RUSSIAN BULLETIN OF HYGIENE

SCIENTIFIC MEDICAL JOURNAL
FOUNDED BY: BURDENKO VORONEZH STATE MEDICAL UNIVERSITY AND
PIROGOV RUSSIAN NATIONAL RESEARCH MEDICAL UNIVERSITY

SUBMISSION https://rbh.rsmu.press/
COLLABORATION editor@rsmu.press
ADDRESS Ostrovityanov St. 1, Moscow, 119997, Russia

Indexed in RSCI. IF 2018: 0,5

Open access to archive

Issue DOI: 10.24075/rbh.2022–01
The mass media registration certificate PI series № FS77-80908 dated April 21, 2021
Founders: Burdenko Voronezh State Medical University (Voronezh, Russia)
Pirogov Russian National Research Medical University (Moscow, Russia).
Publisher: Pirogov Russian National Research Medical University; adress: Ostrovityanov Street 1, Moscow 119997 Russia

Approved for print 30.03.2022
Circulation: 100 copies. Printed by Print.Formula
www.print-formula.ru

РОССИЙСКИЙ ВЕСТНИК ГИГИЕНЫ

НАУЧНЫЙ МЕДИЦИНСКИЙ ЖУРНАЛ ВОРОНЕЖСКОГО ГОСУДАРСТВЕННОГО МЕДИЦИНСКОГО УНИВЕРСИТЕТА ИМ. Н. Н. БУРДЕНКО И РОССИЙСКОГО НАЦИОНАЛЬНОГО ИССЛЕДОВАТЕЛЬСКОГО МЕДИЦИНСКОГО УНИВЕРСИТЕТА ИМ. Н. И. ПИРОГОВА

ПОДАЧА РУКОПИСЕЙ https://rbh.rsmu.press/
СОТРУДНИЧЕСТВО editor@rsmu.press
АДРЕС РЕДАКЦИИ ул. Островитянова, д.1, г. Москва, 119997, Россия

Журнал включен в РИНЦ. IF 2018: 0,5

Здесь находится открытый архив журнала

DOI выпуска: 10.24075/rbh.2022–01
Свидетельство о регистрации средства массовой информации серия ПИ № ФС77-80908 от 21 апреля 2021 г.
Учредители: Воронежский государственный медицинский университет им. Н.Н. Бурденко (Воронеж, Россия);
Российский национальный исследовательский медицинский университет имени Н.И. Пирогова (Москва, Россия)
Издатель: Российский национальный исследовательский медицинский университет имени Н.И. Пирогова; адрес: 117997, г. Москва, ул. Островитянова, д.1, тел.: 8 (495)434-03-29

Подписано в печать 30.03.2022
Тираж 100 экз. Отпечатано в типографии Print.Formula
www.print-formula.ru

RUSSIAN BULLETIN OF HYGIENE **1, 2022**
РОССИЙСКИЙ ВЕСТНИК ГИГИЕНЫ

Contents
Содержание

CONTENTS

MODERN FACTORS DETERMINING THE STATUS OF STUDENTS' HEALTH

Tarasov AV[1] ✉, Rakhmanov RS[2], Bogomolova ES[2], Skoblina NA[3], Ievleva OV[3]

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Students belong to a special medical and social group. A risk of health disturbances is typical of this community. It is associated with the influence of various habitat and educational factors. The most significant factors have been determined based on the analysis of literature data. It is about high levels of stress and depression due to low physical activity, high level of psychoemotional stress during lessons and examination periods, irrational and irregular nutrition, social adaptation to a new habitat, which is often accompanied by acclimatization while moving for educational purposes, disorders of sleep and rest, harmful habits. Significant areas of development of self-preserving technologies for students were determined based on the obtained data. They can include as follows: examination of morbidity risk factors due to the educational period (from the first to the last educational year), assessing the effect of weather and climate conditions on the educational territory (examining the process of students' acclimatization), determining the role (peculiarities) of academic process technologies as a health risk factor (long-distance learning technologies, certain educational program), examining the progression and technology optimizing students' way of life at different stages of education, assessment of physical activity, influence on accessibility of educational programs, significance of using electronic devices and educational means, feeding trends (ethnic ones, conditions and possibilities of adherence to the principles of healthy nutrition), etc.

Keywords: students, examination period, lifestyle, nutrition, stress, sleep, adaptation, hypodynamia, gadget

Author contribution: research concept and design –Tarasov AV, Rakhmanov RS, Ievleva OV; material collection and processing –Tarasov AV; writing a text — Tarasov AV, Rakhmanov RS; editing — Tarasov AV, Rakhmanov RS, Bogomolova ES, Skoblina NA.

Compliance with ethical standards: the research was done in accordance with provisions of the Declaration of Helsinki and approved by the Ethics Committee of the Privolzhsky Research Medical University, Russian Federation, Nizhny Novgorod (protocol No. 8 as of May 08, 2019).

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Received: 21.01.2022 **Accepted:** 28.02.2022 **Published online:** 30.03.2022

DOI: 10.24075/rbh.2022.034

СОВРЕМЕННЫЕ ФАКТОРЫ, ОПРЕДЕЛЯЮЩИЕ СОСТОЯНИЕ ЗДОРОВЬЯ СТУДЕНЧЕСКОЙ МОЛОДЕЖИ

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Студенты — это особая медико-социальная группа. Для данного сообщества характерен риск нарушений здоровья в связи с влиянием различных факторов среды их обитания и обучения. Нами на основе анализа литературных данных определены наиболее значимые из них. Это высокая степень стресса и депрессии вследствие низкой физической активности, высокого уровня психоэмоционального напряжения в процессе занятий и во время сессий, нерационального и нерегулярного питания, социальной адаптации к новой среде обитания, часто сопровождающейся акклиматизацией при переезде в целях учебы, нарушения режима сна и отдыха, вредных привычек. На основе полученных данных определили значимые направления разработки здоровьесберегающих технологий для студентов. К ним можно отнести: изучение факторов риска заболеваемости в связи с периодом обучения (от первого курса к последнему), оценку вклада погодно-климатических условий территории обучения (изучение процесса акклиматизации студентов), определение роли (особенности) технологий учебного процесса как фактора риска здоровью (технологии дистанционного обучения, конкретная образовательная программа), исследование динамики и технологии оптимизации образа жизни студентов на этапах обучения, оценка физической активности, влияния на усвояемость образовательных программ, значимость использования электронных устройств и средств обучения, особенности питания (этнические, условия и возможности соблюдения принципов здорового питания) и др.

Ключевые слова: студенты, сессия, образ жизни, питание, стресс, сон, адаптация, гиподинамия, гаджет

Вклад авторов: Тарасов А. В., Рахманов Р. С., Иевлева О. В. — концепция и дизайн исследования; Тарасов А. В. — сбор и обработка материала; Тарасов А. В., Рахманов Р. С. — написание текста; Тарасов А. В., Рахманов Р. С., Богомолова Е. С., Скоблина Н. А. — редактирование.

Соблюдение этических стандартов: исследование проводилось в соответствии с положениями Хельсинкской декларации и одобрено этическим комитетом Приволжского исследовательского медицинского университета, Российская Федерация, г. Нижний Новгород (протокол № 8 от 8 мая 2019 г.).

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Статья поступила: 21.01.2022 **Статья принята к печати:** 28.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.034

The young people of today's Russia are the future and human resources of our country. Health protection of this group of people is a crucial task of our society and state [1].

Students belong to a social and demographic group of population with a certain count, sex-age structure, social position, role, status [2], intense mental labor, lifestyle and mental structure [3].

From a hygienic point of view, students' lifestyle has a number of shortcomings resulting in health worsening. The most widely spread ones include a high risk of developing stress and depression due to a low physical activity, high level of psychoemotional stress during lessons and examination periods, irrational and irregular nutrition, social adaptation to a new habitat, which is often accompanied by acclimatization while moving for educational purposes, disorders of sleep and rest, harmful habits [4].

The purpose of this review is to determine perspective trends of health-preserving technologies based on the scientific research devoted to assessment of environmental and habitat factors in students.

MATERIALS AND METHODS

30 articles considering the effect produced by various habitat and environmental factors on students' health have been reviewed. The articles published predominantly between 2015 and 2021 were searched through CINAHL, PUBMED, PSYCINFO, ELIBRARY and CYBERLENINKA.

RESEARCH RESULTS

In the modern society, a human health is the highest value. Various environmental factors influence a student's body during an educational process. Their amount is significantly increased now, with unsatisfactory material support, malnutrition and bad habits being of paramount importance. Secondary employment, stress, poor organization of leisure time, and lack of priority for health improvement produce a negative influence on students' health. These factors result in various functional disorders including stress, whereas a body's ability to adapt to the environment determines the level of health.

Owing to intense development of science and technology, global modern university education shows a steady trend towards an increased academic load and, as a consequence, towards a higher level of stress [5]. The specific weight of information overload was significantly increased during the educational process of students. In universities, intensification of the educational process is accompanied by a tense learning mode, increased academic load and negative influence on students' health.

The academic process is characterized by irregular distribution of load, increase in load during an examination period with the fact being a test for students, especially freshmen. It is proven that increased academic loads and requirements to students result in a growing level of state anxiety, and impaired mental capacity during the intersessional period. This leads to a worse level of adaptation and rise in cases for this social group. It is especially difficult for freshmen as they come across the methods of university education different from the school curriculum, and undergo the influence of social, mental, hygienic and behavioral factors of health disturbance risk [6].

Many researchers have shown that exam-associated stress is bad for students' health. This is a massive global trend. During the examination periods, high requirements are sometimes imposed on students' intellectual and emotional sphere. This results in overexcitation of the CNS and hypercompensatory nature of adaptive responses. Constant functional over-stressing violently disrupts the balance between the adrenergic and cholinergic systems leading to their exhaustion. Such disorganization of the vegetative and endocrine systems is one of the leading reasons for the syndrome of vegetative dysfunction, cerebral and vascular abnormalities, and neuroses among students [7].

Students have a pronounced psychoemotional reaction to an examination period. Certain adaptive mechanisms are switched on during this time. They are manifested through physiological and psychological reactions of an organism to stress, thus, the level of state anxiety is increased [8]. Mental manifestations of stress influence the hormonal balance as well. For instance, salivary cortisol level in students is significantly increased prior to exams.

Examination stress is, by definition, mental strain, which occurs in students during an academic activity, right before an examination. It is often responsible for an examination neurosis and is an essential stressful factor. Difficulties, experienced by students while trying to understand the new educational system, are frequently accompanied with nervous tension, unnecessary irritation, low interest in doing things, impaired will activity, and anxiety. Stress experienced by students influences quality of education, acquisition and analysis of knowledge, and precludes academic progress. In its turn, academic difficulties produce discomfort as well, leading to increased general stress and higher level of morbidity in this social group [9].

The most frequent manifestations of stress in students are represented by changes of the cardiovascular and vegetative nervous systems. In students, neurasthenic disorders, illness anxiety disorders, and adaptation disturbances accompanied by anxiety and low mood make the largest contribution in the structure of the discovered disorders. This can result in frequent urination, liquid stool and abdominal pain [10]. Large mental burden in students can lead to altered central and peripheral hemodynamics, and subsequent formation of hypertensive conditions. Arterial hypertension is one of the principal risk factors of cardiovascular diseases.

Thus, early detection of students with high arterial pressure and their dynamic observation is a relevant objective of coronary heart disease prevention. In the early stages of the disease, arterial blood pressure is easily controlled using non-drug treatment and prevention modes [11].

It is interesting that students leading a healthy way of life and actively going in for sports are less prone to examination stress. It means that the level of physical activity is one of the most important factors influencing health [12]. Decreased motor activity, increased load to the visual analyzer and impaired adaptive values are correlated [13].

Hypodynamia is linked to increased fat mass, muscle mass and basic metabolism decrease, and altered homeostasis parameters. It is often associated with such harmful factors as smoking, alcohol intake, irrational nutrition, obesity, syndrome of anxiety and depression [14].

Gender specificities for the intensity rate of risk factors of chronic non-infectious diseases were found among students of secondary and higher educational levels. It is about smoking, arterial hypertension and excessive body mass in men, and hypodynamia, alcohol consumption and hypercholesteremia in women. Students of higher educational institutions commonly take alcohol and have irrational nutrition, whereas students of secondary technical schools and colleges prefer smoking [15].

Nutritional conditions belong to the most significant risk factors producing a negative effect on students' health formation. Obesity and hypodynamia are closely linked to students' nutritional status. There exists a serious risk that obesity of

the young is going to progress in an adult life predetermining a large-scale obesity epidemic during the next decades [16].

Tense mental labor of students places high demands on higher mental functions such as perception, memory, thinking, concentration and attentional capacity. High levels of physical and mental capacity need to be supported during an academic day. For this purpose, food ration of students needs to include enough proteins, fats, carbohydrates, vitamins, macro- and microelements so that all physiological systems of the body could function normally. It is known that students' nutrition is commonly not rational and not adequate. It is characterized by an altered biochemical and vitamin status. This can result in impaired natural resistance of students' body and be a reason for increased acute respiratory viral infection morbidity, especially in freshmen [17].

Obesity and type II diabetes hold a specific place in the list of metabolic diseases due to unhealthy nutrition. Their recent rate turns them into non-infectious epidemics. The majority of students eat not regularly and at random. Long intervals without food are followed by abundant nutritional load at night. Students have fast food which doesn't need much chewing, systematic overnutrition, junk food. The most frequent deviations in chemical composition and dietary energy supply include deficiency of animal protein, essential amino acids, polyunsaturated fatty acids, dietary fibers, various vitamins and mineral substances, excessive caloric content of food with predominance of fats and easily digested carbohydrates. These circumstances are typical both of Russian students, and those from near and far abroad [18].

