The open point "Please, substantiate the advantages of public catering enterprises in several sentences" was included in the questionnaire to identify the reasons for enterprise choosing. Hence, the respondents identified several reasons explaining the choice of public catering establishments.

The most important factor when choosing a catering enterprise was that 42% of respondents looked at the food cost and food products, 20% gave importance to the factor of taste, 13% rated the pleasant environment as important. The specific weight of the following factors "fast service" and "service quality" was in 2 times less than in the previous three.

To the proposal to assess the cost of food at the university in comparison with other public catering enterprises in the city (one answer), the students' answers were distributed as follows: Prices were the same everywhere (29%); the prices at the University catering points were higher than the city average (27%); the prices in the public catering points of the University are lower than the average in the city (43%). It is known that students often choose university canteens and canteens to save time.

The survey questions, in addition to high prices for food, a number of problems in the University catering establishments were noted: The share of "lack of free seats and the presence of queues" was 71%, "monotonous assortment" – 25%, "presence of dirty tables or dishes" – 4%.

Thus, 67% surveyed students regularly and at least 1–2 times a week visited public catering establishments. Consequently, men consumed fast food 1.6 times more per day than women. The relationship between material well-being and nutritional quality was analyzed ($r = 0.72$).

Eating behavior includes a certain set of human behavior (diet, food rate, preferences in the consumption of certain types of food, a subjective approach to the nutrition process, etc.). In the course of the study, individual characteristics were assessed among students of various courses in terms of academic performance, diet, frequency of consumption of basic food products, and physiological need for nutrients. So, when evaluating the group by the frequency of meals, most of the students of all courses were included in the group of irregular meals. The group that we were analyzing included students who did not follow the diet, including those who had deviations in the timing of meals 2–3 times a week and did not comply with the interval between meals. Failure to comply with the diet, in turn, is a risk factor for diseases of the digestive and endocrine systems.

Less than half of the students ate regularly in the university canteen, their breakfast was $42.86 \pm 0.87\%$ and lunch was $4.40 \pm 0.20\%$. Non-use of the university canteen was $8.79 \pm 0.31\%$. About 11.9% of respondents ate food twice a day. Every fifth student ate irregularly. The statistical analysis confirmed that students who followed the balanced diet were characterized by higher indicators of mental performance than students and those who ate 1–2 times a day ($p < 0.05$). Academic performance was taken as a high indicator of intelligence.

The regimen of primary students was more in line with the recommendations for proper nutrition: 59.2% took food 3–4 times a day. There were no statistically significant differences between students of different training courses who ate more than 4 times a day. In addition, it turned out that 56.8% of students took dinner after 19 h and 43.2% – before bedtime. The data obtained on the diet of students reflected

the general trend observed at the present time among other social and age groups of the population of the country when the peculiarities of the lifestyle did not allow eating well during a day, and meals in terms of the main calorie content and volume are in the evening. This well-established habit will further contribute not only to the development of diseases of the digestive and endocrine systems but also to the appearance of excess weight and obesity [17], [18].

To assess the nutritional situation, we analyzed the consumption frequency of respondents who saved money on basic food purchases. Analysis of the structure and frequency of food consumed by students who saved money on food purchases showed that the set of the average daily diet consists of bread, cereals, potatoes, sausages, pasta, sugar, confectionery, ketchup, and mayonnaise (high in fat) 2–3 times a day.

It was revealed that daily or more dairy products (milk, kefir, cottage cheese, and cheese) were consumed by only a third of the respondents. Almost half of the students ($53.8 \pm 0.73\%$) included these foods in their diet less than 3–4 times a week. The obtained data allowed drawing the conclusion about the general deficit of this group of products in the nutrition of the respondents.

The fatty component of nutrition was represented by fat and vegetable fats, as well as fat-and-oil products (margarine, mayonnaise). Vegetable oils were constantly present in the respondents' menu; the frequency of fat consumption was very high.

About 23% of students ate meat and meat products once a day in accordance with the physiological norm, 4% – in excess of the norm, 73% – once a day below the physiological norm. About 90.5% of students consumed fish and seafood less than 1 time/day, which means that they were not included in the diet at all.

Protein in animal products as the main source of essential amino acids and trace elements should be an essential component of the diet. However, according to the obtained data, only a third of the respondents consumed these products in the recommended quantities, which should be considered as a risk factor for impaired protein biosynthesis, deviations in the processes of growth and development.

The important components of full-blown diet are vegetables, fruits, and berries. They cannot be replaced by any other products. It was revealed that 32% of respondents consumed vegetables in accordance with the physiological norm, 68% – below the physiological norm. Daily, 29% of respondents consumed fruit and berries in accordance with the physiological norm, 71% – below the physiological norm. The lack of vegetables and fruits in the diet of the respondents is a risk factor for the development of many chronic non-communicable diseases in the future, and can also lead to a decrease in productivity during school.

The assessment of students' nutrition structure revealed that the share of products of animal origin was

lower, including meat products (9%), eggs, and other egg-based products (37%). The above data indicate an insufficient level of socio-economic conditions and incomes of students, the impossibility of purchasing, and constant consumption of certain food products.

