IMPLEMENTATION OF THE PRINCIPLES OF THE SCIENTIFIC CONCEPT “MEDICINE OF BORDERLINE STATES”, REGARDING DONOSOLOGICAL DIAGNOSIS AND OVERCOMING THE RISKS OF HEALTH DETERIORATION IN STUDENT YOUTH

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Abstract. Implementation of the principles of the scientific concept “Medicine of borderline states” regarding donosological diagnosis and overcoming the risks of health deterioration in student youth. Korobchanskyi V.O., Sarkis-Ivanova V.V., Bohachova O.S., Oliinyk Y.O., Bielecka S.V. Today, the methodological basis of disease prevention among various categories of the population, including students, is an innovative area of medical science and health care practice, namely medicine of borderline conditions. The development of a system of prenosological diagnosis of pathological conditions in young students and their hygienic correction for disease prevention are important both from a scientific and practical point of view. The study was conducted in the conditions of a natural experiment on the basis of three types of educational institutions, at the place of study of representatives of both sexes aged 14 to 23 years, adolescents and young adults. In order to achieve the relevant objectives, the study used the following methods: analytic addressed at the study of educational programs, curricula, schedules, profile and regulatory documents; sanitary-hygienic; psychophysiological; psychological, statistic. Set of risk factors related to the educational process among young people studying in three types of educational institutions – secondary educational institutions, higher educational institution, Professional Agrarian Lyceum was analyzed. It is established that unfavorable living conditions affect donosological mental states of asthenic, hypochondriac and depressive nature.

Key words: medicine of borderline states, donosological diagnosis, overcoming the risks, health deterioration in student youth

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Ключові слова: медицина гранчних станів, донозологічна діагностика, подолання ризиків, погіршення здоров’я студентської молоді

Реферат. Реалізація принципів наукової концепції «Медицина гранчних станів» стосовно донозологічної діагностики і подолання ризиків погіршення здоров’я учнівської молоді. Коробчанський В.О., Саркіс-Іванова В.В., Богачова О.С., Олійник Ю.О., Білецька С.В. На сьогодні методологічною основою профілактики хвороб серед різних категорій населення, включаючи учнівську молодь, є інноваційний напрям медичної науки та практики охорони здоров’я – медицина гранчних станів. Розробка системи донозологічної діагностики передпатологічних станів в учнівській молоді та їх гігієнічної корекції з метою профілактики захворювань є важливою як з наукової, так і практичної точок зору. Дослідження було проведено у умовах натурного експерименту на базі трьох типів освітніх закладів, де навчаються представники обох статей у віці від 14 до 23 років підліткового і юнацького віку. Для досягнення мети дослідження в роботі використані такі методи
The relevance of the topic lies in the implementation of globally recognized preventive activities, in relation to preservation of the health of population which determines the success of the educational process and well-being of further production activities [6, 7]. Based on this, preventive activities to preserve the health of various categories of the population are of great practical importance and is defined as an important state direction in maintaining health and overcoming the risks of general and occupational diseases [12]. In studies of different years, the questionnaire survey identified the main indicators of health disorders of people who were in different conditions, including conditions of quarantine restrictions [5, 16]. A detailed description of the process of emotional disorder, depression and stress in young people has been evaluated by researchers from different countries, it should be noted that the incidence of depression has increased 4 times [17].

Today, the methodological basis of disease prevention in various categories of the population, including students, is an innovative area of medical science and health care practice, namely medicine of borderline states, which studies general patterns of the development of prenosological conditions and transients of their transformations, to prevent somatic and mental diseases of different origin by establishing and minimizing (eliminating) the risks of their occurrence with targeted individual and (or) group correction of the functional state of the body [13]. This progressive medical concept was implemented by a set of scientific investigations on hygienic characteristics and optimization of life of the younger generation: preschool children, schoolchildren, socially maladapted children and adolescents [14], students with disabilities, students of vocational schools [3], students of colleges and technical schools and students of higher educational institutions [10, 15].

The purpose of the study was the prevention of diseases in student youth by establishing and overcoming (minimizing) the risk factors of their life activities based on the determination of objective criteria for prenosological diagnosis of the functional state of the body.