The reasons for abnormal regimen and nutritional balance include a tight academic schedule, limited finances, and insufficient attention to health, which does not commonly pose a major challenge at this age [19].

Three factors such as late nutrition, irregular intake of hot food and meal frequency produce the largest influence on diseases of the gastrointestinal tract. The endocrine system is negatively influenced primarily by such two factors as late nutrition and meal frequency. Respiratory and urinary diseases are linked to meal frequency; CNS and cardiovascular diseases are associated with late food intakes. Apathy is influenced by three factors such as the time of last food intake, meal frequency, intake of energy drinks; increased fatiguability is associated with two factors such as meal frequency and time of late food intake; late food intake is linked to cardiac pains; infrequent food intake is associated with dizziness; dyspnea occurs due to late food intake; heavy legs develop because of late nutrition [20].

There is a significant relation between the learning time at the university, prevalence of gastrointestinal tract diseases, and a number of students requiring dietary nutrition [21].

In students, hypodynamia is developed due to sedentary life style, including growing Internet addiction and online gambling in the modern youth [22]. There is a correlation between the time spent on computers and development of mental stress symptoms [23].

Because of long-term use of electronic devices, schoolchildren and students spent less time on sleep, motor activity, food intake, etc. The rate of using electronic devices by schoolchildren is an etiological constituent of acquired myopia. This is aggravated due to mass adoption of distant learning technologies for the purpose of an academic process. The learners use various electronic devices in areas not intended for such purposes that lack a sufficient level of illumination [24].

The consequence includes a negative tendency to the growth of general and primary eye disorder incidence among students, and a number of diseases from the first to subsequent years of education. Thus, students suffer from eye diseases more frequently than income-earning youths [25].

Healthy sleep is one of the most important factors influencing health, irreplaceable type of rest, enabling to restore body's defenses and energy resources. Students need enough sleep of good quality due to biological maturation and high academic and psychoemotional loads. Based on foreign literature, students report significantly worse sleep quality as compared with a general population. They have increased fatigue, excessive daytime sleepiness, anxiety and impatience. Every second surveyed Russian student reports the symptoms [26]. Sleep quality gets worsened during the examination period. It often happens during the exam term that students are deprived of a good sleep not to waste time. This influences their progress. Sleep disturbances are often observed in students with sleep-wake disorders or those with some personal or learning-related problems. Serious violations of rest and work regimen influence physical and mental health [27]. This assumption is especially true for those students who stay at a residence hall. Young people come across the new experience of staying at a residence hall, new sleep-wake schedule, and freedom from parental custody. They develop a new daily regimen, which includes not just preparation for classes, but also doing extracurricular activities, going to night clubs, working at night. This can significantly reduce the amount of sleep or deprive of sleep and produce a destructive effect on a student's body such as impaired learning quality at a university, and occurrence of a number of serious somatic diseases [28]. Thus, successful learning of educational programs and separate disciplines is impeded. The type of organizing an educational environment produces a great influence on intensity of emotional stress manifestations, sleep disturbances and characteristics of life quality subjective perception by students. It is established that freshmen are deprived of good sleep to a greater extent than senior students [29]. In students, bad quality of sleep depends on the level of stress. As a consequence of social adaptation, stress can be observed both during the first, and the last year of education due to the discomfort associated with transition to an adult life [30].

CONCLUSION

The study of health and its improvement in students is a global pressing issue. It is a human who is responsible for his or her health. Modern prevention, healthy way of life, responsible attitude to ourselves and others, selection of goods and services that produce no harm to health and environment belong to necessary conditions of health preservation and longevity, prevention of various diseases. According to the research, significant trends in health-saving technology development include as follows:

- examination of morbidity risk factors due to the learning period (from the first to the last years of learning);
- assessing the influence of weather conditions on the learning territory (studying the process of students' acclimatization);
- determining the role (peculiarities) of learning technologies as a health risk factor: distant learning technologies, certain educational program;
- examining the dynamics and technology of optimization of students' way of life at the stages of learning;
- assessing physical activity, influence on educational program accessibility;
- significant use of electronic devices and educational means;
- peculiarities of students' nutrition (ethnic ones, conditions and possibilities of compliance with the principles of healthy nutrition), etc.

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BODY MASS INDEX OF RUSSIAN SCHOOLCHILDREN IN THE SECOND DECADE OF THE XXI CENTURY

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The aim of the study is to establish a trend in the body mass index of schoolchildren in different regions of the country. The study was carried out in 2021 as part of the all-Russian monitoring of the physical development of schoolchildren aged 7–17 years (the number of boys - 30,965, the number of girls - 33,290). The statistical software package Statistica 13 PL has been used for data processing. BMI indicators have been established for Russian schoolchildren. Some regional differences in BMI indicators and the influence of the organization of medical support factor in the region have been shown. The Pearson correlation coefficients between the BMI of schoolchildren and the availability of doctors and nurses per 10,000 of population were -0.63 and -0.39 ($p \leq 0.05$). The age and gender standards for BMI for Russian schoolchildren have been updated. A trend towards higher BMI rates in various subjects of the Russian Federation has been revealed, which may be due, among other things, to indicators characterizing the organization of the medical population in the region.

Keywords: schoolchildren, body mass index, health care

Author contribution: Levushkin SP, Zhukov OF, Skoblina NA — trial concept and design; Skoblina EV — data collection and processing; Zhukov OF, Skoblina EV — text writing; Levushkin SP, Skoblina NA — editing.

Compliance with ethical standards: the study has been approved by the Local Ethics Committee of Pirogov Russian National Research University (protocol No. 159 as of November 21, 2016) and conducted as a part of research work (state recording number of research and technological development AAAA-A19-119021890068-7 as of February 18, 2019), it does not endanger the participants, complied with the requirements of biomedical ethics, and voluntary informed consent has been obtained for each participant.

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Received: 17.01.2022 **Accepted:** 24.02.2022 **Published online:** 30.03.2022

DOI: 10.24075/rbh.2022.036

ИНДЕКС МАССЫ ТЕЛА У РОССИЙСКИХ ШКОЛЬНИКОВ ВО ВТОРОМ ДЕСЯТИЛЕТИИ XXI ВЕКА

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Цель исследования — установление тенденции изменения показателя индекса массы тела школьников в разных регионах страны. Исследование выполнено в 2021 г. в рамках общероссийского мониторинга физического развития школьников 7–17 лет (мальчиков — 30 965, девочек — 33 290). Для обработки данных использован пакет статистических программ Statistica 13 PL. Установлены показатели ИМТ у российских школьников. Показаны некоторые региональные различия показателей ИМТ и влияние на него такого фактора, как организация медицинского обеспечения в регионе. Коэффициенты корреляции Пирсона для показателя ИМТ школьников и обеспеченностью врачами и медицинскими сестрами на 10 000 населения составили –0,63 и –0,39 ($p \leq 0,05$). Были обновлены возрастно-половые нормативы ИМТ для российских школьников. Выявлена тенденция к более высоким показателям ИМТ в различных субъектах Российской Федерации, которая может быть обусловлена, в том числе показателями, характеризующими организацию медицинского населения в регионе.

Ключевые слова: школьники, индекс массы тела, медицинское обеспечение

Вклад авторов: Левушкин С. П., Жуков О. Ф., Скоблина Н. А. — концепция и дизайн исследования; Скоблина Е. В. — сбор и обработка материала; Жуков О. Ф., Скоблина Е. В. — написание текста; Левушкин С. П., Скоблина Н. А. — редактирование.

Соблюдение этических стандартов: исследование одобрено ЛЭК РНИМУ им. Н. И. Пирогова (протокол № 159 от 21.11.2016) и выполнялось в рамках НИР (номер государственного учета НИОКТР АААА-А19–119021890068–7 от 18 февраля 2019 г.), не подвергало опасности участников, соответствовало требованиям биомедицинской этики, для каждого участника было получено добровольное информированное согласие.

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Статья поступила: 17.01.2022 **Статья принята к печати:** 24.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.036

There is an increasing evidence in the literature of the high prevalence of overweight and obesity among children, adolescents and young adults. [1–6].

In a number of previous studies, it has been shown that changes in physical development indicators at the beginning of the 21st century were disharmonious due to an increase in body weight and a decrease in functional indicators. [7-8].

Because of the coronavirus pandemic, children, adolescents and young people faced a change in their lifestyle and health care, i. e., change in the facts that influence the physical development of pediatric population [9–14].

In this regard, it is of interest to study such an indicator of physical development as the body mass index (BMI) among schoolchildren in various regions of the Russian Federation. In a number of studies performed earlier, it has already been

shown that changes in physical development indicators are disharmonious in nature and are accompanied by a decrease in functional indicators and an increase in BMI [7].

The purpose of the study is to establish trends in the body mass index of schoolchildren in different regions of the country.

MATERIALS AND METHODS

The study was carried out in 2021 as part of the all-Russian monitoring of the physical development of schoolchildren aged 7–17, among which 30,965 boys and 33,290 girls were examined. A standard anthropometric technique and standard tools have been used. [15–18].

In this research section, results of studying the body mass index among sensitive groups of schoolchildren aged 11 to 15 years are reviewed in detail, as the most sensitive groups are more subject to unfavorable factors, including factors of lifestyle and health care organization. Size of every age- and gender-adjusted group amounted to at least 100 observations. According to the method developed by Otdelnova KA, this provides for 95.0% of probable significance of research result.

The conducted trial didn't expose participants to danger, corresponded to the requirements of biomedical ethics and provisions of the Declaration of Helsinki, and was accompanied with obtaining a voluntary informed consent. Inclusion criteria were as follows: a schoolchild, education at a general educational institution, examination time interval (2021), correctly conducted anthropometric trial, availability of voluntary informed consent. Exclusion criteria: another age group, another examination time interval, lack of correctly conducted anthropometric trial, lack of voluntary informed consent. The conducted trial was approved by the ethical committee of Pirogov Russian National Research University (protocol No. 159 as of November 21, 2016).

The rating of regions based on healthcare system values was taken from open sources and based on expert estimates (https://expertnw.com/upload/pdf/rating_regions_health_2019.pdf; http://vid1.rian.ru/ig/ratings/rating_regions_2020.pdf; http://vid1.rian.ru/ig/ratings/rating_regions_2021.pdf, date of referral February 25, 2022).

Statistica 13 PL (StatSoft, USA) was used to process the obtained data. Correspondence of the obtained values to the normal distribution law of variation series was preliminarily estimated when the results were processed. The obtained quantitative data had normal distribution. That's why the methods of parametric statistics using the arithmetic mean (M) and mean square deviation (σ) were applied. Student's t-test was utilized to assess the statistically significant difference in average values (the differences were significant at $p \leq 0,05$). The Pierson correlation coefficients were calculated and the regression models were built.

RESULTS

The average BMI for the sensitive group of 11-year-old schoolchildren in 2021 was 18.4 ± 0.1 kg/m^2 for boys and 18.2 ± 0.1 kg/m^2 for girls; for 15-year-old boys – 20.7 ± 0.05 kg/m^2, for 15-year-old girls – 20.2 ± 0.05 kg/m^2, respectively.

Examination of the BMI value of boys and girls at the regional level showed significant differences ($p \leq 0.05$) in national data for a number of federal constituent entities of the Russian Federation representing various federal districts which differ by climate, geographical, social, economic and other indicators (fig. 1,2).

Consistent differences in BMI among boys and girls were noted. Meanwhile, the nationwide BMI of 25-27 was 16.1–20.0 kg/m^2 for 11-year-old boys, 18.6–22.1 kg/m^2 for 15-year-old boys, and 15.8–19.9 kg/m^2 and 18.4–21.9 kg/m^2 for 11-year-old and 15-year-old girls, respectively. This allows to make a conclusion that in no federal constituent entity of the Russian Federation the BMI value went beyond the normal age.

