

**ASSESSING RISK FACTORS THAT CAN CAUSE ALIMENTARY-DEPENDENT DISEASES AMONG STUDENTS DUE TO THEIR NUTRITION****O.V. Mitrokhin, A.A. Matveev, N.A. Ermakova, E.V. Belova**

I.M. Sechenov First Moscow State Medical University, bld. 2, 2 Bol'shaya Pirogovskaya Str., Moscow, 119435, Russian Federation

This research can be considered quite vital due to digestive organs diseases being widely spread among young students. We chose students attending I.M. Sechenov's First Moscow State Medical University as our research object. We questioned 840 students who attended the above-mentioned higher education establishment and assessed their medical check-ups data; having done that, we analyzed risks of alimentary-dependent diseases among students related to impacts exerted by their nutrition.

Our research goal was to assess students' nutrition, its structure, frequency, and conditions; to determine priority risk factors for students' health; and to develop recommendations on healthy nutrition provided for them as a factor related to pursuing healthy lifestyle.

We detected that about 20 % students didn't have breakfast; about 8 % didn't have lunch or dinner (and it meant they had less than 3 meals a day; however, half of the students had 3 meals a day. 65.7 % of the students had their last meal a day after 9 p.m., and about 20 %, after 23 (late meal). We ranked a correlation between nutrition-related risk factors and existing nosologies and revealed that 3 factors exerted the most significant influence on the digestive organs diseases; they were late meals, irregular hot meals, and a number of meals taken a day. Endocrine system diseases were mostly influenced by 2 factors, late meals and a number of meals a day. Number of meals a day was also correlated to respiratory organs diseases and urogenital system diseases; late meals, to diseases in the nervous and cardiovascular systems.

Key words: risk assessment, students, number of meals a day, nutrition regime, late meals, meal, morbidity, health preservation, healthy lifestyle, prevention.

Nowadays an issue related to rational and balanced nutrition consumed by various population groups as well as adherence to good nutrition is a priority in research accomplished in the sphere of nutrition including studies aimed at preventing the most widely spread non-infectious diseases [1].

Given that, it is necessary to accomplish task-oriented applied scientific research aimed at detecting and assessing influences exerted on population health by food products which are able to create intolerable

(unacceptable) risks for people's life and health¹.

As a result, such research should allow achieving mass adherence to good nutrition as a factor that helps pursue healthy lifestyle².

Methodology for assessing risks caused by impacts exerted by environmental factors on population health is an efficient tool for assessing influence on a human body including adverse impacts exerted on health by non-rational and imbalanced nutrition.

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Oleg V. Mitrokhin – Doctor of Medical Sciences, Professor at the Common Hygiene Department (e-mail: mov1163@yandex.ru; tel.: +7 (499) 248-19-65; ORCID: <https://orcid.org/0000-0002-6403-0423>).

Aleksandr A. Matveev – Doctor of Medical Sciences, Professor at the Common Hygiene Department (e-mail: matveevmed@mail.ru; tel.: +7 (916) 832-50-82; ORCID: <https://orcid.org/0000-0002-0309-4474>).

Nina A. Ermakova – Senior Lecturer at the Common Hygiene Department (e-mail: ninaok11@gmail.com; tel.: +7 (916) 150-07-06; ORCID: <https://orcid.org/0000-0002-9745-4265>).

Elena V. Belova – Assistant lecturer at the Common Hygiene Department (e-mail: ms.ekochina@mail.ru; tel.: +7 (985) 085-39-95; ORCID: <https://orcid.org/0000-0002-2134-6348>).

¹ The strategy aimed at increasing food products quality in the Russian Federation up to 2030. Approved by the RF Government Order dated June 29, 2016 No. 1364-p. Moscow, 2016, 17 p.

² On sanitary-epidemiologic welfare of the population in the Russian Federation in 2019: The State report. Moscow, 2019, 254 p.

Assessment of health risks caused by exposure to adverse environmental factors is given in details in multiple publications that focus both on assessing health risks themselves and assessing efficiency of accomplished control and surveillance activities aimed at preventing non-infectious diseases [2, 3].

