THE IMPACT OF SOCIO-HYGIENIC AND PSYCHOPHYSIOLOGICAL FACTORS ON THE HEALTH STATUS OF MEDICAL UNIVERSITY STUDENTS

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The analysis of socio-hygienic and psychophysiological factors affecting the students'health is a highly relevant issue. The paper reports hygienic and psychophysiological health risk factors in the second-year medical students. The study was aimed to assess the influence of psychophysiological and hygienic factors on the health status of 263 medical students. According to the polling data, complaints of asthenic and neurotic nature prevailed among the respondents. The Spielberger State-Trait Anxiety Inventory results showed that during the semester high state anxiety was found in 43% of the respondents. State anxiety increased more, than trait anxiety during the end of semester exams. Furthermore, the correlation between anxiety and the students' academic load was revealed. Hygienic analysis of the students' lifestyle revealed the following health risk factors: hypodynamia, spending large amounts of time on social media, inadequate sleep duration, harmful habits (smoking). Such hygienic factors of learning environment, as microclimate and luminosity, were assessed. It was found, that there was a strong positive correlation between air temperature in the classrooms and low students' working capacity. We have proposed possible ways to improve socio-hygienic and psychological environment for maintenance and promotion of students' health, which will result in the development of effective health preservation programs in educational institutions. Appropriately, such solutions will help ensure the students' wellness and good working capacity, and will have a positive effect on the learning outcomes and further professional career.

Keywords: health, students, functional status, working capacity, socio-hygienic factors, psychophysiological factors

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Compliance with ethical standards: the study was compliant with the principles of biomedical ethics. The written informed consent was obtained from all study participants.

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ВЛИЯНИЕ СОЦИАЛЬНО-ГИГИЕНИЧЕСКИХ И ПСИХОФИЗИОЛОГИЧЕСКИХ ФАКТОРОВ НА СОСТОЯНИЕ ЗДОРОВЬЯ ОБУЧАЮЩИХСЯ МЕДИЦИНСКОГО УНИВЕРСИТЕТА

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Анализ социально-гигиенических и психофизиологических факторов, влияющих на здоровье студентов, является весьма актуальной темой. В статье рассмотрены гигиенические и психофизиологические факторы риска здоровью обучающихся на 2-м курсе медицинского университета. Целью исследования было оценить влияние психофизиологических и гигиенических факторов на состояние здоровья 263 студентов-медиков. По данным анкетирования, среди респондентов преобладали жалобы астенического и невротического характера. Результаты опросника Спилбергера показали, что в течение семестра высокий уровень ситуативной тревожности имел место у 43% опрошенных. Во время сессии ситуативная тревожность выросла в большей степени, чем личностная. Кроме того, установлена корреляционная связь между тревожностью и учебной нагрузкой студентов. Гигиенический анализ образа жизни обучающихся выявил ряд факторов риска здоровью: гиподинамию, длительное пребывание в социальных сетях, несоблюдение продолжительности сна, наличие вредных привычек (курение). Были исследованы гигиенические факторы учебной среды, такие как микроклимат и освещенность. Установлена сильная прямая связь между температурой воздуха в учебных аудиториях и низкой работоспособностью обучающихся. Предложены возможные пути улучшения социально-гигиенической и психологической среды для поддержания и укрепления здоровья студентов, которые приведут к разработке эффективных программ здоровьесбережения в образовательных организациях. Соответственно, такие решения помогут обеспечить студентам хорошее самочувствие и работоспособность, положительно повлияют на результаты обучения и будущую профессиональную карьеру.

Ключевые слова: здоровье, обучающиеся, функциональное состояние, работоспособность, социально-гигиенические факторы, психофизиологические факторы

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The students' health status is a frequently discussed and always relevant issue, as well as an important component of educational process. Many disorders are swiftly rising lately, chronic forms of the diseases are reported, which reduces the learning efficiency [1–3].

More than a half of applicants already have health problems by the moment of entering higher education institutions. Upon graduation, student morbidity in the Russian Federation increases on average 3.8-fold.

Poor work/rest balance, inadequate nutrition, uncomfortable living conditions, high academic load, and other factors observed during the period of study at the university can contribute to the increase in the student youth morbidity [4–6].