The discovered tendency to higher BMI values in different federal constituent entities of the Russian Federation required subsequent examination, in particular, that of the effect produced by the health care system. The effect underwent changes during the coronavirus pandemic. A prognostic regression model was obtained. It described the effect of a set of factors on BMI ($p \leq 0.05$) of 11-year-old schoolchildren (Y):

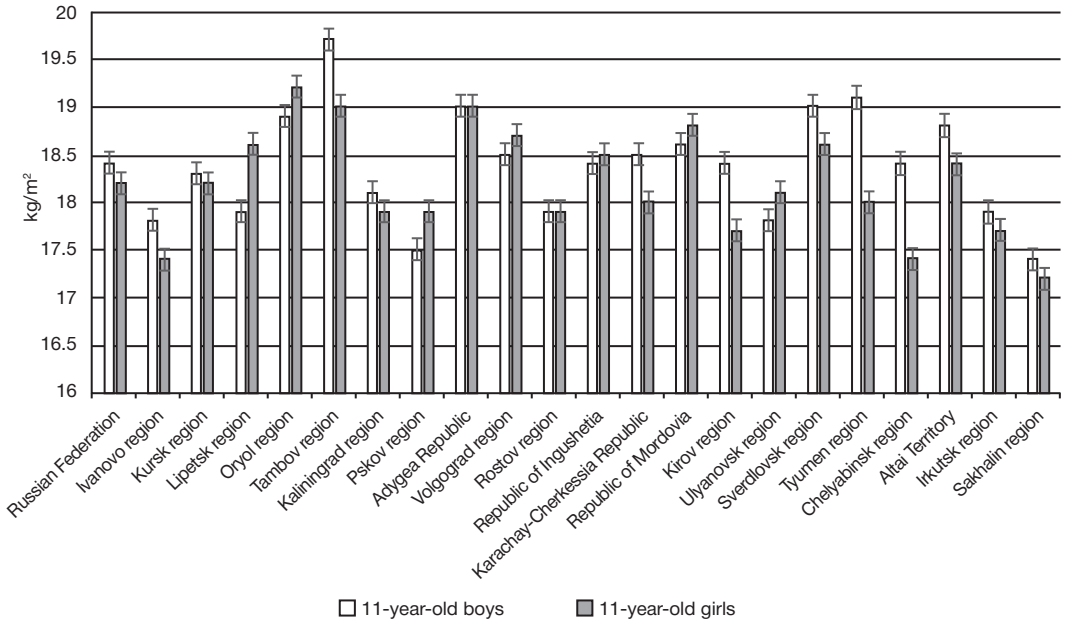

Fig. 1. BMI of 11-year-old schoolchildren from federal constituent entities of the Russian Federation, kg/m^2

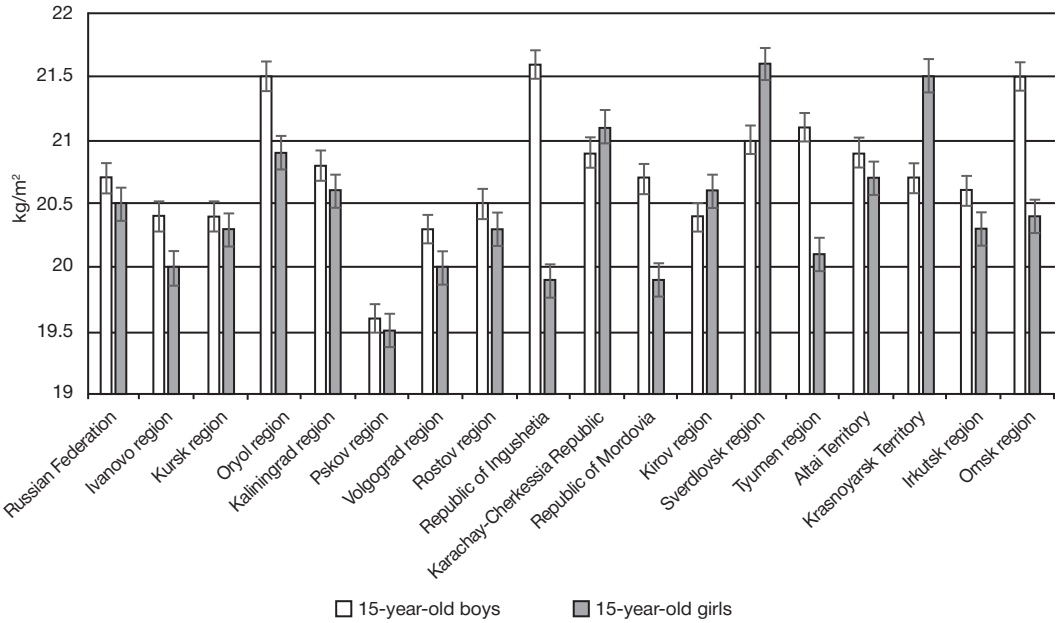

Fig. 2. BMI of 15-year-old schoolchildren from federal constituent entities of the Russian Federation, kg/m²

Table. Normative BMI values for 7- and 17-year-old schoolchildren as compared with 2004 and 2021, 25–75 centiles, kg/m²

	7-year-old boys	7-year-old girls	8-year-old boys	8-year-old girls	9-year-old boys	9-year-old girls	10-year-old boys	10-year-old girls	11-year-old boys	11-year-old girls	12-year-old boys	12-year-old girls	13-year-old boys	13-year-old girls	14-year-old boys	14-year-old girls	15-year-old boys	15-year-old girls	16-year-old boys	16-year-old girls	17-year-old boys	17-year-old girls
1	14.6–16.8	14.6–16.6	14.8–17.2	14.8–17.0	15.0–18.0	15.2–17.6	15.4–18.6	15.4–18.2	16.0–19.4	16.0–18.8	16.6–20.2	16.4–19.8	17.0–21.0	17,0–20,4	17.6–21.6	17.6–21.2	18.2–22.4	18.2–22.0	18.8–22.8	18.8–22.8	19.2–23.4	19.4–23.4
2	14.8–17.6	14.6–17.4	15.2–17.9	14.8–17.8	15.4–18.6	15.1–18.6	15.7–19.1	15.3–19.1	16.1–20.0	15.8–19.9	16.7–20.7	16.6–20.4	17.3–21.3	17,3–21,3	18.0–21.6	17.9–21.6	18.6–22.1	18.4–21.9	19.2–22.5	18.7–22.2	19.6–22.9	18.7–22.3

Note: 1 — normative values of 2004; 2 — normative values of 2021.

$$Y = 20.0 - 1.5*X1 - 1.5*X2,$$ where

$A = 20.0$ is a constant;
$B = -1.5$ means regression coefficients;
X denotes the independent variables in points:
X_1 — regional ranking according to basic values of healthcare system effectiveness (1 — for high rating; 0 — for low rating);
X_2 — rating of healthcare provider supply (1 — for high rating; 0 — for low rating);

The Pierson's correlation coefficients for BMI of 11- and 15-year-old children and doctor/ nurse coverage per 10,000 of people accounted for –0.63 and –0.39 ($p \leq 0.05$).

BMI values for various age- and gender-adjusted groups of Russian schoolchildren as compared with previous standards presented by Dedov II and Melnichenko GA (2004) are presented in table [19].

The presented data show a change in the BMI values of schoolchildren in the beginning and second decade of the XXI century. In research of 2021, higher BMI values were observed among the 7- to 13-year-old, no differences were found for the 14- to 15-year-old, and less high BMI values were found for the 16- to 17-year-old.

RESULT DISCUSSION

Increased overweight and obesity incidence rates are observed among children, adolescents and young people from many highly developed and developing countries [20–23].

Apart from genetic factors, deficiency of motor activity, improper nutrition, higher pace of life and associated stress, health care, etc. are the reasons for obesity in children, adolescents and young people [24–26].

The trial established the BMI values of Russian schoolchildren obtained after the change in lifestyle components and health care related to restrictive measures during the pandemic. Several regional differences in the BMI values and how provision of health care in regions influences the values were shown.

CONCLUSIONS

Age and gender-adjusted normative BMI values of Russian schoolchildren have been updated. The rising trend in BMI has been found in different federal constituent entities of the Russian Federation. It can partially be due to the values that characterize provision of health care in the region.

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EFFECT OF LABOR CONDITIONS ON QUALITY OF LIFE AND DEGREE OF DYSPHONIA AMONG TEACHERS. HYGIENIC REQUIREMENTS TO THEIR PREVENTION

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The purpose of our research was to provide a general hygienic assessment of an effect produced by labor conditions on quality of life dependent on the prevalence rate of parameters that form the voice pathology, and to develop prevention recommendations. The interrelation between objective complaints and diagnosed voice pathologies was examined. 224 teachers aged ≥ 38 y. o. who participated in the study were selected based on subjective complaints and objective data. Two examined groups of teachers were formed during the preliminary survey. The first control group consisted of 30 healthy non-smoking men and 70 women. The second group included 26 men and 98 women with different voice disorders. 79% of those surveyed had voice disorders (dysphonia), and 28% had aphonia, which occurred in those surveyed 2–5 times during the academic year. Over 70% of teachers from the second group lost their voice strength, 61% complained of periodically occurring hoarse and husky voice, one third (32%) had dry cough, every fourth person (24%) complained of decreased voice pitch. The extraordinary majority of teachers (77%) associated their voice distortion with a great professional vocal load. Remote results obtained at six months after the therapeutic and preventive course of Homeovox in teachers of higher educational institutions with a voice pathology significantly confirmed life quality improvement.

Key words: voice pathology, teachers, survey, hygienic assessment of working conditions, prevention

Compliance with ethical standards: the study was approved by the Local Ethics Committee of Pirogov Russian National Research Medical University (Protocol No. 159 as of November 21, 2016). Informed consent was obtained for every participant. The conducted study carries no risk to the participants and corresponds to the requirements of biomedical ethics.

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Received: 19.01.2022 **Accepted:** 25.02.2022 **Published online:** 30.03.2021

DOI: 10.24075/rbh.2022.033

ВЛИЯНИЕ УСЛОВИЙ ТРУДА НА КАЧЕСТВО ЖИЗНИ И СТЕПЕНЬ ДИСФОНИИ У ПЕДАГОГОВ. ГИГИЕНИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ИХ ПРОФИЛАКТИКЕ

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Целью нашего исследования было дать обобщенную гигиеническую оценку влияния условий труда на качество жизни, обусловленное уровнем распространенности параметров, формирующих патологии голоса, а также разработать рекомендации по их профилактике. Исследовались взаимосвязь наличия объективных жалоб, диагностированных патологий голоса. На основе субъективных жалоб и объективных данных о диагностированных патологий голоса были отобраны 224 педагога в возрасте ≥ 38 лет, принявшие участие в исследовании. Предварительный опрос респондентов сформировал две обследуемые группы педагогов. Первую — контрольную, состоящую из здоровых некурящих 30 мужчин и 70 женщин. Вторая группа состояла из 26 мужчин и 98 женщин с различными заболеваниями голосового аппарата. В процессе опроса 79% респондентов группы отмечали нарушения голоса (дисфонию), а 28% — его полную афонию, возникающие у опрашиваемых от 2 до 5 раз в течение учебного года. Более 70% педагогов второй группы отмечали потерю силы голоса, 61% жаловались на периодически возникающий осиплый, охриплый голос, треть (32%) — на сухой кашель, каждый четвертый (24%) — на недостаточную высоту голоса. Подавляющее большинство педагогов (77%) связывали искажение голоса с большой профессиональной голосовой нагрузкой. Отдаленные результаты, полученные через шесть месяцев после проведенного курса лечебно-профилактического использования препарата «Гомеовокс» у педагогов высших ученых заведений с наличием патологии голоса, достоверно свидетельствовали об улучшении КЖ.

Ключевые слова: патология голоса, педагоги, опрос, гигиеническая оценка условий труда, профилактика

Соблюдение этических стандартов: данное исследование было одобрено ЛЭК РНИМУ им. Н. И. Пирогова (Протокол № 159 от 21.11.2016). Добровольное информированное согласие было получено для каждого участника. Проведенное исследование не подвергало опасности участников и соответствует требованиям биомедицинской этики.

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Статья поступила: 19.01.2022 **Статья принята к печати:** 25.11.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.033

A human voice does not only express personified information, social status, personal traits and emotional state of an individual, but is also a socially significant instrument of communication including upbringing and education which is playing an important role in daily domestic and labor life of a human. Voice disturbances belong to a frequent pathology in professional voice users.

Based on literature data, about 60% of teachers, 6–24% of adolescents during voice mutation and 41% of people with speech problems suffer from voice disturbances. In its turn, voice disturbances prevent healthy development of speech and communication, worsen mental health, restrict career choices [1–5].

Mechanical forcing of voice, loud speech during the process of teaching should be selected among the reasons leading to the pathology of the larynx and vocal cords. Unfavorable factors that influence the larynx include physical factors such as cold or hot dry air, taking icy drinks, general hypothermia.

The voice can become hoarse, with altered tone, voice pitch and strength due to smoking, alcohol intake, excessive use of hot and very cold or very spicy food. However, the most frequent reasons of voice disorders are infectious inflammation of the larynx and vocal cords resulting in laryngitis, pharyngitis, tonsilitis, etc.

Benign and malignant tumors leading to fatigue, voice hoarseness, throat irritation and pain occupy a certain place in the structure of laryngeal pathological conditions [6–12].

Diseases of the vocal apparatus decrease the working capacity, and create the risk of professional impropriety in some cases.

Significant speech loads demand higher standards of the vocal apparatus. This makes it necessary to develop preventive measures to preserve a healthy voice and search for the ways of its restoration in case of disturbance [13–18].

The research purpose was to estimate the LQ by the rate of dysphonia in teachers of higher educational institutions considering the load on the vocal apparatus that forms the class of labor conditions.

MATERIALS AND METHODS

The research was conducted from 2020 to 2021 in a number of some higher educational institutions of Moscow. 224 teachers aged 38 and elder were preliminary surveyed to find dysphonia of different degrees (vocalization disturbance) when the quality and functional adequacy of voice is violated (pitch, strength, tone, hoarseness, huskiness, etc.) until aphonia was developed or those with objective medical data about diagnosed nosologies of voice pathology [9, 19].

VHI-10 (Voice Handicap Index) was used to assess acoustic vocal characteristics and life quality (LQ) in teachers. The questions of VHI-10 questionnaire are based on the subjective acoustic analysis of questionnaire-based study of vocal function certain disturbances. Every one of the three VHI-10 questionnaires included 10 questions corresponding to one of the three dysphonia aspects: F (Functional); P (Physical); E (Emotional).

For each of 10 questions, the surveyed one selected the most suitable answer evaluated based on five-point score (0–4): 'never' — 0 points; 'almost never' — 1 point; 'occasionally' — 2 points; 'almost always' — 3; 'always' — 4 points. Thus, the common result could be as follows: minimum (0 points and above) or maximum (up to 120 points). Considering the number of obtained points, three rates of dysphonia were distinguished such as mild (up to 30 points); moderate (from 31 to 60 points); and severe (from 61 to 120 points) [20].

Hygienic assessment of labor severity and intensity considering the load on the vocal apparatus due to labor activity of teachers was done based on provisions of Guidance R 2.2.2006–05 'Hygienic classification of labor taking into account the values of harm and danger'. Optimal work (class 1) (judged by labor intensity) meant that the load on the vocal apparatus due to labor activity was less than 16 hours per week. Acceptable work (class 2) by labor intensity meant that the load on the voice apparatus was less than 20 hours. Judged by labor intensity, work can also be harmful (class 3 degree 1) with load on the vocal apparatus of 20 to 25 hours per week and harmful (class 3 degree 2) with load on the vocal apparatus of over 25 hours per week.