Great attention has been paid to nutrition provided for children and teenagers in educational establishments. Annual State reports “On sanitary-epidemiologic welfare of the population in the Russian Federation”² contain data on nutrition provided for children and teenagers including senior school-children as well as on nutrition provided for students who attend vocational schools. However, nutrition provided for students at higher educational establishments (HEE) is not given proper attention though they were school children only “yesterday” and are of the same age as students who attend vocational schools.

A growth in morbidity with gastrointestinal diseases among young students is a serious issue as 65 % of them already suffer from chronic diseases; it can be due to either improper nutrition regimes or imbalanced daily rations consumed by students and it exerts negative influence on macro- and micro-nutrient structure of consumed food [4, 5].

An issue related to providing students attending a medical HEE with regular and balanced nutrition is rather outstanding as their educational system is quite peculiar. A peculiarity is related to educational departments being located at a distance from each other and any student who attends a medical HEE has to spend a lot of time moving from one department to another; it leaves smaller amount of available time that could be spent on taking a meal. Due to it a lot of students have their meals at fast-food cafes or even “on foot”. Besides, senior students spend a lot of time on duties and meals are not regular during them; hot meals are not always available [6–8].

Students’ lifestyle has such peculiar features as untimely meals; systematic lack of sleep; too little time spent outdoors; necessity

to study during night hours when a student should be in bed sleeping; absence of any physical exercise or activities aimed at health strengthening; smoking, etc. [9, 10].

All the above mentioned creates elevated risks of non-infectious diseases among students caused by both improper nutrition and other factors that are not in line with “healthy lifestyle” postulates [11, 12].

Besides, more and more foreign students have been attending Sechenov’s Medical University over the recent years; they have their own tastes and nutrition habits due to a national nutrition culture. At the same time a range of food products and cooked meals provided for students at the University canteens, cafes, and cafeterias doesn’t necessarily take into account their existing nutrition preferences and habits.

Despite there are multiple scientific research works on students’ nutrition, assessment of risks related to bad nutrition and, consequently, non-infectious morbidity among students haven’t been given proper attention or studied in greater detail.

Our research goal was to assess nutrition consumed by students who attended Sechenov’s Medical University; to spot out priority risk factors that could cause health disorders in them; and to give recommendations on good nutrition as a healthy lifestyle factor.

Data and methods. Our research was based on reports that contained data obtained via periodical medical examinations of students performed at the Clinical and Diagnostic Center of the First Moscow State Medical University (Sechenov’s Medical University) and on questioning results; overall, 840 students were questioned, 280 males and 560 females; they were 2–4 year students attending the Medical Faculty. Observation period was 2012–2017.

We determined an actual body mass of all the examined students and calculated their body mass index (BMI).

In our research we applied a correlation as per body mass index; determined a correlation between specific nutrition factors and existing

nosologies as well as between students' complaints and specific nutrition factors.

When assessing risks caused by influences exerted by food products on students' health, we applied procedures and techniques fixed in methodical guidelines approved by Rospotrebnadzor's Order dated January 18, 2016 No 16 and in several research works^{3,4} [14–17].

Results and discussion. We analyzed students' nutrition regimes and revealed several violations. First of all, 20 % students didn't have breakfast, about 8 % didn't have either lunch or dinner; consequently, these students had less than 3 meals a day (each 10th student), and only half of students had 3 meals a day (Figure 1).

Meals taken at home or dormitories were mostly breakfast or dinner (82–88 %). Most students (78 %) had their lunch at catering facilities. From 5.6 % to 11.3 % students had their lunch at the University canteens or cafes.

Besides, we detected that more than 30 % questioned students had only one or two meals a day; most students (79.9 %) had one or two hot (cooked) meals a day. Figure 2 shows students' answers regarding a number of hot meals they have a day.

The next vital issue is time when students have their last meal a day. It has been proven and substantiated from a physiological point of view that if a person is active during 10 hours and has his or her meals in this period of time than the next 14 hours, starting from the last meal a day to the first meal the next day, should be a break for rest. 14 hours is a period that is considered to be quite sufficient for all the food consumed a day to be digested by a body. This approach to distribution of meals over a day is based on human biorhythms theory [18, 19].

A late meal is a significant factor that can cause alimentary-dependent diseases. Thus, 65.7 % questioned students had their last meal rather late, at 9 p.m. and even later; about 20 % had it after 11 p.m. (Figure 3).