The medical students' health status remains a concern due to the emergence of a number of negative factors during training (such as the need to communicate with patients and their relatives). The student health risks can be diverse, these can include the interrelated hygienic, psychological,

and social causes. It is necessary to understand, which factors are crucial and how to affect these factors.

An important role in ensuring the students' health is played by the socio-hygienic and psychophysiological factors. Their effects can be both direct and indirect. Hygienic factors, such as good indoor microclimate, high-quality air, sufficient lighting, contribute to the students' health preservation. Failure to comply with hygiene requirements may on the contrary lead to impaired immunity, various diseases, and reduced working capacity [7–9].

Psychophysiological factors, such as emotional tension, stress, fatigue, lack of sleep, negative emotions, affect the students' well-being. Continuous tension and chronic stress can result in the reduced working capacity, worse training outcomes, and various psychosomatic disorders.

The reported negative trends in the students' health are confirmed by numerous studies conducted by other authors [4, 10, 11]. It seems necessary to ensure healthy learning environment considering both hygienic and psychophysiological aspects of the educational process organization.

The study was aimed to assess psychophysiological and hygienic health risk factors in medical university students.

METHODS

The cross-sectional study involved students of the general medicine and pediatric faculties of the Burdenko Voronezh State Medical University (VSMU). A total of 263 individuals (179 females and 84 males) took part in the study. We performed anonymous polling of the second-year medical university students, whose average age was 19.2 ± 0.3 years. The students' somatic and mental health was assessed by performing the questionnaire survey. We used a universal questionnaire developed in accordance with the nosological and functional-systemic principles by the Research Institute of Hygiene and Health Protection of Children and Adolescents RAMS. The questionnaire represented clusters of questions including the sets of symptoms reflecting the condition of various body organ systems. Furthermore, the study involved the use of the Spielberger State-Trait Anxiety Inventory (adaptation by Yu.L. Khanin) and the Anfimov tables. Microclimate parameters in the classrooms were assessed using the Meteoscope-M meter (NTM-Zashhita; Russia); luminosity was assessed using the TKA light meter (TKA NGO; Russia).

The data acquired were processed and analyzed by the mathematical statistics methods. Statistical analysis of the results was performed using the MyOffice 2022 software package (New Cloud Technologies; Russia). Comparison of sample means was performed using the Student's *t*-test for independent samples with subsequent determination of statistical significance (*p*-value). Correlations were considered significant at $p \leq 0.05$. Quantitative assessment of the correlation between the level of health and the hygienic and psychophysiological risk factors was performed using the parametric Pearson correlation coefficient (*r*).

RESULTS

The anonymous polling results showed that the level of health of the majority of university students was average (45%) and above average (48%). Only 7% of the respondents characterized their level of health as high.

During the study we revealed health problems that were most common among students, which made it possible to form groups at risk and perform monitoring of the level of health. According to the results of the questionnaire survey conducted in accordance with the nosological and functional-systemic principles, asthenic and neurotic syndromes, as well as the set of symptoms characterizing vegetovascular dysfunction prevailed among the surveyed students.

Asthenic syndrome, i.e. behavior characterized by the increased fatigue, weakening of the ability for prolonged physical or mental stress, irritability, frequent changes of mood, manifested itself, in particular, by the increased rate of headache (40% of students). Furthermore, 50% of students complained of rare mild headache, 10% of students had no headache.

Sleep disorder is an important symptom of asthenic syndrome. Almost all the respondents (99%) reported sleep disorders of varying severity. Thus, 99% of the respondents suffered from drowsiness during the day. More than 80% of the surveyed students noted unsociability and inattention, 89.5% of the respondents reported lethargy and rapid fatigue during the day, as well as reduced working capacity.

Neurotic syndrome, the core of which is represented by the impaired balance and flexibility of the major neural processes, and which is characterized by subjective experiences and somato-vegetative disorders (anxiety, irritability, disturbance of speech due to excitement, loss of appetite, palpitation), manifested itself in many young adults. Thus, 88% of the respondents experienced irritability, 82% experienced anxiety, 52% reported restless sleep, about 70% reported disturbance of speech due to excitement.

Within the framework of hysteria-like syndrome 85% of the respondents were prone to fantasy, 70% reported resentment, 76% reported emotional incontinence. At the same time, 80% of the respondents experienced indecisiveness, self-doubt, and shyness.