Hygienic assessment of microclimate for workplace environment (classrooms and lecture halls) was performed based on academic environment measured parameters and comparison with sanitary standards and norms of SanPiN 1.2.3685–21 'Hygienic standards and requirements to safety and (or) harmlessness of habitat factors for a human being'.

Treatment-and-prophylactic course aimed at preservation or restoration of a healthy voice included the use of Homeovox recommended by experts of the Ministry of Health of the Russian Federation [7].

Statistical data processing was done with widely acceptable methods handed using IBM PC, MS Excel and Statistica 6.0. During mathematical processing of research results the methods of parametric statistics were utilized. To estimate statistically significant differences, Student's t-test was applied.

In international and Russian practice, voice handicap index (VHI-10) developed by B. Jacobson et al. (1997) was used to study the intensity of vocal disturbances and life quality (LQ) in dysphonia. According to recommendations of the questionnaire's authors, the intensity of vocal disturbances was determined using the aggregate of points (VHI aggregate) consisting of three categories of dysphonia reasons: P (Physical), F (Functional), and E (Emotional).

When the sum exceeds 60 points, the LQ index corresponds to severe dysphonia, when the sum is 30–60 points, the LQ level determined a moderate voice disturbance, when the sum was less than 30 points, the LQ index corresponded to mild dysphonia. VHI values typical of professional voice adult users in Russia presented in literature sources are very limited. However, it's reliably known that VHI values for adults have no gender differences [21]. Careful interrogation enabled pooled collection of 224 respondents and formation of two examined groups of teachers. The first control group consisted of 30 male and 70 female healthy non-smokers. At baseline, they had no acute oropharyngeal diseases (pharyngitis, tonsilitis), pharyngeal and laryngeal abnormalities, and exacerbations of chronic inflammatory diseases of internal organs. The second group consisted of 26 men and 98 women with various diseases of the vocal apparatus. During the review, 79% of those surveyed had a voice disorder (dysphonia), whereas 28% of them lost their voice completely (aphonia) 2 to 5 times during an academic year. Over 70% of teachers from the second group lost the strength of the voice, 61% complained of periodically occurring hoarse and husky voice, one third part (32%) of patients complained of dry cough, every fourth patient (24%) had an insufficient voice pitch.

In teachers, such voice disturbances lasted from several minutes or hours to several days and weeks. The majority of teachers (77%) believed there was an association between voice distortion and professional vocal load. The patients usually had medical conclusions that confirmed the results of a complex examination (traditional instrumental examination of ENT-organs) to detect the presence of pathological abnormalities in the larynx. 20% of them reported chronic laryngitis or laryngotracheitis.

RESEARCH RESULTS AND THEIR DISCUSSION

Results of the conducted comparative analysis of LQ assessment for those surveyed from the control group and group of teachers with a voice pathology by the beginning of the academic year in higher educational institutions are presented in table 1.

The conducted studies showed a significant difference ($p < 0.05$) for all examined parameters of dysphonia reasons characterizing the LQ of those surveyed from the control group and from the group with a voice pathology presented in VHI-10 questionnaire.

On the contrary, the results of LQ comparative assessment in teachers from the control group demonstrated no significant

difference for all the examined parameters of dysphonia reasons and aggregate VHI considering the labor process severity and intensity at four months after the beginning of an academic process at higher institutions presented in table 2 ($p > 0.05$).

A more significant difference for all the examined parameters of dysphonia reasons and VIH aggregate was established at 4 months based on LQ comparative assessment results in teachers with a voice pathology depending on labor class (see table 3). However, no significant differences were found in this group as well for any studied parameter of VHI questionnaire ($p > 0.05$). It is interesting to note that the leading parameter with the largest value in the group of teachers with a voice pathology was represented by the value associated with physical disturbances (P) caused by dysphonia.

Considering the known data demonstrating that the majority of professional voice users with a durative vocal load who didn't undergo therapeutic and preventive activities have an abnormally intensified voice distortion, we suggested the following activities aimed at restoration of vocal function in teachers.

For this purpose, every one of the four groups of teachers with different classes of labor intensity who suffered from a voice pathology was divided into two parts. This resulted in formation of two groups with 62 teachers each. Every group consisted of four subgroups: 9 people for an optimal class; 14 people for an acceptable class; 19 people for a harmful class (class 3 degree 1) and 20 people for a harmful class (class 3 degree 2). Considering the recommendations of experts from the Russian Association of Phoniatrists and Phonopaedists and Association of ENT Specialists, one group (62 people) received Homeovox for treatment and prevention purposes (two tablets 5 times a day or more for 6 days) depending on the severity of the voice apparatus lesion.

Table 1. Aggregate results of life quality comparative assessment in those surveyed from the control group and a group of teachers with a voice pathology by the beginning of the academic year (M ± m), points

Parameters of VHI dysphonia reasons	LQ assessment among groups of those surveyed		
	control (n = 100)	Teachers with a voice pathology (n = 124)	p
physical P	5.8 ± 0.27	27.4 ± 0.85	< 0.05
functional F	3.8 ± 0.19	22.7 ± 0.68	< 0.05
emotional E	2.3 ± 0.19	13.7 ± 0.59	< 0.05
VHI aggregate	11.9 ± 0.63	63.8 ± 2.0	< 0.05

Table 2. Life quality comparative assessment results in teachers from the control group considering the severity and intensity of a labor process at four months from the beginning of the academic process at a higher institution (M ± m), points

Parameters of VHI dysphonia reasons	LQ assessment among teachers of the control group depending on a labor class			
	Optimal (class 1) (n = 16)	Acceptable (class 2) (n = 18)	Harmful (class 3 degree 1) (n = 28)	Harmful (class 3 degree 2) (n = 38)
physical P	4.8 ± 0.5	5.3 ± 0.6	6.4 ± 0.4	6.9 ± 0.4
functional F	3.3 ± 0.3	3.7 ± 0.5	3.8 ± 0.2	4.7 ± 0.2
emotional E	1.4 ± 0.4	1.8 ± 0.3	2.3 ± 0.2	2.7 ± 0.2
VHI aggregate	9.5 ± 1.1	10.8 ± 1.3	12.5 ± 0.8	14.3 ± 0.9

Table 3. Life quality comparative assessment results in teachers with a voice pathology considering the labor process severity and intensity at four months from the beginning of the academic process at a higher institution (M ± m), points

Parameters of VHI dysphonia reasons	LQ assessment among teachers with a voice pathology depending on a labor class			
	Optimal (class 1) (n = 18)	Acceptable (class 2) (n = 28)	Harmful (class 3 degree 1) (n = 38)	Harmful (class 3 degree 2) (n = 40)
physical P	20.8± 1.6	26.6± 1.4	31.6± 1.4	36.7± 1.5
functional F	16.7± 1.0	17.7± 1.0	21.9± 1.5	22.8± 1.3
emotional E	11.9± 0.5	11.9± 0.8	18.9± 1.2	18.7± 1.3
VHI aggregate	49.4± 3.1	56.2± 3.2	72.4± 3.8	78.2± 4.1

Table 4. Life quality comparative assessment results in teachers with a voice pathology considering the labor process severity and intensity at six months after the therapeutic and preventive effect of Homeovox (M ± m), points

Parameters of VHI dysphonia reasons in subgroups of those who received Homeovox (numerator) and those who didn't receive Homeovox (denominator)	LQ assessment among teachers with a voice pathology depending on the class of labor intensity after therapeutic and preventive effect (numerator) and without such an effect (denominator)			
	Optimal (class 1) (n = 9; n = 9)	Acceptable (class 2) (n = 14; n = 14)	Harmful (class 3 degree 1) (n =19; n = 19)	Harmful (class 3 degree 2) (n = 20; n = 20)
physical P	10.4 ± 1.3* 22.6 ± 2.5	12.3 ± 1.3* 27.6 ± 1.7	17.8 ± 1.3* 36.6 ± 1.7	18.5 ± 1.5* 39.6 ± 2.1
functional F	7.6 ± 0.7* 17.8 ± 1.3	8.5 ± 0.9* 18.6 ± 1.7	11.3 ± 1.0* 23.7 ± 1.9	12.7 ± 1.2* 24.9 ± 1.4
emotional E	4.2 ± 0.4* 12.2 ± 0.6	4.8 ± 0.5* 12.8 ± 0.6	6.4 ± 0.6* 19.8 ± 1.0	6.6 ± 0.5* 20.6 ± 1.2
VHI aggregate	22.2 ± 2.4* 52.6 ± 2.4	25.6 ± 2.6* 59.0 ± 2.5	35.5 ± 2.9* 80.1 ± 2.6	38.1 ± 3.1* 85.1 ± 2.7

Note: * significant result $p < 0.05$.

Assessment results of VHI-10 values obtained at six months after the therapeutic and preventive effect of Homeovox on the subgroups of teachers with a voice pathology are presented in table 4.

The presented results of life quality comparative assessment in subgroups of teachers with a voice pathology demonstrate its stable effectiveness considering the rate of labor process severity and intensity at six months after the therapeutic and preventive effect of Homeovox and in those who didn't receive the medicinal agent. Thus, life quality comparative assessment with VHI-10 questionnaire shows a significant difference ($p < 0.05$) for all the examined parameters of dysphonia reasons, including VHI aggregate, in teachers with a voice pathology who took Homeovox in all labor class subgroups at 6 months.

Similar positive results were previously obtained by way of comparative assessment of life quality with VHI-10 questionnaire when examining effectiveness of the course of a therapeutic and preventive effect aimed at preservation of a healthy voice or its restoration in case of inflammatory abnormal processes in the nasopharynx. The course included sevenfold irrigation with 0.05% chlorhexidine bigluconate aqueous solution every alternate day and subsequent lubrication with Lugol's solution.

The use of VHI-10 questionnaire is currently widely applied in foreign practice not only for LQ research in voice disorders, but also to determine the effectiveness of new methods of dysphonia prevention and treatment [22–30].

At the same time, Homeovox has a number of significant advantages consisting in high effectiveness irrespective of dysphonia reasons, as well accelerated and stable restoration of a professional vocal function.

CONCLUSIONS

1. Based on VHI-10 questionnaire result assessment, by the beginning of the academic year, teachers of higher educational institutions with a voice pathology had significantly worse LQ values ($p < 0.05$) for all dysphonia reason parameters (P, F, E), including VHI aggregate, as compared with healthy teachers.
2. According to VHI-10, labor process severity and intensity produced no significant effect on dysphonia reason parameters (P, F, E) that characterized LQ of teachers without a voice pathology. Similar, more pronounced, but insignificant results were obtained in the examination of the effect produced by labor conditions of different classes on LQ of teachers with the vocal apparatus pathology.
3. According to VHI-10, remote results obtained at six months after the course of therapeutic and preventive use of Homeovox in teachers of higher educational institutions with a voice pathology significantly ($p < 0.05$) demonstrated LQ improvement for all parameters that characterized both dysphonia reasons (P, F. E), and VHI aggregate parameters.

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MEDICAL VOLUNTEERING: THE PRESENT COURSE

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Volunteering is becoming an integral part of life of people of different age. Volunteers can currently be met in every sphere of life. The phenomenon of readiness to free aid is particularly evident in healthcare. Schoolchildren, students and young specialists participate in this process. The purpose of the article is to systematize and represent the modern stage of medical volunteering development as part of volunteer activities and social phenomenon that can be formed with the help of a favorable environment and measures of support at the state, industry-specific and regional levels. Volunteer activity can serve as a good tool of sanitary education of citizens and volunteers.

Keywords: volunteering, medical volunteering, public health, sanitary education

Author contribution: Savchuk PO — literature analysis, data collection and analysis, data interpretation, preparing a draft manuscript, preparing the final version of the manuscript; Milushkina OY — article plan, data interpretation, adjusting the draft manuscript.

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Received: 19.01.2022 **Accepted:** 27.02.2022 **Published online:** 30.03.2022

DOI: 10.24075/rbh.2022.037

МЕДИЦИНСКОЕ ДОБРОВОЛЬЧЕСТВО: СОВРЕМЕННОЕ РАЗВИТИЕ

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Добровольческая (волонтерская) деятельность становится неотъемлемой частью жизни людей совершенно разного возраста. Сейчас волонтеров можно встретить, пожалуй, в каждой сфере жизни общества. Особенно феномен готовности к безвозмездной помощи проявляется в сфере здравоохранения. Участниками этого процесса становятся школьники, студенты, молодые специалисты. Целью данной статьи являются систематизация и изложение современного этапа развития медицинского добровольчества как части добровольческой деятельности и социального феномена, формированию которого способствуют благоприятная среда и меры поддержки, создаваемые на государственном, отраслевом и регионном уровнях. Волонтерская деятельность может быть хорошим инструментом по санитарному просвещению граждан и самих волонтеров.

Ключевые слова: волонтерство, медицинское волонтерство, общественное здоровье, санитарное просвещение

Вклад авторов: П. О. Савчук — анализ литературы, сбор и анализ данных, интерпретация данных, подготовка черновика рукописи; подготовка итоговой версии рукописи; О. Ю. Милушкина — план статьи, интерпретация данных, внесение корректировок в черновик рукописи.

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Статья поступила: 19.01.2022 **Статья принята к печати:** 27.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.037

The Universal Declaration on Volunteering (issued during the XVI World Conference of the International Association of Volunteering Efforts (IAVE) in Amsterdam in 2001) states as follows: 'All people around the globe should be able to voluntarily devote their time, talent and energy to other people or their communities by means of individual or collective actions without expecting financial reward in return'.