MATERIALS AND METHODS OF RESEARCH
The study was conducted in the conditions of a natural experiment on the basis of three types of educational institutions, at the place of study of representatives of both sexes aged 14 to 23 years of adolescents and young adults. On the basis of secondary schools of Kharkiv city and Kharkiv region, the study involved 627 high school students of secondary educational institutions (SEI) aged 14 to 17 (296 males and 331 females). Based at Oknyorobivske Professional Agrarian Lyceum (PAL) (Kharkiv region, Zolochiv district) 130 male lyceum students aged 15 to 18 years were under the direct dynamic supervision. On the basis of higher education institution (HEI) Kharkiv National Medical University 827 students aged 17 to 23 years (308 males and 519 females) were surveyed. In order to achieve the relevant objectives, the study used the following methods: analytic one, aimed at the study of educational programs, curricula, schedules, profile and regulatory documents, as well as establishing important professional features and qualities; sanitary-hygienic – aimed to measure indicators of living conditions [8]; psychophysiological – to determine the functional state of the CNS and the level of professionally important physiological functions [9]; psychological – to evaluate personal characteristics and professionally important psychological qualities [13]. The study meets modern requirements of moral and ethical standards and was conducted in accordance with the principles bioethics set out in the Welsh Declaration of Helsinki – “Ethical principles of participatory medical research People” and the “Universal Declaration on Bioethics and Human Rights” (UNESCO). The study analyzed the impersonal data of respondents under the Law of Ukraine “On Personal Data Protection”. According to the conclusion of the expert commission of Kharkiv National Medical University, the research methods described in the publication were applied in compliance with human rights in accordance with current legislation in Ukraine, they do not violate ethical norms in science and standards of biomedical research. The analysis of the obtained results was carried out by using traditional statistical processing methods [1] using statistical analysis applications Statistical processing of materials was performed using programs “Statsoft Statistica 8.0” (STA862D175437Q).

RESULTS AND DISCUSSION
Investigation of the conditions of life of representatives of three groups of student youth aimed to determine the relevant risk factors regarding the probable deterioration of health.
During training (from the 1st to the 3rd year) there was a significant number of respondents estimated psychological microclimate of their environment as unsatisfactory (9.86±4.47%, <p>0.05), a certain number of respondents described their nutrition as “above average” (22.11±5.81%, <p>0.05). In addition, 8.5±3.51% of the examined senior students did not follow the rules of a healthy lifestyle, being prone to drinking alcoholic beverages and smoking. In relation to the daily living activities of PAL students, the study established that the vast majority of lyceum students (85.71±5.40% or more respondents, <p>0.001) enjoyed favorable psychological microclimate in the team and are in compliance with the rules of personal hygiene and a healthy lifestyle (86.21±6.40%, <p>0.001). However, the obvious factor that can significantly complicate daily life of lyceum students was rather low motor activity during all years of study (68.97±8.59%, <p>0.01). It is also noted that with a certain stability of the indicators of psychological microclimate (<p>0.001), during training (from the 1st to the 3rd year) there was a gradual decrease in motor activity (<p>0.01). Daily life activity of HEI students occurred mainly under the conditions of favorable psychological microclimate (93.52±3.98% of respondents evaluated it as optimal, <p>0.01), strict adherence to personal hygiene requirements (77.91±4.52% of respondents, <p>0.05). At the same time, students are influenced by the complex of unfavorable regime-organizational factors associated with a significant remoteness of educational premises, asynchronous and excessive duration of the school day, lack of free time and time for sleep, leading to a decrease in motor activity (55.84±4.34%), a violation of labor and recreation regime (38.95±3.02%, <p>0.05), non-compliance with rational nutrition requirements (64.93±4.11%, <p>0.05). In addition, 22.07±3.64% of students were found to be prone to harmful habits.

Regarding daily life activities of the student youth in the conditions of the Covid19 pandemic, the study showed its negative impact on the lifestyle of students. The most frequent complaints were disorders of sleep regime, headaches, changes in the visual organs, which might be triggered, firstly, by the restructuring of the day regime, a non-rational organization of workplace and time, physical inactivity and information overload as a whole.