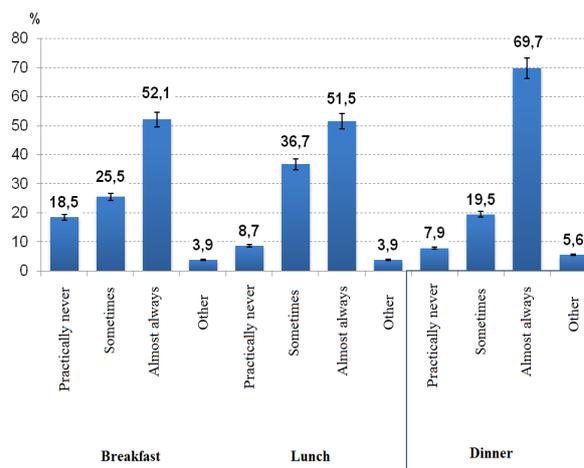


Figure 1. Answers given by students regarding their nutrition regime

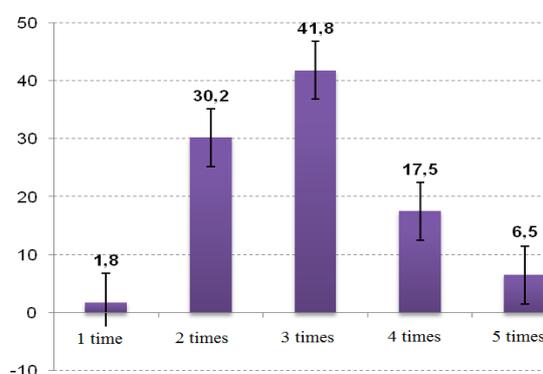


Figure 2. Number of hot meals students have a day

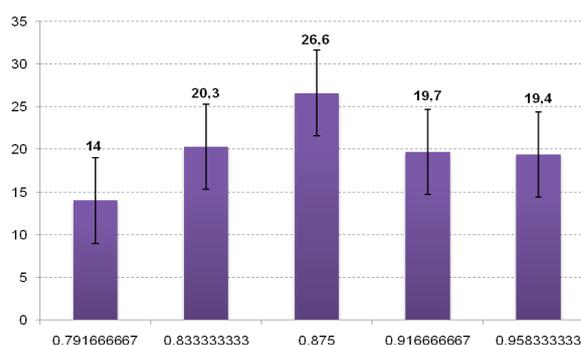


Figure 3. Distribution of the last meal taken by students a day (%)

³ On implementation of the methodical guidelines "Classification of food products distributed on the market as per potential health risks and property losses borne by consumers for organizing scheduled control and surveillance activities": Rospotrebnadzor's Order dated January 18, 2016 No. 16. *KODEKS: The electronic fund for legal and reference documentation*. Available at: <http://docs.cntd.ru/document/420332234> (date of visit September 03, 2019).

⁴ On sanitary-epidemiologic welfare of the population in the Russian federation in 2018: The State report. Moscow, The Federal Service for Surveillance over Consumer Rights Protection and Human Well-being, 2019, pp. 52–64.

This situation results in insulin being produced in greater amounts in a body; it makes for fat preservation in it and can lead to obesity. A late meal (after 9 p.m.) is a risk factor that can cause pancreatic diabetes and cardiovascular diseases.

As a body produces gastric juice and hormones more actively during the first half of a day, food consumed during it is digested rapidly and efficiently. A human body tends to function slower in the evening and at night, therefore, late dinners or suppers increase a load on the gastrointestinal tract. Too much food consumed in the evening can cause gastrointestinal diseases (gastritis, intestinal allergies, dysbacteriosis, etc.) [20, 21]. We should note that nutrition regimes exert direct impacts on students' body mass. Given that, we examined body mass of all questioned students and calculated their body mass index (Figures 4 and 5).

These data reveal that students' body mass is within average standards values for male and female students. At the same time students' body mass tends to grow which is more apparent among male students (regression quotient $b_1=1.5$), than among female ones ($b_1 = 1.1$).

We analyzed dynamics of body mass index (BMI) and concluded that the parameter was within its standards both for male and female students. However, average BMI values for men were detected close to the upper limit of its standard value. Should the detected trend be extrapolated to the future, we can obtain a

prediction that after three next periods an average BMI among male students will exceed its standard value. These results can be expected if male students' nutrition continues to be improper.