By the beginning of the second decade of the XXI century, the total number of volunteers in Russia exceeded 1.5% of the total population [1].

Volunteering is widely spread around the globe. Its subject is free aid represented as execution of various works and/or services intended for all those in need [2]. The spectrum of volunteering is rather wide: from eventful volunteering during sports events to professional pro bono activity (from the Latin term 'pro bono publico' meaning 'for the public good'). Volunteering is an activity represented as free execution of various works and/or services in order to solve social tasks in education, healthcare, culture, social support and social services, physical culture and sports, environmental protection, prevention and mitigation of emergencies. Assistance in volunteering development and promotion is a priority guideline of social and youth policy in accordance with the Concept of Volunteering Development in the Russian Federation until 2025 (approved by Government Resolution of the Russian Federation as of December 27, 2018 No. 2950-p) [3]. Establishment of medical volunteering is considered separately in this review.

MATERIALS AND METHODS

Volunteering and medical volunteering regulatory acts, international research on participation of volunteers in healthcare, analysis of stages of medical volunteering establishment in Russia in the XXI century.

RESULTS AND DISCUSSION

In recent years, a stable growth of citizens and various companies participating in volunteering has been observed.

As a result of labor force survey conducted by the Federal State Statistics Service, a steady increase in population aged 15 or older who participated in volunteering was observed in 2016–2020 [4]. Thus, a number of volunteers accounted for over 1.44 mln people in 2016, over 1.47 mln people in 2017,

over 1.53 mln people in 2018, over 1.79 mln people in 2019, and 2.03 mln people in 2020 (increased 1.4-fold than in 2016). The results of reviews held by the Public Opinion Foundation in 2020 showed a positive tendency to the increased number of citizens engaged in volunteering [5].

Thus, 23% of those reviewed consider themselves volunteers or former volunteers.

In 2019, the Government of the Russian Federation determined the procedure of functioning of the Unified Information System (Dobro.ru UIS) as far as volunteering goes, and rules of UIS interaction with other information systems [6]. Healthcare volunteering is developing in a particularly intensive way. Based on the open data taken from Dobro.ru UIS, 'Healthcare and Healthy Life Style' position holds the third most popular place among volunteers, and 208,378 people are involved in this activity via the portal (as of January 30, 2022).

Systemic and large-scale development of medical volunteering started in 2013 with the Sklif's Volunteers Project. President of the Russian Federation V. V. Putin in his address to the Federal Assembly delivered as follows: 'We need to revive the traditions of charity. I suggest that we start a wide movement of volunteers in Russia who are ready to work in the health sector and afford all possible assistance' [7]. Then the project gained support and was over time transformed into the Medical Volunteer association. In 2016, the association was registered as the All-Russia Social Healthcare Movement of Medical Volunteers. Today, the voluntary organization provides a regular volunteer aid in 1,200 medical institutions with volunteers from 260 higher and secondary medical schools and schoolchildren from 1,900 educational institutions being involved.

In 2017, the Federal Center of Health Volunteering Support of the Ministry of Health of the Russian Federation (hereinafter referred to as the FCHVS of the Ministry of Health of the Russian Federation) was created by the Ministry of Health as an administration and organization resource to coordinate the work of authorities in health protection and their interaction with volunteering organizers and volunteer associations in Russia [8].

The goal of the work of the FCHVS of the Ministry of Health of the Russian Federation is to develop common approaches to building and work of volunteering movements, development, methodological support and promotion of volunteering initiatives, identification and dissemination of successful volunteering practices, and pooling of resources to solve problems and overcome barriers that arise during volunteering organization and implementation.

The system of medical volunteering in Russia includes as follows:

- Federal Center of volunteering and mentoring support of the Ministry of Health of the Russian Federation;
- All-Russia Public Movement of Medical Volunteers having departments in 85 regions on the basis of medical universities, institutes and colleges (over 100,000 volunteers);
- network of employees responsible for support of health volunteering among regional healthcare authorities of constituent entities of the Russian Federation and responsible employees in medical organizations;
- other specialized interregional, regional and municipal non-commercial organizations, volunteering organizers.

The main directions of health protection volunteering include aid provided to medical personnel and patient care in medical organizations; sanitary education and prevention of socially significant diseases; popularization of a healthy way of life (improved health literacy); teaching population the skills of first aid; facilitating medical support during sports and public events; popularization of regular donorship of blood and its components; health care orientation for students. According to volunteers, participation in healthcare volunteering enables to develop specialized skills and competences, increase the level of professional leadership and provide assistance in developing effective communication with patients [9]. Thus, the obtained experience in volunteering can produce a direct influence on both overprofessional, and professional skills, and expand the circle of competencies. Guidelines on volunteering accounting for those entering the residency have been currently implemented in the country. This is an additional motivation for healthcare volunteers [10].

In Russia, creation of a favorable environment for medical volunteering is set in the Standard of health protection volunteering support in federal constituent entities of the Russian Federation developed by the FCHVS of the Ministry of Health of the Russian Federation in 2019 and implemented until today [11]. It includes regular and effective interaction of the employees responsible for volunteering development with the volunteering community aimed at subsequent development and strengthening of health protection volunteering in federal constituent entities of the Russian Federation, monitoring of volunteering environment, making a plan of medical volunteering development, regulatory support of medical volunteering in a region, consultative, information and methodological assistance, and resource support of volunteering regional organizers by federal constituent entities of the Russian Federation. The basic principle is represented by publicity and transparency. Annual rating of regional volunteering support is based on healthcare data taken from sites of government authorities of federal constituent entities of the Russian Federation.

CONCLUSIONS

Considering the level and multilateral format of healthcare volunteering development in the Russian Federation, it can be taken and used as a good tool of sanitary education of citizens and volunteers (during specialized volunteering).

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AWARENESS OF REPRODUCTIVE HEALTH PROTECTION ISSUES AMONG FEMALE STUDENTS

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The study was aimed to define the female students' awareness of the reproductive health protection issues. A survey was conducted in 2021–2022 in order to study the onset of menstrual cycles and age at menarche in 372 female students of medical and non-medical universities and colleges of the Central Federal District. The survey of 530 female students concerning their knowledge about the reproductive health protection issues and their attitude towards sexuality education for children and adolescents was also conducted. Statistical processing was performed using the Statistica 10.0 software package (StatSoft, USA). Insufficient knowledge about the reproductive health protection issues among students was reported: the contingency coefficient for the presence of real menstrual disorder and the students' belief of having problems was low (Pearson contingency coefficient = 0.31, $p \leq 0.05$).

Key words: menstrual function, female students, reproductive health care

Author contribution: all authors contributed to manuscript preparation equally.

Compliance with ethical standards: the study was approved by the Ethics Commitee of Pirogov Russian National Research Medical University (protocol No. 159 dated November 21, 2016) and conducted within the framework of the research project (R&D project national number AAAA-A19–119021890068–7, February 18, 2019); the study did not endanger the participants and complied with the principles of biomedical ethics; the informed consent was obtained for all subjects.

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Received: 21.01.2022 **Accepted:** 27.02.2022 **Published online:** 30.03.2021

DOI: 10.24075/rbh.2022.038

ИНФОРМИРОВАННОСТЬ СТУДЕНТОК ПО ВОПРОСАМ ОХРАНЫ РЕПРОДУКТИВНОГО ЗДОРОВЬЯ

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Целью исследования явилось установление информированности студенток по вопросам охраны репродуктивного здоровья. Методом анкетирования в 2021–2022 гг. было изучено становление менструальной функции и возраст менархе у 372 студенток медицинских и немедицинских вузов и колледжей, обучающихся в ЦФО, и также проведено анкетирование 530 студенток, связанное с их информированностью по вопросам охраны репродуктивного здоровья и субъективным отношением к проведению полового воспитания детей и подростков. Статистическая обработка проводилась с использованием пакета Statistica 10.0 (StatSoft, США). Показан недостаточный уровень информированности студенток по вопросам охраны репродуктивного здоровья: коэффициент сопряженности наличия реальных нарушений менструального цикла у студенток с их мнением о наличии у них нарушений оказался невысоким (коэффициент сопряженности Пирсона 0,31, $p \leq 0,05$).

Ключевые слова: менструальная функция, студентки, охрана репродуктивного здоровья

Вклад авторов: все авторы сделали эквивалентный вклад в подготовку публикации.

Соблюдение этических стандартов: исследование одобрено ЛЭК РНИМУ им. Н. И. Пирогова (протокол № 159 от 21.11.2016) и выполнялось в рамках НИР (номер государственного учета НИОКТР АААА-А19–119021890068–7 от 18 февраля 2019 г.), не подвергало опасности участников, соответствовало требованиям биомедицинской этики, для каждого участника было получено добровольное информированное согласие.

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Статья поступила: 21.01.2022 **Статья принята к печати:** 27.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.038

As defined by the WHO, reproductive health is the ability to conceive and give birth to a child, protection against sexually transmitted infections, access to family planning, ptotection and safety during pregnancy and labor, maintaing maternal and child health [1].

The importance of the youth reproductive health protection was noted at the federal level with the Demography project implemented in 2019.

Researchers distinguish the following factors contributing to the reproductive health challenges faced by girls: low quality healthcare, unfavourable socio-economic conditions, low income family, healthcare system weakness at the state level, low medical activity, and the lack of awareness about the reproductive health protection issues [2–11].

The study was aimed to define the female students' awareness of the reproductive health protection issues.

METHODS

An online survey was conducted in 2021–2022 in order to study the establishment of menstrual cycles and age at menarche in 372 female students of medical and non-medical universities and colleges of the the Central Federal District, which, according to the method by Otdelnova KA, ensured a 95.0% confidence level of the results [12]. The average age of the surveyed students was 19.5 ± 0.3 years. The database "Status of Reproductive Function in Schoolchildren, Students

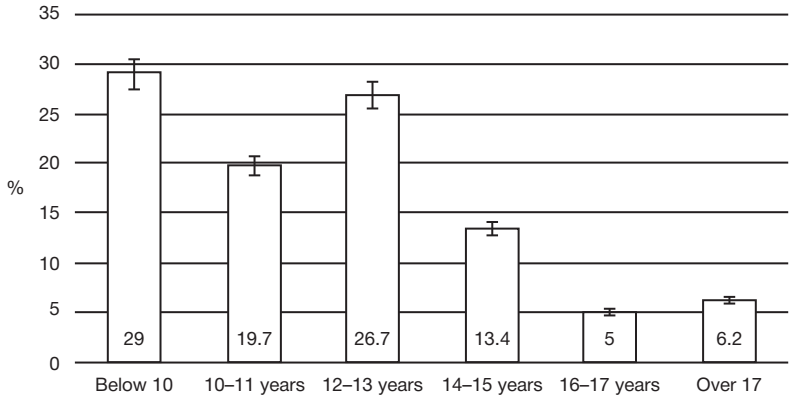

Fig. Distribution of students based on their answers about the age of starting sexuality education for children and adolescents,%

and Medical Students, and Their Awareness of Possible Menstrual Disorders" was created based on the findings.

When condicting the online survey in 2021, the students were given questions concerning their awareness of the reproductive health protection issues and their subjective attitude towards sexuality education for children and adolescents. A total of 530 female students were surveyed, their average age was 19.3 ± 0.3 years. The database "Attitude of Students and Medical Students towards Hygiene Education, and the Role of Online Resouces in the Process (Illustrated by The Younger Generation Reproductive Health Protection)» 2021622290 dated October 26, 2021.

The questions in the questionnaire were prepared with the involvement of teachers at the Department of Hygiene having the following certificates: "Hygiene of Children and Adolescents", "Hygiene Education". Inclusion criteria: correct fill-in of the questionnaire that was considered the informed consent, students belonging to the relevant gender and age group, residence in the Central Federal District.

The data obtained were processed using the Statistica 10.0 software package (StatSoft, USA). The results were tested for normality prior to processing. Discriptive statistics was used: the mean (M) and standard deviation (σ). Student's t-test was used to assess the significance of differences between the mean values (the differences were considered significant when $p \leq 0.05$). Pearson contingency coefficients were calculated (95.0%, $p \leq 0.05$).

RESULTS

In 87.6% of students, menarche occured between the ages of 11–14, the onset of menstruation took place under 10 of age in 5.7% of students, and 7.0% of students had menarche at the age of 15 or older.

The features of menstrual cycle were studied in students. At the time of the survey, menstrual cycles less than 21 days (epimenorrhea) were reported in 1.6% of students; the menstrual cycle length exceeding 35 days (opsomenorrhea) was found in 9.9% of students. The period length exceeding 7–8 days was noted by 14.8% of students; the period delay of 9 days and more was reported by 35.2%.

A total of 35.5% students replied positively to the question "Do you have problems with menstrual cycle?", however, contingency coefficient for the presence of real menstrual disorder and the students' belief of having problems was low (Pearson contingency coefficient = 0.31, $p \leq 0.05$), which was indicative of the lack of awareness of the reproductive health protection issues. This argument was supported by the fact that 34.0% of students had never received any information about the reproductive health protection, and another 45.0% were hardly ever provided such information.

Probably it was the lack of up-to-date information and knowledge about the reproductive health protection issues that resulted in the following distribution of the students' answers to the question "At what age should sexuality education begin?" (Fig.): a quarter of students (24.6%) suggested to discuss the issues of sexuality education with children and adolescents older than 13, which was irrelevant based on the age at menarche.

DISCUSSION

In recent years, Russian researchers are increasingly focusing on protecting the youth reproductive health due to the demographic situation. Reproductive health of students is the most exposed to negative lifestyle and social factors, which make it a multifaceted problem. High social expectations of this group of young people requires the utmost attention to the issue [13].