Vegetovascular dysfunction syndrome manifested itself in mood instability (70%), emotional overexcitability, and fatigue (70%).

According to the questionnaire survey results, the condition of other body's functional systems, such as respiratory, cardiovascular, and hematopoietic systems, was not a serious concern. However, the following gastrointestinal symptoms were reported: abdominal pain associated with food consumption, loss of appetite, heartburn.

When considering the impact of psychophysiological factors on the health status, it should be noted that positive emotions experienced by students during training can improve many aspects of academic activity. Positive emotions contribute to higher motivation for learning, better memorization of information, better concentration of attention, and create an atmosphere of more productive communication in the group of students.

However, unsustainable academic load can result in overstrain of the students' nervous system, which, in turn causes the decrease in working capacity, increases anxiety and absent-mindedness, results in loss of focus and sleep disorder. Based on the questionnaire survey results, sleep inversion manifested by drowsiness during the day, disturbed night sleep, and restless sleep attracts attention.

There are numerous tests for assessment of anxiety, however, the experts recommend the use of the Spielberger State-Trait Anxiety Inventory (adaptation by Yu.L. Khanin), since the Inventory enables differentiated measurement of anxiety as a personal trait and as a condition associated with the current situation. The Inventory results show the level of trait anxiety (determines susceptibility to anxiety) and the state component (demonstrates subjective emotions in the stressful situation).

Table. Mean values of microclimate indicators of the classrooms throughout the academic year (M ± *m*)

Microclimate indicators (M ± *m*)	Microclimate indicators before classes		Microclimate indicators after classes	
	Cold season	Warm season	Cold season	Warm season
Temperature (°C)	21.3 ± 0.7	24.8 ± 1.2	22.0 ± 0.9	26.2 ± 1.3
Relative humidity (%)	77.9 ± 4.95	55.2 ± 1.2	80.2 ± 3.4	57.5 ± 5.0
Air velocity (m/s)	0.04 ± 0.02	0.06 ± 0.04	0.07 ± 0.03	0.09 ± 0.05

The Spielberger State-Trait Anxiety Inventory (adaptation by Yu.L. Khanin) results have shown, that the majority of respondents have elevated state anxiety levels, which makes it possible to assess the level of real anxiety. Thus, in the fall semester 6% of the respondents had low state anxiety, 51% had moderate state anxiety, and 43% had high state anxiety. Trait anxiety was determined using the second scale showing the response to the threatening situations. Moderate trait anxiety was found in 76%, while high trait anxiety was reported in 24% only.

During the end of semester exams state anxiety increased by 33%, while trait anxiety increased by 26%. Assessment of the results revealed gender differences: state anxiety was higher in girls, while trait anxiety, on the contrary, was higher in boys.

We revealed a correlation between anxiety and the students' academic load (pair correlation coefficient $r = 0.67$, $p < 0.05$). Thus, elevated academic load significantly increases the students' anxiety.

Estimation of mental performance conducted in this age group using the Anfimov tables yielded the average population result (131.8 ± 7.2 symbols/min).

Working capacity was assessed in terms of its effect on academic performance. The students, who studied "satisfactorily", showed low working capacity as early as by midweek, while students with good academic performance kept working throughout the week. Perhaps, this is due to high anxiety in students with low academic performance.

Working capacity and anxiety affect not only the learning process efficacy and outcomes (marks for tests and exams), but also the students' body functioning, reflected in the mood decline, lethargy, inattention.

The correlation between academic load and working capacity was significant ($r = 0.67$, $p < 0.05$).

Along with psychophysiological factors, hygienic factors also play an important role in maintaining the medical students' health. Their effects can be significant and have both beneficial and adverse consequences.

Hygienic assessment of the students' lifestyle revealed a number of adverse features, such as hypodynamia (42%), spending large amounts of time on social media (on average 4.5 ± 0.2 h during the week), inadequate sleep duration (6.3 ± 0.3 h), high rate of tobacco smoking (71% of males and 59% of females).

The students spend most of their time in the classrooms that are often noncompliant with the hygienic standards for microclimate. The relationship between microclimate and health status have been rather thoroughly investigated in many studies and is beyond doubt. The optimal parameters of microclimate, luminosity, air quality contribute to maintenance of high working capacity and ensure effective mastering of educational material. In this regard, it is important to provide a comfortable environment in the classrooms and lecture halls, laboratories and recreational areas.