Our next goal was to reveal specific risk factors related to students' nutrition that could cause relevant nosologies; to do that, we assessed correlations between them (Table 1).

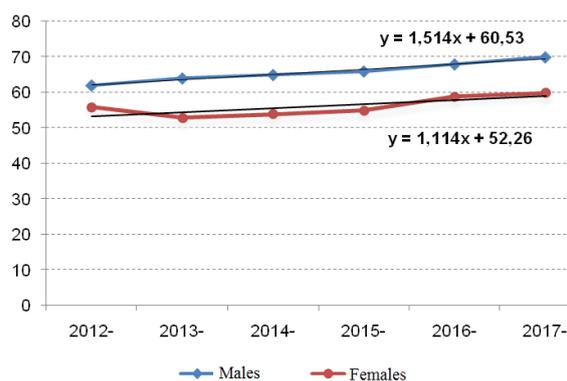


Figure 4. Body mass of students at the Medical faculty taken in dynamics (kg)

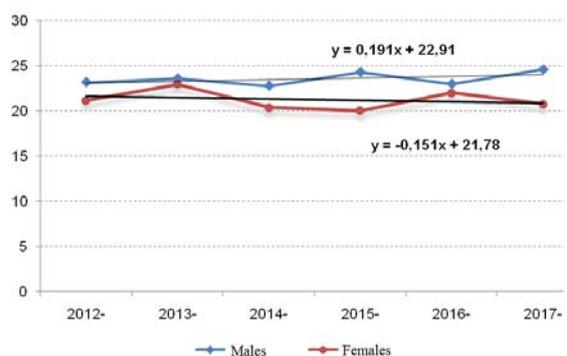


Figure 5. Body mass index taken in dynamics

Table 1

Assessment of correlations between specific nutrition-related factors and relevant nosologies

Nosologies	Regression quotients for correlations			
	Number of meals a day	Hot meals	Meals taken after 9 p.m.–11 p.m. (late meals)	Energy drinks consumption
Respiratory organs diseases	0.52	0.20	0.21	-0.15
Urogenital system diseases	0.30	0.26	0.23	0.16
Nervous system diseases	0.29	0.13	0.63	0.16
Cardiovascular diseases	0.30	0.25	0.66	0.02
Gastrointestinal diseases	0.50	0.60	0.66	-0.10
Endocrine system diseases	0.32	0.27	0.64	0.13

Table 2

Assessment of correlations between students' complaints and specific nutrition-related factors

Complaints (indicating there are health disorders)	Коэффициенты регрессии зависимостей b1			
	Number of meals a day	Hot meals	Meals taken after 9 p.m.–11 p.m. (late meals)	Energy drinks consumption
Fatigue	0.59	0.19	0.49	-0.06
Flabbiness	0.35	0.27	0.57	0.37
Headache	0.31	0.27	0.10	0.26
"Heart" ache	0.12	0.24	0.41	-0.16
Unpleasant feeling in the eyes	0.26	-0.20	-0.21	0.12
Dizziness	0.52	0.12	0.25	-0.21
Noises in the ears	0.15	-0.19	0.09	-0.08
Numbness in the extremities	0.12	0.22	0.09	-0.08
Dyspnea	0.12	0.23	0.63	-0.18
Heavy legs	0.03	0.09	0.71	-0.10

These data indicate that respiratory organs diseases are predominantly influenced by a number of meals ($b1 = 0.52$). Urogenital system diseases also have the greatest correlation with a number of meals a day ($b1 = 0.30$). Diseases of the central nervous system are predominantly influenced by late meals ($b1 = 0.63$). The most significant factor that causes cardiovascular diseases is also late meals ($b1 = 0.66$). Gastrointestinal diseases occur mostly due to late meals ($b1 = 0.66$), a number of hot meals taken a day ($b1 = 0.60$), and overall number of meals a day ($b1 = 0.50$). Endocrine system diseases are predominantly caused by late meals ($b1 = 0.64$) and a number of meals a day ($b1 = 0.32$).