Knowlege about the reproductive health is an important aspect of the girl's life after reaching puberty, since the ability to conceive and bear children depends on her reproductive health. The basic knowledge of reproductive health is necessary to ensure sufficient control and timely medical activity. However, according to a number of authors, even the basic knowledge among female medical students is insufficient and requires focusing on the issues of reproduction during junior years [14].

Among female college students, the level of knowledge about the cultural context of reproductive health is below 35.0% [15].

Our study also shows low awareness of the reproductive health protection issues among female students.

Various educational programs are one of the efficient tools for prevention of menstrual disorders and reproductive health protection [16, 17].

The earlier quasi-experimental operational research aimed at assessing the efficiency of the two types of reproductive health training programs for female students showed that, regardless of the intervention (lectures for the year group or training seminars in the groups), both reproductive health training programs had equal efficiency and contributed to better understanding of reproductive health among students [18].

CONCLUSIONS

The study revealed the features of menstrual cycle in female students of medical and non-medical universities and colleges of the Central Federal District. Insufficient level of knowledge about the reproductive health protection issues was reported: the contingency coefficient for the presence of real menstrual disorder and the students' belief of having problems was low (Pearson contingency coefficient = 0.31, $p \leq 0.05$).

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EFFECT OF PSYCHOLOGICAL CLIMATE ON RISKS OF BURNOUT SYNDROME IN A TEAM OF HEALTHCARE PROFESSIONALS

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Healthcare professionals deal with the greatest prevalence of burnout syndrome (BS). The object of this paper is to study the effect of psychological climate and working conditions on risks of burnout in a team of healthcare professionals. Working conditions of 136 healthcare workers from the Saratov region who underwent little training were examined according to Regulation 2.2006–05. The level of burnout was estimated in accordance with the method of V. V. Boyko, and the psychological climate in a team was analyzed using A. F. Fiedler's questionnaire. The results were processed with the help of Microsoft Excel 10 for Windows. Based on the research results, the BS signs were recorded in 52.3% of healthcare workers. Physical and emotional symptoms were predominant BS signs. Factors predisposing to BS in healthcare workers have been determined. It is established that there is a dependence between a harmful factor of working conditions and probable BS. The dependence acquires significance at 3.2 level of working conditions. It is determined that the risk of BS was 74.3% in the most unfavorable psychological climate, and didn't reach 21% if the climate was favorable.

Keywords: medical workers, working process conditions, psychological climate in a team, burnout syndrome

Author contribution: Eliseeva YuV — academic advising, study concept and design, writing an article, approval of a manuscript for publication; Ratushnaya NSh — collection, data acquisition and processing, analysis and interpretation of results, writing an article; Dubrovina EA — collection, data acquisition and processing, result analysis and interpretation, writing an article.

Compliance with ethical standards: the trial was approved by the Local Ethics Committee of V. I. Razumovsky Saratov State Medical University (protocol No. 5 as of 02.03.2021). Voluntary informed consent was obtained from every trial participant and signed by all those examined by healthcare professionals. The trial corresponded to the requirements of biomedical ethics. No participant was exposed to danger.

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Received: 20.01.2022 **Accepted:** 24.02.2022 **Published online:** 30.03.2022

DOI: 10.24075/rbh.2022.035

ВЛИЯНИЕ ПСИХОЛОГИЧЕСКОЙ ОБСТАНОВКИ НА РИСК РАЗВИТИЯ ЭМОЦИОНАЛЬНОГО ВЫГОРАНИЯ В КОЛЛЕКТИВЕ МЕДИЦИНСКИХ РАБОТНИКОВ

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Распространенность синдрома эмоционального выгорания (СЭВ) остается наибольшей среди работников медицинских профессиональных групп. Цель работы — изучение влияния психологической обстановки и условий труда на риск развития эмоционального выгорания в коллективе медицинских работников. Изучены условия труда 136 малостажированных медработников лечебных учреждений Саратовской области согласно Руководству 2.2006–05. Уровень эмоционального выгорания оценивался по методике В. В. Бойко, анализ психологической обстановки в трудовом коллективе — по опроснику А. Ф. Фидлера. Обработка результатов исследования проводилась с помощью прикладных статистических программ Microsoft Excel 10 for Windows. По результатам исследования у 52,3% медицинских работников регистрировались признаки СЭВ. Среди групп симптомов СЭВ преобладали: физические и эмоциональные симптомы. Определены факторы, предрасполагающие к возникновению СЭВ у медработников. Установлено, что между фактором вредности условий труда и вероятностью развития СЭВ имеется зависимость, которая становится значимой при классе условий труда 3.2. Определено, что при максимальном уровне неблагоприятной психологической обстановки в коллективе риск развития СЭВ составлял 74,3%, при благоприятной обстановке — не превышал 21%.

Ключевые слова: медицинские работники, условия трудового процесса, психологическая обстановка в коллективе, синдром эмоционального выгорания

Вклад авторов: Елисеева Ю. В. — научное руководство, концепция и дизайн исследования, написание статьи, утверждение рукописи для публикации; Ратушная Н. Ш. — сбор, получение и обработка данных, анализ и интерпретация результатов, написание статьи; Дубровина Е. А. — сбор, получение и обработка данных, анализ и интерпретация результатов, написание статьи.

Соблюдение этических стандартов: данное исследование было одобрено ЛЭК ФГБОУ ВО «Саратовский ГМУ им. В. И. Разумовского» (протокол № 5 от 02.03.2021 г.). Добровольное информационное согласие было получено от каждого участника исследования и подписано всеми участвующими в обследовании медицинскими работниками. Исследование соответствовало требованиям биомедицинской этики и не подвергало опасности участников.

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Статья поступила: 20.01.2022 **Статья принята к печати:** 24.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.035

One of the most important tasks of hygienic science and sanitary practice includes preservation and promotion of health among medical workers [1–6]. To solve the task, it is necessary to develop a real methodology analyzing professional risks for health of medical workers based on the study of working conditions [7–23], and on detailed analysis of the 'climate' in teams, conditions of stressful circumstances and possible concurrent burnout (BS) among medical personnel. During the last 10 years, prevalence of BS among medical workers has been increased by 1.5–2 times [24]. BS significantly exceeds the level noted in any other professional team for now and reaches critical levels in healthcare industry [25–29]. Analysis of the outcomes obtained through implementation of the suggested methodology can result in subsequent correctly substantiated development of preventive activities designed to decrease occupational morbidity of healthcare workers.

The purpose of the paper consisted in studying the effect of psychological climate and working conditions on risks of burnout in a team of healthcare professionals who underwent little training.

MATERIALS AND METHODS

The conditions of occupational environment, severity and intensity of the working process when surveying 136 working positions of medical professionals who underwent little training (1 to 5 years of work) from health facilities of the Saratov region were examined in accordance with Guideline 2.2006–05 'Hygienic estimation of environmental factors and working process. Criteria and classification of working conditions'. The level of burnout in healthcare professionals was assessed following the generally accepted method by V. V. Boyko [30]. The method allows to record separate signs or symptoms of burnout (12 of them in total) associated with subsequently developed stages (phases) of stress: tension, resistance and exhaustion. The psychological climate among employees was analyzed using A. F. Fiedler's questionnaire. It was used to estimate words with an opposite meaning by a number of bipolar scales. For this, cognitive studies were conducted by the technique of semantic differential of verbal antonyms.

The technique is interesting due to a combination of a scaling procedure selecting the most significant (up to 8 scores) response out of 10 points in the anonymous examination. As a result, the final indicator of the psychological climate among employees can reach 10 (the most positive result) to 80 points (the most negative result). The study results were processed with the help of Microsoft Excel 10 for Windows. The level of difference significance ($p < 0.05$) was determined using a Mann-Whitney U-test for non-parametric values.

TRIAL RESULTS

Based on the trial results, initial signs of BS (tension phase) were recorded in the majority of examined healthcare professionals (52.3%). BS prevalence in various professional teams was estimated at the average level of 30–60%.

Physical (tiredness, physical fatigue, exhaustion, weight change, poor sleep, a rise in arterial blood pressure, cardiovascular diseases) and emotional symptoms (lack of emotions, pessimism, cynicism, indifference, tiredness, feeling of helplessness and despair, aggressiveness, irritability, anxiety, increased irrational anxiety, inability to concentrate; depression, feeling of guilt, loss of ideals, hopes or professional perspectives, increased depersonalization) were predominant BS signs.

According to the opinion of healthcare professionals, the most frequent factors leading to BS included tight schedule and working conditions; the level of salary not corresponding to applied physical efforts; impossibility to influence the activity result; monotonous, dead-end job; necessity to show emotions that don't correspond to inner feelings; lack of time; necessity to work during free time; frequent negative labor estimation; chaotic organization of working time; unhealthy competition in the employment setting.

It is established that the factors of a working process determining levels of working conditions among healthcare professionals produced a direct effect on risks of BS in medical personnel from the studied MPI of the Saratov region (table 1). Thus, considering the conducted working process, the risk of burnout at 2.0 level of working conditions and in 5 years of working experience amounted to 30.7%. In 46.6% of cases, BS was developed at 3.2 level of working conditions and with a similar period of working experience. Taking into account the obtained data, an interrelation between the harmful factor of working conditions and risk of BS can be suggested.

Our studies have shown that the maximum risk of BS was associated not only with 3.2 level of working conditions, but also with the level of unfavorable psychological climate among healthcare professionals (table 2). Thus, when the maximum level of unfavorable psychological climate in a team of healthcare professionals reaches the score of 80, the risk of BS was 74.3%. Under the favorable conditions (the score of 20) the risk of BS didn't exceed 21%.

DISCUSSION OF RESULTS

In accordance with literature data presented by Russian authors, over half of different healthcare professionals in Russia report constantly high psychoemotional tension. The latter is accompanied with a significant growth of the so-called burnout syndrome among healthcare professionals with reasonable dismissal and subsequent reduction of qualified staff. There is an opinion that burnout produces a negative effect on a doctor's working capacity, his/her health and quality of aid, but it can also play a protective role.

Burnout symptoms probably occur to protect the mind from subsequent damage when there is no way out [28–29]. In all works presented by the authors, BS is reasonably related either to the profession of a medical worker (psychiatrist, narcologist, oncologist) or to age-related traits of a specialist and his or her professional experience [25–27]. However, it should be noted that unlike our trials, the abovementioned authors failed to analyze the interrelation between BS and unfavorable psychological climate inside a team, and study the severity and intensity of doctors'

Table 1. Risk of BS at the stage of exhaustion among medical personnel (in %) considering the effect of working conditions (level) and employment term

Working conditions (level)	Employment term (completed years)				
	1 year	2 years	3 years	4 years	5 years
2.0	–	–	12.2	24.3	30.7
3.1	–	16.2	18.8	28.6	33.4
3.2	–	19.8	23.4	36.8	46.6

Table 2. Risk of BS at the stage of exhaustion among medical personnel (in %) considering the effect of working conditions (level) and various level of unfavorable psychological climate in a team of people with similar 5 years of employment

Working conditions (level)	Level of unfavorable psychological climate in a team of healthcare professionals with completed 5 years of employment (in scores)			
	20	40	60	80
2.0	4.7	12.3	24.2	32.4
3.1	16.2	24.6	33.2	58.5
3.2	21.0	38.6	48.9	74.3

harmful working conditions. Meanwhile, the study conducted by us has fully confirmed our hypothesis about the interrelation between BS and intensity of psychological ill-being in a medical team and harmfulness level of working environment.

The results obtained during the conducted trial provided strong evidence for current dependence of medical workers' health protection not only on working conditions, but also on the nature of unfavorable psychological climate in a team. This resulted in development of burnout syndrome among healthcare professionals.

CONCLUSION

1. In a half of examined healthcare professionals with up to 5 years of employment, initial signs of burnout were determined during the conducted trials.
2. In the permissible limit of working conditions, the prevalence of burnout was determined in 30.7% of cases, whereas in harmful conditions of 2 degree it was defined in 46.6% of cases.
3. In the most unfavorable psychological climate (in scores) the risk of burnout among healthcare professionals was 74.3%.

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HYGIENIC ASSESSMENT OF HEALTH GROUPS ASSIGNED TO STUDENTS OF CHELYABINSK AND AKTOBE UNIVERSITIES WHO PARTICIPATE IN PHYSICAL EDUCATION CLASSES

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The article presents a comparative assessment of the health of students of the Russian Federation and Kazakhstan, obtained by copying and analyzing the distribution by health groups during physical education classes. Statistical data processing was carried out using Statistica 13.0 software. A comparative analysis of the health of students in the Russian Federation and Kazakhstan according to medical records made it possible to establish that at the beginning of education at the university, the number of students with the main group for physical education is 36–42%, during the period of study it decreases to 30–38%. At the same time, there were no significant differences in the analyzed parameters. The obtained data on health assessment are the basis for the development of educational programs in the medical-biological, natural-science areas and for the research work of students. This study was carried out within the framework of the International Scientific and Pedagogical Cooperation.

Keywords: health, students, a group for physical education

Author contribution: Makunina OA — literature review, analysis of trial results, article presentation, corresponding author; Botagariyev TA— organizing and conducting a trial at K. Zhubanov Aktobe Regional University; Kovalenko AN— organizing and conducting a trial at the Ural State University of Physical Culture; Bykov EV — analysis of trial results; Kubieva SS — analysis of trial results, organizing and conducting a trial at K. Zhubanov Aktobe Regional University.