In the classrooms of the Burdenko VSMU laboratory building, regular assessment of such parameters, as temperature, humidity, air velocity, luminosity was performed before and after the classes in different periods of the year. The results of the microclimate parameter measurement are provided below (Table).

The results provided indicate noncompliance of hygienic microclimate parameters (air velocity, temperature, and humidity) with comfortable values in both warm and cold seasons. In winter relative humidity in classrooms exceeded the upper permissible limit by more than 15%. In summer humidity was acceptable, while the air temperature exceeded the upper limit of normal, especially in the end of classes. We revealed a strong positive correlation between the air temperature in the classrooms and low students' working capacity (correlation coefficient $r = 0.74$, $p < 0.05$). Thus, deterioration of the microclimate parameters during classes was observed, which caused deterioration of students' health and loss of concentration.

Artificial and natural lighting in the classrooms, in contrast, was sufficient based on all major lighting indicators. When all the light sources were on, the average artificial lighting intensity was 800 lux. Students did not complain of visual discomfort and visual fatigue during classes.

DISCUSSION

The analysis of data of a number of research studies [7, 9, 11–13] focused on health preservation in students revealed negative trends. In particular, the incidence of visits to medical institutions due to seasonal diseases increases from course to course, overall morbidity increases, diseases become chronic, behavioral deviations occur.

The trend towards predominance of asthenic and neurotic complaints in students observed in our study is associated with the increased anxiety levels and manifestations of psycho-emotional stress.

Specific factors typical for medical university students, such as large time costs for transfer from one medical institution to another, increased emotional strain due to empathy toward patients and their relatives, contribute to the increased anxiety and fatigue, which affect health and academic performance.

The students' health is also largely determined by their lifestyle, rejection of harmful habits, such as smoking, consumption of alcohol and other psychoactive substances, which is confirmed by many researchers [1, 10, 14, 15].

One positive trend is the young adults' desire to preserve their health, lead a healthy lifestyle. Among young adults, 48% believe that one needs to take care of maintaining his/her health already in youth, 71% believe that it is necessary to adhere to the principles of healthy lifestyle and to do it consciously [16–18]. Despite the fact, that students understand the importance of health preservation, not all the respondents adhere to the principles of healthy lifestyle. The reasons for such behavior can include lack of time, unwillingness to visit doctors and share problems with other people. In particular, this is demonstrated by our study, during which the students were reluctant to answer the questions related to the body's disorders.

The correlation between hygienic factors and students' health is the subject of many studies. Hygienic factors

include diverse aspects, such as environmental conditions, healthy diet, physical activity, personal hygiene, etc. The studies show that these factors can have a significant impact on the students' health. Therefore, these form important directions for organization of health preservation [19–22].

CONCLUSIONS

In general, the results of the questionnaire survey conducted in accordance with the nosological principle made it possible to distinguish asthenic and neurotic syndromes as the most challenging for the second-year students. The surveyed students significantly less often reported the symptoms characterizing somatic disorders.

Our study showed that the students' working capacity remained at the average level during the learning process, but it was to the greater extent violated in students with low academic performance. The Spielberger State-Trait Anxiety Inventory results revealed rather high anxiety in the respondents during the learning process. The majority of students experience emotional stress due to inner and personal experiences. Furthermore, it should be noted that girls show higher state anxiety, while trait anxiety is higher in boys. The relationship between anxiety and academic load has been determined. According to our data, working capacity and anxiety levels affect not only learning outcomes, but the students' overall health.

To reduce anxiety, it has been proposed to introduce light physical activity aimed to relieve strain of the musculoskeletal and nervous systems into the daily routine, ensure that students develop a healthy lifestyle attitude.

The correlations between air temperature in the classrooms and the students' working capacity, academic load and working capacity are significant. To optimize the students' working capacity, it is recommended to normalize academic load, adhere to the work, rest, and sleep mode. It has been proposed to introduce the scale for labour intensity per discipline in order to ensure optimal schedules in the universities. To improve socio-hygienic environment and the general level of the culture of health among student youth, it has been recommended to develop effective programs involving inclusion of classes, creative competitions, sports competitions on health preservation in the educational process. This is especially relevant for medical students, who will take over the function of messengers of healthy lifestyle principles for the population in the future.

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