We ranked correlations between nutrition-related factors and relevant nosologies and revealed that gastrointestinal diseases were influenced by three major factors, late meals, a number of hot meals a day, and overall number of meals a day; endocrine system diseases were influenced by two factors, late meals and a number of meals a day. Respiratory organs diseases were influenced by a number of meals a day; urogenital system diseases, a number of meals a day; central nervous system diseases, late meals; cardiovascular diseases, late meals.

We also assessed correlations between students' complaints and specific nutrition-related factors (Table 2).

Out of all the examined factors, increased fatigue is predominantly related to a number of

meals a day ($b1 = 0.59$), and late meals ($b1 = 0.49$); flabbiness is influenced by late meals (0.57), a number of meals a day (0.35), and energy drinks consumption (0.37). Complaints about pains "in the heart" are related to late meals (0.41). Dizziness is most closely correlated to a number of meals a day (0.52). Dyspnea is most frequently met among those who take their last meal after 11 p.m. (0.63). Heavy legs are also most tightly correlated with late meals ($b1 = 0.71$).

We ranked correlations between students' complaints and specific nutrition-related factors and revealed that flabbiness was influenced by three factors, namely late meals, a number of meals a day, and energy drinks consumption; increased fatigue was related to two factors, a number of meals a day and late meals; complains about pains "in the heart" correlated with late meals; dizziness, with a number of meals a day; dyspnea, with late meals; heavy legs, with late meals.

In order to help students get acquainted with nutrition habits and tastes of their foreign counterparts, there is 'Unity Food Fest' annual festival organized at Sechenov's Medical University. During the festival students from Malaysia, China, Iran, Kuwait, Bahrain, Tajikistan, Uzbekistan, Kazakhstan, Abkhazia, Russia, and other countries present a great variety of dishes cooked by students themselves. Foreign students tell guests about

existing food preferences and nutrition habits in their national nutrition cultures. The festival is also visited by those who organize meals for students at the University buffets and canteens and they can learn some recipes. This event is a significant factor that can help pursuing healthy lifestyle by foreign students as it stimulates workers at the University canteens and buffets to cook national dishes.

Conclusions. Actual students' nutrition is improper due to its regime being violated as about 20 % students don't have breakfast, about 8 % don't have lunch or dinner, and only half of students actually have three meals a day.

Late meal is a risk factor that can cause alimentary-dependent diseases as 65.7 % questioned students have their last meal a day late in the evening, at 9 p.m. or even later; about 20 % have it after 11 p.m.

Students' body mass is within average standard values both for male and female students but it tends to grow, $Rx/y = 1.5$ and $Rx/y = 1.1$ accordingly.

Body mass index is within its standard values both among male and female students. However, its average values in male students are close to the upper limits of its standard value.

We ranked correlation between nutrition-related factors and relevant nosologies and revealed that gastrointestinal diseases were influenced by three major factors, late meals, a number of hot meals a day, and overall number of meals a day; endocrine system diseases were influenced by two factors, late meals and a number of meals a day. Respiratory organs diseases were significantly influenced by a number of meals a day; urogenital system diseases, a number of meals a day; central nervous system diseases, late meals; cardiovascular diseases, late meals.

We also ranked correlations between students' complaints and specific nutrition-related factors and revealed that flabbiness was influenced by three factors, namely late meals, a number of meals a day, and energy drinks consumption; increased fatigue was related to two factors, a number of meals a day and late meals; complains about pains "in the heart" correlated with late meals; dizziness, with a number of meals a day; dyspnea, with late meals; heavy legs, with late meals.

The greatest adverse effects were produced on health by nutrition conditions such as too few meals a day (mostly, two meals a day), late meals, too few hot meals a day, and energy drinks consumption.

Recommendations. To increase a number of hot meals a day, we recommend equipping the University canteens and buffets with microwave ovens so that students could warm up cooked dishes they buy there or bring in lunch boxes from home.

To make cooked dishes more consistent with foreign students' nutrition habits, we recommend making a range of cooked dishes more variable taking into account food preferences and nutrition habits as well as national cultures of foreign students who attend Sechenov's Medical University.

To make students pursue healthy lifestyle and to prevent alimentary-dependent diseases, it is necessary to organize and hold lectures, discussions, and consultations on rational and balanced nutrition for students who attend a medical HEE.

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