Acknowledgements: the authors express their gratitude to health professionals of students' outpatient clinics of the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University for their assistance and cooperation in organizing the trial, and to Lyudmila L. Golyshmanova, translator of the Ural State University of Physical Culture, for professional translation of the article title, abstract, key words and references. The trial was carried out within the framework of the International Scientific and Pedagogical Cooperation of the Ural State University of Physical Culture (Chelyabinsk) and K. Zhubanov Aktobe Regional University (Aktobe).

Compliance with ethical standards: all trials were conducted in accordance with the principles of biomedical ethics represented in the Declaration of Helsinki of 1964 and its subsequent updates, and approved by the Local Bioethics Committee of the Ural State University of Physical Culture (Chelyabinsk), Minutes of the meeting of the Ethics Committee as of January 14, 2022 No. 5.

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Received: 19.01.2022 **Accepted:** 21.02.2022 **Published online:** 30.03.2022

DOI: 10.24075/rbh.2021.039

ГИГИЕНИЧЕСКАЯ ОЦЕНКА ГРУПП ЗДОРОВЬЯ СТУДЕНТОВ Г. ЧЕЛЯБИНСКА И Г. АКТОБЕ ДЛЯ ЗАНЯТИЙ ФИЗИЧЕСКОЙ КУЛЬТУРОЙ

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В статье представлена сравнительная оценка здоровья студентов Российской Федерации и Казахстана, полученная путем выкопировки и проведения анализа распределения по группам здоровья в ходе занятий по физической подготовке. Статистическая обработка данных проведена с использованием программного обеспечения Statistica 13.0. Сравнительный анализ здоровья студентов Российской Федерации и Казахстана по данным медицинских карт позволил установить, что на начало обучения в вузе количество студентов с основной группой для занятий физической культурой составляет 36–42%, за период обучения он уменьшается до 30–38%. При этом достоверных различий по анализируемым параметрам не выявлено. Полученные данные по оценке здоровья являются основанием для разработки образовательных программ медико-биологического, естественно-научного направления и проведения научно-исследовательской работы студентов. Настоящее исследование выполнено в рамках Международного научно-педагогического сотрудничества.

Ключевые слова: здоровье, студенты, группа для занятий физической культурой

Вклад авторов: Макунина О. А. — обзор литературы, анализ результатов исследования, оформление статьи, корреспондирующий автор; Ботагариев Т. А. — организация и проведение исследования в АРУ; Коваленко А. Н. — организация и поредение исследования в УралГУФК, Быков Е. В. — анализ результатов исследования; Кубиева С. С. — анализ результатов исследования, организация и проведение исследования к АРУ.

Благодарности: авторский коллектив выражает благодарность медицинским сотрудникам студенческих поликлиник УралГУФК и АРУ за помощь и содействие в организации исследования, Людмиле Леонидовне Голышмановой, переводчику УралГУФК, за профессиональный перевод названия, аннотации, ключевых слов и списка литературы статьи. Настоящее исследование выполнено в рамках Международного научно-педагогического сотрудничества Уральского государственного университета (г. Челябинск) и Актюбинского регионального университета имени К. Жубанова (г. Актобе).

Соблюдение этических стандартов: все исследования проведены в соответствии с принципами биомедицинской этики, сформулированными в Хельсинкской декларации 1964 г. и ее последующих обновлениях, и одобрены локальным биоэтическим комитетом ФГБОУ ВО «Уральский государственный университет физической культуры» (г. Челябинск). Протокол заседания этического комитета от 14.01.2022 № 5.

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Статья поступила: 19.01.2022 **Статья принята к печати:** 21.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2021.039

Assessing health of children, adolescents and young people, including students, is a top priority of national healthcare in the Russian Federation and Kazakhstan [1–6]. However, taking into account certain indicators of health among students both in Russia [7–12], and in Kazakhstan [13–17], scientific research results are illustrative of an unfavorable condition.

Scientific research results confirm a negative trend in morbidity for all nosological entities among students [4, 18].

The purpose of the article is to perform a comparative assessment of health among the students of the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University considering their distribution by health groups during physical education classes.

MATERIALS AND METHODS

A comparative analysis of health of students from the Ural State University of Physical Culture (n = 2,780) and K. Zhubanov Aktobe Regional University (n = 2,004) was performed based on medical records. Data extraction from medical records was used to collect data from 2018 to 2021 for the first and second years of education. No significant differences were found in relation to age and gender of the students.

Statistical data processing was carried out using Statistica 13.0 (StatSoft Inc., США) and Excel (Microsoft Office, 2010). A Student's t-test was utilized to show the statistical difference with the probability of 95%.

RESEARCH RESULTS

Analysis of student's distribution by health groups during physical education classes is the basis for selecting an optimal physical load considering the state of health.

An analysis of distribution of students from the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University by health groups during physical education classes was made using data extraction from medical records (tab. 1).

Those from the preparatory group predominated among university students. During transfer to the second year, there was a decrease in the number of students from the main group by 4.1% in the Ural State University of Physical Culture and by 6.6% in K. Zhubanov Aktobe Regional University ($p \leq 0,05$). In the preparatory group, a number of students is increased by 3.8% in the Ural State University of Physical Culture and by 8.2% in K. Zhubanov Aktobe Regional University ($p \leq 0,05$). In the special group, it is increased by 0.3% in the Ural State University of Physical Culture and decreased by 1.6% in K. Zhubanov Aktobe Regional University. The obtained results show there is a negative trend in the health of students within two years of education.

Table 2 includes data on functional deviations among students of the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University distributed to the main and preparatory groups during physical education classes.

Deviations in the locomotor system predominate among the students of the Ural State University of Physical Culture with insignificant fluctuations during the first and second years of education (36–34%) and occupy the first position in the rank.

In K. Zhubanov Aktobe Regional University, locomotor diseases are ranked second among the second-year students (12% of students). Diseases of the eye and adnexa are ranked first (35% and 38% among the first- and second-year students, respectively).

In the Ural State University of Physical Culture, the second position in the rank is occupied by gastrointestinal disorders. In the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University, cardiovascular diseases are ranked third.

Diseases of the genitourinary system, respiratory diseases and ENT disorders are also available on morbidity patterns.

DISCUSSION OF RESULTS

According to the majority of trials, 30 to 50% of applicants have already had health problems [11]. A negative trend in health state of students for the whole period of education at the University is confirmed by the trial results represented in the publications [8, 9, 19]. The trial demonstrates the trend as well.

Comparison of health among students of different universities within the same region is of interest, too. For instance, a comparative analysis of health of students from three universities such as the Ural State University of Physical Culture, Chelyabinsk State University and South Ural State Medical University was performed. Comparison of state of health among students from different regional universities is also of interest as it establishes common and specific tendencies to develop strategic tasks improving health of the students. So, a

Table 1. Distribution of students from the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University by health groups during physical education classes, %

University	Ural State University of Physical Culture				K. Zhubanov Aktobe Regional University			
year, assignment to groups during physical education classes	1 year abs. (people)	%	2 year abs. (people)	%	1 year abs. (people)	%	2 year abs. (people)	%
I Main	600	41.9	510	37.8	378	36.3	286	29.7*
II Preparatory	730	51	740	54.8	529	50.8	568	59.0*
III Special	101	7.1	99	7.4	134	12.9	109	11,3
Total number of people	1,431	100	1349	100	1,041	100	963	100

Table 2. Functional deviations in the ranks among students of the Ural State University of Physical Culture and K. Zhubanov Aktobe Regional University distributed to the main and preparatory groups during physical education classes,%

University	Ural State University of Physical Culture			K. Zhubanov Aktobe Regional University			
Rank	deviations	1 year	2 year	deviations	1 year	deviations	2 year
1	Locomotor system	36%	34%	eyes	35%	eyes	38%
2	Gastrointestinal tract	32%	31%	metabolism, weight deficit	23%	locomotor system	12%
3	Cardiovascular system	22%	23%	cardiovascular system	23%	cardiovascular system	11%

comparative assessment of health of students from the Russian Federation and Kazakhstan allows to add to the available data on the effect produced by ethno-national and ecological factors on health of students across similar climate and geographical areas. Moreover, according to the list of countries by quality of healthcare, Bloomberg (2021) shows that out of 100 analyzed countries, 56th and 58th positions are occupied by Kazakhstan and Russia, respectively.

The obtained results with regard to the health of students from Russian and Kazakhstani universities confirm data of other researchers on deviations in the health of 50% students [9, 11, 12].

Scientists from Kazakhstan also confirm that health of students is worsened during their education at universities [16–18]. It is also shown in the present trial.

All this is confirmed by literature data on the necessary prevention and promotion of health among university students [3, 20].

In the previous work by Kalmakova ZhA (2014) it has been established that students' diet is unbalanced with low energy content, and that a number of first-year students assigned to the groups of risk is increased. A complex program of health preservation and promotion is developed based on the results obtained by the author. It puts interrelation between the systems of healthcare, education and social structures engaged in organization of leisure among young students at its center [16].

In publications, it has been unanimously confirmed that 'the state of health and associated life quality of students correlate with the way of life, physical activity…' [21, 22].

However, it has been shown in this trial that apart from abundant literature data on the effect produced by diet and motor activity which are associated with locomotor and gastrointestinal disorders and metabolism, special attention should be given to diseases of the eye and adnexa occupying the leading positions in the rank.

Prevention of diseases of the eye and adnexa and development of preventive programs are required, which is shown in a number of publications [23–25].

CONCLUSIONS

The trial data are provided to establish differences and common trends in the changes of health among students from Chelyabinsk and Aktobe universities.

Based on medical records, a comparative analysis of health among students of the Russian Federation and Kazakhstan enabled to establish that at the initial stage of education at universities a number of students with a main health group during physical education classes constitutes 36–42% and gets decreased to 30–38% within the entire educational period; no significant differences have been found based on the analyzed parameters.

The obtained data on health assessment are the basis for the development of educational programs in the medical-biological, natural-science areas and for the research work of students. The obtained results are also used to develop health-saving and physical activity of the universities.

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HEALTH OF STUDENTS AND ITS DETERMINING RISK FACTORS

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Students' state of health is both a national, and a global challenge. Its relevance is increasing every year. When developing prevention programs, it's important to consider principal factors of risk for students' health. The youth is a significant group of population with students being a fundamental part of it. This article analyzes the risk factors that influence students' state of health to the greatest extent. Bad habits are given considerable attention to. A set of prevention activities must be developed for students taking into account specifics of their education. A comprehensive approach must be used to ensure the greatest effect on students' health.

Keywords: health, students, lifestyle, risk factors

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Received: 20.01.2022 **Accepted:** 25.02.2022 **Published online:** 30.03.2021

DOI: 10.24075/rbh.2022.040

ЗДОРОВЬЕ СТУДЕНЧЕСКОЙ МОЛОДЕЖИ И ФАКТОРЫ РИСКА, ЕГО ОПРЕДЕЛЯЮЩИЕ

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Состояние здоровья студентов является проблемой не только нашей страны, но и всего мира. Актуальность ее только увеличивается из года в год. Важно учитывать основные факторы риска для здоровья обучающихся при составлении программ профилактики. Молодежь составляет значительную группу населения, фундаментальной частью которой являются именно студенты. В данной статье проведен анализ наиболее влияющих на состояние здоровья студенческой молодежи факторов риска. Большое внимание уделено вредным привычкам. Для обучающихся должны разрабатываться комплексы профилактических мероприятий согласно специфике их обучения. Необходимо использовать всесторонний подход для наибольшего эффекта для здоровья студенческой молодежи.

Ключевые слова: здоровье, студенты, образ жизни, факторы риска

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Статья поступила: 20.01.2022 **Статья принята к печати:** 25.02.2022 **Опубликована онлайн:** 30.03.2022

DOI: 10.24075/rbh.2022.040

Around 70% of non-infectious diseases such as cancer, cardiovascular diseases, diabetes mellitus, obesity, etc. are somehow associated with a human behavior and lifestyle. They constitute the main causes of premature death. Their prevalence is especially high in developing and developed countries, which is the most important problem to date [1].

Students are the future of our country. Life and further destiny of our nation depend on them. Students' morbidity is a pressing problem of the modern society through challenging times. Students of Universities belong to the future potential of our country. They constitute a greater part of young population of Russia, and will rule the world soon [2].

Requirements for preparation of future medical students are increasing every year. In future, this can lead to their overburden and — finally — to a decreased level of aid provided to the population [3]. It is believed that doctors without bad habits more frequently discuss the issue with their patients and motivate them for a healthy way of life. Recommendations of these doctors are perceived as more reliable ones. Bad health of doctors produces a negative effect on work performance, efficiency and quality of patient care [4].

Numerous works deal with the issue of health of medical students by widely using the questionnaire method. However, the topic should be examined in a comprehensive manner. Inadequate attention is given to the indicators of students' physical development and effect produced on them by conditions of an educational process [3].

Health of today's students is closely associated with their psychoemotional condition and state of the nervous system. A sharp increase in load has been occurred recently due to introduced computer aided teaching, significantly changed educational programs, ultimately leading to chronic fatigue of students and decrease of their activity during a day. Specific character of long-distance learning left a mark on students' way of life. Physical activity of medical students and time spent by them in the fresh air was reduced. Time spent by students on the phones or computers was increased [5].

Currently students experience difficulties while studying. It's difficult to eat well and on time, as it takes much time to study at a medical university. Work and rest schedule is not followed, physical activity is low. These are all risk factors of ill health for a young and weak body which is especially vulnerable during university days.

Students get into a totally new and unknown environment, a higher educational institution, which is totally different from school to which they have got so used in eleven years [6].

Today, it is difficult to compare health researches of medical students around the country, as in different regions, medicine can vary by structure and composition. That's why it's important to conduct researches in all regions of the country and develop a set of highly individualized prevention activities depending on the results obtained in a certain region [7]. It is necessary to develop a complex approach to the study of students' morbidity, strive for an extensive testing and establishing of causative relationships between various diseases.