Regarding the life of senior HEI students, the study showed a motor activity (56.49±6.94%, <p>0.05), which is due to the availability of modern means of physical improvement for urban youth. However, (27.87±6.28%, <p>0.05) of students under investigation did not comply with requirements of the rational day regimen due to going to bed lately, reduced sleep duration and getting up late, a significant number of respondents estimated psychological microclimate of their environment as unsatisfactory (9.86±4.47%, <p>0.05), a certain number of respondents described their nutrition as “above average” (22.11±5.81%, <p>0.05). In addition, 8.5±3.51% of the examined senior students did not follow the rules of a healthy lifestyle, being prone to drinking alcoholic beverages and smoking. In relation to the daily living activities of PAL students, the study established that the vast majority of lyceum students (85.71±5.40% or more respondents, <p>0.001) enjoyed favorable psychological microclimate in the team and are in compliance with the rules of personal hygiene and a healthy lifestyle (86.21±6.40%, <p>0.001). However, the obvious factor that can significantly complicate daily life of lyceum students was rather low motor activity during all years of study (68.97±8.59%, <p>0.01). It is also noted that with a certain stability of the indicators of psychological microclimate (<p>0.001), during training (from the 1st to the 3rd year) there was a gradual decrease in motor activity (<p>0.01). Daily life activity of HEI students occurred mainly under the conditions of favorable psychological microclimate (93.52±3.98% of respondents evaluated it as optimal, <p>0.01), strict adherence to personal hygiene requirements (77.91±4.52% of respondents, <p>0.05). At the same time, students are influenced by the complex of unfavorable regime-organizational factors associated with a significant remoteness of educational premises, asynchronous and excessive duration of the school day, lack of free time and time for sleep, leading to a decrease in motor activity (55.84±4.34%), a violation of labor and recreation regime (38.95±3.02%, <p>0.05), non-compliance with rational nutrition requirements (64.93±4.11%, <p>0.05). In addition, 22.07±3.64% of students were found to be prone to harmful habits.

Regarding the state of health of senior SEI pupils, the study found that more than 70% of senior pupils could be described as healthy persons (44.81±2.22% – health group I, 26.57±1.97% – health group II). Health group III (patients) included 26.94±1.98% individuals. Up to 2% of the surveyed belonged to persons with disabilities. The most common diseases among senior SEI pupils were acute and chronic bronchitis, bronchopneumonia (16.80±1.67%) and allergic diseases (16.00±1.64%).

Regarding the health of PAL students, the study established a significant number of subjects with chronic diseases, which increased under the influence of unfavorable factors of the training and production environment. A significant number of lyceum students belonged to health group III (patients in compensation stage), which accounted for 37.50±7.65% in the first year and remained unchanged during the period of study (<p>0.05), and 2.50±2.47% – group IV (congenital malformations, deformation and chromosomal anomaly). In the structure of chronic morbidity, the diseases of digestion (13.74±5.44%), eye and accessory apparatus (12.21±5.18%), blood circulation disease (6.87±3.99%) were dominant. The incidence of chronic diseases significantly increased throughout the three-year training period (from 47.5±7.89% to 74.47±6.36%, <p>0.05), especially the following nosological forms: diseases of eye and accessory apparatus, blood circulation system, urogenital system, respiratory system, skin and subcutaneous cellular tissue, skeletal-muscular system and connective tissue.

Regarding the state of health of HEI students, the study established that the general overloads exerted on students by concomitant effect of the special factors of the educational process and adverse factors of the educational environment (overproduction of the thermoregulation system as a consequence of violations of the air-heat regime) lead to an undesirable but clearly expressed trends: in the process of learning a decrease in the number of people in health group I from 47.00±7.80% to 35±7.65% (<p>0.05), due to a significant increase in the number of people belonging to health groups II (from 22±1.97% to 26±2.93%) and III (from 31.00±6.65% to 39±7.60%), (<p>0.01).

Indicators of prenosological mental state, along with the indicators of the psychophysiological state of representatives of certain groups of student youth, belong to the criteria of prenosological diagnosis of risk of development of pathological states.

The state of mental health of senior SEI pupils was assessed on the basis of a study of the prevalence of prenosological mental states. Senior pupils with borderline mental deviations amounted for 50.57±7.00% of the number of surveyed, indicating a significant
distribution of prenosological conditions of asthenic (14.94±4.93%), hypochondric (25.29±6.02%) and depressive (36.78±6.78%) features which characterizes half of the studied schoolchildren. Only the frequency of the states of the borderline hypochondria syndrome significantly decreased in pupils of the 11th grade (p<0.05), which obviously may be associated with a more responsible and critical attitude of graduates to their health. Psychophysiological characteristics of the functional state of SEI senior pupils is given in Table 1.