Assessment of the average daily consumption of energy and macronutrients in the selected groups revealed significant differences by gender (Table 2).

Table 2: Actual average daily indicators of the diet of respondents who save on food ($M \pm SD$)

Indices	Actual consumption		Physiological norm	
	Women (n = 146)	Men (n = 112)	Women	Men
BMI, kg/m ²	20.7 ± 3.4	21.7 ± 3.6*	18.5–24.9	18.5–24.9
Frequency rate of food/day	3.1 ± 0.9	3.2 ± 1.0	≥3	≥3
Protein, g	79.7 ± 33.6	91.1 ± 32.7*	61 ± 9	72 ± 11
Fat, g	110 ± 40.6	128 ± 44.7*	67 ± 10	81 ± 12
Carbohydrates, g	290.0 ± 112.1	321.8 ± 107.0*	289 ± 43	358 ± 54
Energy value, kcal	2357.7 ± 759.9	2666.5 ± 743.2*	2000 ± 300	2450 ± 368

BMI: Body mass index; Significance of gender differences *p<0.05.

Evaluation of the content of nutrients in the diet revealed that in two gender groups according to the daily ration of the respondents, the content of the physiological need for protein was 1.3 times higher than the recommended norm. The daily physiological need for fat in the diet was 1.6 times higher than the norm in both groups. The average daily intake of carbohydrates in girls corresponded to the norm, in men – below the norm. It was found that the energy value of the daily diet was 1.2 times higher than the physiological requirement.

Discussion

Eating behavior includes a certain set of human behavior (diet, food rate, preferences in the consumption of certain types of food, a subjective approach to the nutrition process, etc.). In the course of the study, individual characteristics were assessed among students of various courses in terms of academic performance, diet, frequency of consumption of basic food products, and physiological need for nutrients. Hence, when evaluating the group by the frequency of meals, most of the students of all courses were included in the group of irregular meals. The group that we were analyzing included students who do not follow the diet, including those who have deviations in the timing of meals 2–3 times a week and do not comply with the interval between meals. Failure to comply with the diet, in turn, is a risk factor for diseases of the digestive and endocrine systems.

Currently, number of published studies noted that a certain contribution to the development of chronic pathology of the digestive system of students is made, for example, by frequent fasting days and lack of breakfast ($r = 0.21–0.19$; $p < 0.001$; 2.8% contribution to total variance) and material support of students, the presence of bad

lifestyle habits, unfavorable ecology, etc. ($r = 0.13$; $p < 0.001$; 1% contribution to the total variance). Thus, this established habit contributes not only to the development of diseases of the digestive, cardiovascular and endocrine systems but also to the appearance of overweight and obesity [17], [18].

Low physical activity and dietary habits of modern young people largely affect not only the development of chronic systemic diseases but also directly on morphometric indicators [7], [18]. Average group of BMI values were assessed as normal in 66% of students of both sexes. Underweight was recorded in 25% girls and 17% boys. Overweight and obesity were found in 10% of girls and 18% boys at the age of 20.

The proportion of young people with underweight decreases with age – from 12.9% among children 18 years old to 2.9% among children 23 years old ($p < 0.001$), while the proportion of young people with overweight, on the contrary, ranges from 10 to 20.6% ($p < 0.05$). The different picture was observed for girls: The proportion of underweight students increases with age – from 15.5% among the students of 18 years old to 30.6% among 23 years old ($p < 0.01$). The proportion of overweight students practically did not change (7.2%).

It is known that overweight and obese people consume foods with a higher energy value than people with a normal BMI. In this study, significant differences were obtained in the energy value of the diet in girls with underweight (2296 ± 788 kcal/day) and overweight (2769 ± 771 kcal/day). No such dependence was found in young men.

It was found that the main types of food consumed daily did not meet the recommended norms in the daily ration of students who saved money on buying food. Protein products of animal origin were particularly inadequate. However, when analyzing the average daily diet, we came to the conclusion that the high protein and fat content was due to plant foods and fast food products. As for the results of our study, the respondents' nutrition was mainly protein-fat, the same conclusion was found in other researchers [19], [20].

Evaluation of nutrition made it possible to establish that the diet didn't meet hygienic standards in 70% of cases. The predominance of the fatty component in food disrupts the absorption of other food components and can lead to metabolic disorders, the formation of a number of risk factors for overweight and obesity, as well as diseases of the cardiovascular, endocrine system and musculoskeletal system.

Conclusion

Research results showed that more than 50% of respondents did not have an idea of a rational and balanced diet, as well as the skills of preliminary planning and organization of meal.

Recommendations

In difficult nutritional conditions for students, it is necessary to immediately take measures from both the state and the universities. It is necessary to introduce a preferential regime for the purchase of food in canteens of universities. In terms of serving size, it should also consider introducing standards for some meal sets.

For students suffering from alimentary dependence and the risk of gastrointestinal diseases, due to the high importance of their nutrition, we propose to introduce the position of a nutritionist at universities, independent of the university administration. The development of the social catering system at the university will improve the socio-economic situation of students.

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