Development of health in adolescents starts at school. The prevalence of morbidity among students is significantly increased from the first year of education. Students of the first and subsequent years of education should be provided with health education, their health awareness must be improved, they should be given an opportunity to participate in different activities of health promotion, and lead a healthy lifestyle to prevent diseases. The greatest awareness of a healthy lifestyle is commonly typical of senior students, whereas junior students know the least of it [8].

Availability of outpatient clinics in the regions of Russia is a pressing matter. Some cities have already transferred students to community-based medical institutions increasing the load on the entire medical personnel and decreasing the quality of medical aid provided both to students, and other citizens. Many students can't afford commercial services and costly methods of examination due to their high cost [9].

A number of students from preparatory or special health groups is increased every year. The trend is true both among medical, and other students. A number of the first-year students who enter universities with various diseases has increased as well. An obvious growth which is probably associated with an increased academic load is found among senior students [10].

A significant quantity of health abnormalities during medical examinations, a growth of chronic disorders, premorbid states and physical weakness are found among applicants and students on the annual basis. The figures are steadily on the rise with every passing year [11]. Not all the universities in our country pay much attention to an annual physical exam to detect diseases both among applicants, and students. It is always easier to cure a disease at an early stage as a late stage requires spending more strength and capabilities.

Closely interrelated theoretical and practical training belongs to the unique feature of education at medical universities. A certain impression is left by a great number of clinical sites where medical students are educated. Time spent on travelling is increased. Communication with patients and staying in the hospital setting decrease body defenses and figures result in the risk of infectious diseases. Negative emotions experienced by students while obtaining clinical knowledge and feeling compassion for patients, their pain and sufferings have an impact as well [12].

It is not right to develop prevention activities aimed at improvement of health in students without paying attention to a complex hygienic assessment of educational conditions and other important constituents. Every constituent must be taken into account to develop complex preventive activities and substantiate them [13].

Priority factors for future self-fulfillment of the youth include health and healthy lifestyle (HLS) [14]. HLS is a human lifestyle aimed to preserve health and decrease the risk of a non-infectious disease. It is based on the control of behavioral risk factors. Development and implementation of a set of activities targeted at promotion of a healthy lifestyle in young people, including students, belong to a basic direction [15].

A number of healthy students is decreased every year; at the same time, a number of students with various diseases is increased. People, including students, have been lately leading an inactive lifestyle, which can result in certain diseases [14]. The majority of students from the Chelyabinsk State University (72.3%) don't do exercises in the morning. The main reasons are lack of time or laziness. 3 to 5% of those requested believe they don't need it [16]. Things are a little better among medical students of the Orel State University, as only 27% and 64% of them did morning gymnastics always or sometimes, respectively. It should be noted that hypodynamia is a current global challenge not just for students, but also for the entire population of our country, and the world [17]. Thus, conversations about the benefit of morning exercises and increased level of physical activity within a day are beneficial for medical, and other students.

One of the top priority tasks for any university is to strengthen and preserve health of its students. Professional abilities and skills depend on the health of future specialists. Promotion of a healthy lifestyle among medical students could build a layer of healthy doctors who — in their turn — would probably conduct preventive counselling. Patients would listen more to those doctors who lead a healthy lifestyle and have no bad habits [18].

Nowadays, students face a big challenge associated with financial support, as scholarships are commonly small. They have to reconcile educational tasks and practical work, which leads to an increased load and violated rest and labor regimen. The consequence can include low performance, less sleep, and risk of various diseases sooner or later [6]. Working at nights can influence performance and anxiety of medical students, violate their rest and labor regimen and produce an effect on students' health and life quality.

The most pressing problem is that every next generation is less healthy than the previous one. It happens due to numerous factors. According to the leading specialists, a lifestyle (50–60%) is one of the most important health factors. Time spent by students at educational institutions is both an important and complicated period of their life. Biological growth and changes in social roles and behavior produce an effect on students' health [19].

Students, and especially medical students, often have different disorders and diseases of the nervous system. All previously described risk factors result in stress, depression, anxiety, etc., especially during tests and exams. By the 4th year of education, students consult a neurologist twice as often [19]. It is difficult for former schoolchildren to adjust to the specific nature of education at universities. Students who already feel severe stress and increased anxiety because of a new and unfamiliar place of education and many new people and teachers who differ from school teachers, undergo through significant alterations [20]. So, students who shift from childhood to adulthood, must be instructed to prevent the diseases associated with the lifestyle.

It's necessary to take into account the living conditions of non-resident students who stay alone, especially at residence halls, as they spend much time there, do homework and sleep. It is necessary to take responsibility in building comfortable conditions to restore performance and prevent various diseases. Not all non-resident students can afford to rent an apartment or stay with their relatives or friends and have to stay at residence halls. Unfortunately, requirements to residence halls are not followed in many cases [21].

University management needs to pay attention to how the training agenda is composed. Busy workload often found in the beginning or at the end of the week, a great number of double classes during the same day, and several complex disciplines in sequence result in impaired productivity of students no matter of their year of education [22].

It is important to follow hygienic requirements for classrooms. They are not always given enough attention to. It results in consequences that influence the health indicators of students, teachers and other employees of educational institutions. In spite of proper technical capacity at the Novosibirsk State Medical University, numerous sanitary requirements are not

followed. 3 points out of 10 were assigned to welfare by over than 50% of students [23].

Medical students often (in 65% of cases) have different chronic diseases. Digestive diseases which account for about 25% belong to the most common ones. This shows again that students are malnourished, skip a meal or two, and sometimes don't eat properly due to an uncomfortable schedule or short intervals between classes [24]. The food is often far from being diversified or contains little nutrients. Only 65% of students eat regularly, while 35% take food less than 3 times a day [25]. According to various data, over 50% of medical students have violated regimen of food intake, as they eat not regularly or inadequately. This is especially true for those students who stay without parents.

Lack of full breakfast or eating twice a day are widely found as well. Practical and theoretical facilities are located far from one another, and students spend much time trying to reach them and often miss their meals [26].

The problem of obesity and underweight is currently pressing both in our country, and abroad. Students are not the exception. Many researches show that not all the students are worried about their body mass. It is proven that obesity is a risk factor for many diseases such as diabetes mellitus, cardiovascular diseases, etc. Malnutrition and unhealthy nutrition increase the risk of obesity. Poor or bad quality sleep is another risk factor. About 10% of the total number of students suffer from obesity, whereas every seventh student is classified as underweight. As a rule, underweight or obese students are less aware of health problems [27]. It is necessary to develop healthcare programmed that could include physical activity and nutrition.

Many obese students try to lose their weight. According to China-based researches, various laxatives taken without a doctor's prescription or on purpose triggered vomiting. It produced a negative effect on student's health. The high incidence of diets is of great concern as it subsequently results in eating disorders and increases the risk of digestive diseases [28]. The majority of students don't follow nutritional recommendations. According to the research conducted in Jordan, around half of students consume fast food once a week or even more often, 76% of those reviewed don't follow recommendations on daily fruit consumption, whereas 82% don't take vegetables in recommended amounts [29].

Every year requirements for medical workers are increased. Much information needs to be examined. There is a variety of new domestic and foreign developments, competition among specialists which is getting higher every year. It makes life of medical students difficult decreasing the amount of sleep and rest required to restore their health. The adaptation potential is depleted, the defense is reduced, thus, leading to pre-existing conditions and different diseases [30].

Medical students should be taught to lead a healthy lifestyle as soon as possible. In spite of specific knowledge obtained, health of students is deteriorated by the last years of education. Considering the working load and emotional stress associated with the chosen profession, the academic program of the medical university needs to supply students with instruments and skills preserving health habits during their entire professional life, and protect them from work-associated health risks. The efforts will enable better work of the healthcare system, and doctors can become true examples for their patients [31].

Medical students in Russia, and the entire world frequently complain of sleep disturbances and headaches. In its turn, this results in decreased life quality, reduced efficiency of future doctors and risk of various diseases. Almost every student used to have headaches due to fatigue or some other reason [32].

With regard to health, adaptation potential of students needs to be considered. It should be noted that the lowest adaptation abilities are found in the first-year students leaving a mark on their quality of life and health. The first year is the most complex and demanding as far as adaptation to new educational conditions goes. This should be taken into consideration when schedules and educational programs are developed [33].

The cultural constituent of student-age population has been significantly decreased lately. High incidence of bad habits is detrimental to the health of future doctors. Measures taken at the federal level and at the universities produce no significant changes. The issue must be solved in complex with participation of educational and medical institutions [7]. According to many authors, bad habits influence achievements, and not for the better. Disappointing results are obtained in those drinking alcohol, smoking and using drugs. An increased interest to psychoactive substances has been found lately as compared with the last year. There is a high prevalence of hookahs, the harm of which is often disregarded [34]. The World Health Organization has set a task to decrease a harmful intake of alcoholic beverages by 10% by 2025. New university programs must be developed or old health-improving programs must be improved to unite all bad habits and show the students how they influence their immature organisms. Alcohol consumption is very dangerous for those around as well. A number of road traffic accidents involving alcohol-impaired drivers is increased. Unfortunately, not all these accidents have a happy ending [35].

Smoking has been a huge problem lately among students both in Russia, and globally. Almost every fourth medical student is a smoker. Hookahs and e-cigarette smoking is widely spread today. Its harm is always disregarded by students as the issue is not well concerned [36]. There is a significant difference between health of smoking medical students and those who don't smoke. Health improving programs oriented to behavior of students strengthening their health and promoting a healthy lifestyle need to be developed. It is also important to develop smoking refusal programs for medical students as they are future doctors. It will be difficult for a specialist who sets a bad example to convince a patient to refuse from the bad habit [37].

Alcohol consumption is currently a leading bad habit among students, and other groups of population. Previous studies state that about 70% of students consume moderate amounts of alcoholic beverages, whereas only 14% don't drink at all [38]. Around 11% of requested medical students have abusive drinking behavior. It should be noted that at other medical universities it's even worse [39]. For instance, researches of Romanian students show that alcohol consumption is slightly higher there (about 80%). Irrespective of the year of education, the majority of students take alcohol on a monthly basis. The effect of alcoholic beverages on sleep should be noted. Students who misused alcohol could have inadequate quantity of sleep of bad quality. It is also stressed that the more beverages were consumed, the less the students slept [40].

Nowadays, when many people have different bad habits, low physical activity and fail to conduct a healthy way of life, it is important to foster a reverential attitude to health among medical students, teach them to conduct preventive conversations and advocate a healthy lifestyle for future patients. This will contribute to recovery of the country, as many people don't know how a healthy lifestyle can be led [41]. In Russia, preventive medicine is just on the way of development, and competent staff needs to be prepared.

Self-estimation of health should be considered as well. It means that students assess their state of health by their own. The indicator is most commonly objective, as those examined are more familiar with features, well-being and life quality of their bodies. Health self-estimation is usually higher for those students who have breakfast in the morning, do morning exercises, have higher physical activity and pay enough attention to studying. It means that good habits are important factors for health self-estimation. At the same time, students with bad habits had a higher level of stress and estimated it in a slightly worse way [42].

It is important to consider dependence of health on mental condition of students. Mental disturbances influence performance and physical health. Many global researches show that the majority of mental illnesses start in university. It is noted that stressed or depressed students are more prone to alcohol consumption and other bad habits [43]. Medical students — especially junior students — often complain of emotional burnout, depression and anxiety. 41% of first-year students reported depression symptoms, 28% had symptoms of depression, 4% said they had suicidal thoughts. It means that psychological service needs to be available in any college. All applicants entering educational institutions need a compulsory health check and treatment if necessary [44].

Many factors such as culture, religion, social and economic status, and beliefs influence a human lifestyle. They are all developed at school and in university. The management of educational institutions faces an important task of establishing strong convictions and knowledge about human health, way and quality of life, which are closely related to their well-being [45].

Academic achievement is also influenced by commitment to a healthy way of life, high physical activity of students and participation of parents in the educational process. This stresses the necessity to develop a complex approach to leading a healthy way of life, as it can improve the quality of life, knowledge about students' health and academic achievements [45].

A great number of global researches are currently devoted to the issue of bad sleep among students. It leads to various pathologies, including nervous system disorders, performance degradation, midday sleepiness and reduced attention. It influences progress of students as it is difficult to study when there is not enough sleep. Researches in the USA have shown that 27% reported poor sleep quality, 36% said that they were sleeping less than 7 hours per day, and 43% reported that they required over 30 minutes to fall asleep at least once a week. It is also noted that symptoms of depression and anxiety are associated with insufficient sleep of bad quality [46]. In our country, the results are comparable with those found globally. About 29% of students complained of at least one sleep disturbance. Initial insomnia developed in 51.8% of students was the most prevalent disturbance [47]. Medical students have a large academic load that can worsen the quality of sleep even more than it is observed in the modern world. Prevalence of sleep disturbance is higher in medical students as compared with other students and population in general. Long-term and highly intensive education, clinical disciplines, emotional constituents, etc. explain why the problem is so popular among medical students.

CONCLUSIONS

Thus, the issue of students' health has always been pressing not just in our country but also globally. Unhealthy lifestyle and behavior play a vital role in development of many non-infectious diseases. University students of the future will take decisions at the level of institutions, communities and countries. Considering the importance of their health, health-promoting lifestyle of students should become a priority area for politicians and medical workers by way of giving services at a high level and aimed at helping the students to lead a healthy lifestyle.

Medical students are future specialists in healthcare. Thus, they can take better care of others when they improve their health, lifestyle and achieve the highest level of their own well-being.

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