**Table 1**

<table>
<thead>
<tr>
<th>Period of study</th>
<th>Without deviations</th>
<th>With deviations</th>
<th>Asthenic syndrome</th>
<th>Depression syndrome</th>
<th>Hypochondria syndrome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 9</td>
<td>48.28±6.56</td>
<td>51.72±6.56</td>
<td>17.24±4.96</td>
<td>34.48±6.24</td>
<td>27.59±5.87</td>
</tr>
<tr>
<td>Grade 10</td>
<td>48.28±7.80</td>
<td>51.72±7.80</td>
<td>20.69±6.33</td>
<td>31.03±7.22</td>
<td>34.48±7.42</td>
</tr>
<tr>
<td>Grade 11</td>
<td>51.72±6.93</td>
<td>48.28±6.93</td>
<td>6.89±3.51</td>
<td>44.83±6.89</td>
<td>13.79±4.78</td>
</tr>
<tr>
<td>p1/2</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>p2/3</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>p1/3</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
<td>&gt; 0.05</td>
</tr>
</tbody>
</table>

Notes: *p1/2 – reliability of differences between 9th and 10th grades; p2/3 – reliability of differences between 10th and 11th grades; p1/3 – reliability of differences between 9th and 11th grades.

Assessment of mental performance of senior SEI pupils showed that these indicators of cognitive activity were characterized by a certain stability of the accuracy coefficient for 9th-11th grades (from 0.871±0.01 to 0.895±0.01), an increase in mental performance (from 158.017±3.26 to 201.671±7.07), stability and volume of attention for 9th to 11th grade (from 36.899±2.78 to 84.89±12.18) (p<0.05 and p<0.01) and attention concentration coefficient (up to 14.566±1.28) (p<0.01), which again decreased to 12.84±1.44 (p<0.01) in the 11th grade. The lack of functional stability of senior pupils was identified by a significant decrease in the mental performance of senior pupils during the academic week (p<0.001). Evaluation of indicators of short-term memory of senior pupils showed that the percentage of correct responses in 9th and 10th grades decreased to 5 and 6 digital signs, respectively, and further increased in the indicators of up to 8 digital signs, with minimal values of 82.12±2.57% and 92.5±1.71% respectively. The percentage of correct responses decreased to the sixth and seventh digital signs with subsequent insignificant increase. In addition, the research identified that senior pupils had an effective way to memorize and reproduce information. Besides, 50.0±5.21% of PAL students were found to have a deviation in the mental state of prenosological nature, which extended with the term of study, the highest one was in the first year – 59.09±10.48% of students, 51.72±9.28% – in the second and 62.2±7.57% – in the third year students (p<0.05). The most widespread prenosological state was a predictor of depression (up to 31.8±9.93% of the number of the surveyed), hypochondria was the least widespread (up to 10.80±4.85%). During the studies, significant changes in the structure of prenosological mental states were not observed (p>0.05). Psychophysiological characteristics of the functional state of PAL adolescents indicated the effectiveness of the existing system of study at PAL. This feature was associated with a significant improvement in the level of implementation of the professionally significant function of representatives training in agrarian specialties, namely equability of the nervous system, which at the beginning of the study period (the beginning of the 1st year) was in accordance with the physiological norm in 35.29±8.19% of the studied persons, and at the end of the term of training (end of the 3rd year) showed a physiological norm in 45.95±8.19% of lyceum graduates (p<0.05). According to this indicator of the nervous system, the end of the second year of study was the most critical when the number of persons with belated reaction was 58.62±9.15% (p<0.05) from the number of examined lyceum students, which objectively indicated the domination of inhibition process, as a consequence and manifestation of significant fatigue.
The general trend of the mental performance of PAL students was its gradual growth with the term of study against physiologically determined fatigue which is the most severe in the 2nd and 3rd year. The coefficient of mental performance increased from 686.35±28.61 standard units up to 731.14±21.40 (p>0.05) from the 1st to 3rd year, the rate of stability of attention from 37.89±7.97 standard units to 53.29±7.49 standard units, p=0.05 followed by a sharp drop to 35.12±3.99 standard units (p<0.05), the coefficient of accuracy remained practically unchanged (p>0.05). Statistically significant reduction of such indicators as the accuracy coefficient and the coefficient of stability of attention in the 2nd year of study (p<0.05), and a significant reduction in the rate of stability of attention in the 3rd year (p<0.05) allowed to attribute this time to the periods of risk, requiring the introduction of psychohygienic measures to correct the regime of the day and the adaptive process as a whole (Table 2).

<table>
<thead>
<tr>
<th>Indicator</th>
<th>1st year of study</th>
<th>2nd year of study</th>
<th>3rd year of study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>beginning of year</td>
<td>end of year</td>
<td>beginning of year</td>
</tr>
<tr>
<td>Accuracy coefficient</td>
<td>0.950±0.006</td>
<td>0.970±0.004</td>
<td>0.960±0.005</td>
</tr>
<tr>
<td>p</td>
<td>&gt;0.05</td>
<td>&lt;0.001</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Mental performance coefficient</td>
<td>686.35±28.61</td>
<td>783.5±24.93</td>
<td>731.14±21.40</td>
</tr>
<tr>
<td>p</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>Attention stability coefficient</td>
<td>37.89±7.97</td>
<td>45.38±9.08</td>
<td>53.29±7.49</td>
</tr>
<tr>
<td>p</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
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</tbody>
</table>


Evaluation of the prevalence of prenosological mental states among HEI students showed that a large number of students (p<0.001) had prenosological states that can transform into asthenic, depressive or hypochondric disorders under certain conditions. In modern system of education, the percentage of persons with the above-mentioned prenosological states was 42.95±2.27%. Depressive manifestations (40.38±2.77%) prevailed in the structure of prenosological mental states. The second place was occupied by precursors to asthenia (11.21±1.78%). A small number of students were found to have hypochondric manifestations (7.05±1.44%).

Psycho-physiological assessment of the functional state of HEI students found an improvement of their functional state from the first to last year of training. Statistically significant improvement was typical both for indicators of the basic properties of the nervous system (balance, strength, motor activities p<0.05-0.001) and leading psychophysiological functions that provide cognitive activity of students, namely different measured features of attention and memory. At the same time, the study showed that the functional state of the CNS of HEI students was distinguished by high stability during the “normative” (everyday educational load). All this indicates a sustainable functional state of students, which under normal conditions is characterized by stability and high levels of implementation (Table 3).

Under conditions of natural loading test (increased mental and psycho-emotional loads during the preparation to exams, credits, module control), aimed at identifying the CNS adaptation reserves, first year students were shown to have a variety of changes in the leading indicators of the functional state (p<0.01-0.001): a significant decrease in the coefficient of accuracy (up to 0.810±0.01 standard units) and an increase in the coefficient of attention stability (up to 66.00±2.85 standard units). This phenomenon can be estimated as immaturity of physiological mechanisms of maintaining the stable state of the body. This phenomenon was typical for students of the first three years of training. Senior students had another result in loading test. Statistically significant discrepancies between the indicator of the functional state of the central nervous system before and after the load were not observed (p>0.05). This indicates the actualization of the functional capabilities of students which develops as a result of studying at HEIs.
Динаміка ментальної продуктивності в студентів вищих навчальних закладів в умовах звичайного академічного навантаження (M±m, n=200, стандартні одиниці)

<table>
<thead>
<tr>
<th>Значення показника (стандартні одиниці)</th>
<th>Значення показника (стандартні одиниці)</th>
<th>p</th>
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</table>
| Враховуючи відповідні вартості, що були більші за 0.869±0.01 окремих стандартних одиниць, у звичайному наявності звичайного навантаження, але при зростанні психоекіїчного навантаження (0.835±0.01 стандартних одиниць), оскільки чоловіки мали значно понижена коефіцієнт точності у відповідних умовах (0.803±0.03 стандартних одиниць і 815±0.02 стандартних одиниць, відповідно, p<0.01). Результати компарувальної дослідницької діагностики вказують на більш низьку коефіцієнт точності у відповідних умовах (0.869±0.01 стандартних одиниць, і 815±0.02 стандартних одиниць, відповідно, p<0.01). Результати компарувальної дослідницької діагностики вказують на більш низьку коефіцієнт точності у відповідних умовах (0.869±0.01 стандартних одиниць). Було виявлено, що жінки і чоловіки мали відповідно більш низький і високий коефіцієнт точності у відповідних умовах.

1. Знайдено ризик фактори для умов життєдіяльності студентів, які впливають на стан здоров’я в розрізі зміни гігієни та рівня шкідливих факторів; зміна стану здоров’я згдя на визначення належності до відповідного групового стану; домінування хронічних захворювань (хронічна бронхіт, бронхінфекція (16.80±1.67%)) у хронічних захворюваннях (16.0±1.64%), значний зростання в хронічному захворюванні (47.5±7.89% до 74.47±6.36%, p<0.05) по розным місцам: захворюваннях очей і носо-ротової залози, захворюваннях серцево-судинної системи, захворюваннях генітально-урологічної системи, дихальних захворюваннях, захворюваннях шкіри і жирової тканини, захворюваннях скелетно-суглінкової системи і сочудкової тканини.

2. За допомогою принципів наукової концепції "Лікування на межах стани" критерії преносологічної діагностики використовуються для об'єктивного оцінення стану здоров’я студентів, що навчаються в різних навчальних установах (наприклад, SEI, PAL, HEI) і дозволяють оцінити стан здоров’я студентів, що навчаються в різних навчальних установах.
REFERENCES


Стаття надійшла до редакції 14.12.2021