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

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DEVELOPMENT OF A PHYSICAL HEALTH MANAGEMENT SYSTEM FOR ADULTS AND CHILDREN: CURRENT ORGANIZATIONAL AND METHODOLOGICAL ASPECTS

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Currently, given the high risk of exposure of the country's population to various adverse factors in the context of everyday life, it is important to promote efforts aimed at improvement of the people's health, its physical aspect in the first place. Establishing the state of the population's physical health management system is a significant part of this process. This study aimed to look into the current organizational and methodological aspects of the development of the physical health management system designed for adults and children in the regions of the country. For this purpose, we surveyed heads of regional government bodies using a 40-item questionnaire that had both multiple choice and grid-in questions. The questionnaires were sent to all regions of the country; 59 of them got filled by the respective officials and returned. The filled questionnaires were subsequently systematized and processed. Having analyzed the responses received, we classified the promoting and limiting factors that affect the development of the adults and children physical health management system. This exercise was designed to yield data needed to support the development of the national (regional, municipal) system underpinning physical culture and sports popularization, the GTO movement (Ready for Labor and Defense), and training of elite athletes. We have also prepared the "Classification of examples of the best management solutions," the "Consolidated list of proposals to improve the regional physical health management system for adults and children," and the "Collection of assistance requests issued by the regions to the federal authorities." Thus, analyzing the responses from the participating regions allowed learning their experience in managing the physical health of both adults and children.

Keywords: organizational and methodological aspects, physical health management system, adults and children, regions, health

Author contribution: Ushakov IB — literature analysis, article text preparation, authoring, and editing; Turzin PS, Lukichev KE — source data collection and analysis, article text preparation and authoring; Popov VI — literature data collection and analysis, article text preparation and authoring. All authors confirm conformity of their parts to the international ICMJE criteria (all authors have made a significant contribution to the development of study's concept, its conduct, and article authoring; all authors have read and approved the final version thereof before publication).

Compliance with ethical standards: representatives of the regions participated in the study voluntarily.

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СОВРЕМЕННЫЕ ОРГАНИЗАЦИОННЫЕ И МЕТОДОЛОГИЧЕСКИЕ АСПЕКТЫ РАЗВИТИЯ СИСТЕМЫ УПРАВЛЕНИЯ ФИЗИЧЕСКИМ ЗДОРОВЬЕМ ВЗРОСЛЫХ И ДЕТЕЙ

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В настоящее время в условиях высокого риска воздействия на население страны различных неблагоприятных факторов жизнедеятельности большое значение приобретают вопросы улучшения здоровья населения, прежде всего физического. В связи с этим значительную роль играет определение состояния системы управления физическим здоровьем населения регионов страны. Целью исследования было изучить современные организационные и методологические аспекты развития системы управления физическим здоровьем взрослых и детей в регионах страны. Для этого был выполнен опрос руководителей органов управления регионов с использованием анкеты, состоявшей из 40 вопросов и позволявшей отвечать на вопросы, как используя варианты ответов, так и произвольно. Такие анкеты были направлены во все регионы страны. Полученные от руководителей органов управления 59 регионов ответы были систематизированы и обработаны. На основании анализа полученных ответов в интересах развития национальной (региональной, муниципальной) системы физической культуры, массового спорта, ГТО и спорта высших достижений в регионах систематизированы факторы, как сдерживающие, так и способствующие развитию системы управления физическим здоровьем взрослых и детей в настоящее время. Наряду с этим подготовлены «Классификация примеров лучших управленческих решений» и «Сводный перечень предложений по улучшению системы управления физическим здоровьем взрослых и детей в регионе», а также «Свод запросов регионов о помощи, которая требуется им со стороны федеральных органов власти». Таким образом, анализ полученных из принявших участие в опросе регионов страны ответов позволил изучить опыт регионов по управлению физическим здоровьем взрослых и детей.

Ключевые слова: организационные и методологические направления, система управления физическим здоровьем, взрослые и дети, регионы, здоровье

Вклад авторов: И. Б. Ушаков — анализ литературных источников, подготовка и написание текста статьи, редактирование статьи; П. С. Турзин, К. Е. Лукичев — сбор и анализ исходных данных, подготовка и написание текста статьи; В. И. Попов — сбор и анализ литературных источников, подготовка и написание текста статьи. Все авторы подтверждают соответствие своего авторства международным критериям ICMJE (все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией).

Соблюдение этических стандартов: участие представителей регионов в опросе было добровольным.

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As a specific subject matter, management of the system for maintaining, strengthening, and improving physical health is being actively studied both in our country [1, 2] and abroad [3–8]. A number of domestic and foreign studies investigated the features of the development of physical health from medical, psychological, and economic perspectives [9–10], as well as the relationship between physical and mental health [11–15], and some have considered physical health as a component of a healthy lifestyle [16, 17] under normal and altered conditions (in the context of digitalization) [18]. Physical development components of corporate programs designed and implemented to strengthen health of the employees are an important part of the overall related efforts [19, 20]. The significance of measures aimed at preserving physical health of the population from childhood is recognized both in the Russian Federation (RF) and abroad [21–25]. In this regard, understanding the development of physical health management system is an important task from both the national economic and social perspectives. Therefore, we conducted a special study that looked into the current organizational and methodological approaches applied at the regional level to the development of the said system, which is designed for both children and adults.

METHODS

Seeking to assess the performance of regional and municipal authorities in developing organizational, methodological, scientific and practical foundations that would underpin the system for managing the physical health of adults and children, and also aiming to learn about the experience of large companies, we sent to 89 regions of the country a 40-item questionnaire designed to collect current information. The questionnaire allowed making suggestions.

The results of this survey were processed in several stages, all revolving around the analysis and interpretation of the collected data with the aim to identify patterns, trends, and to form reasonable conclusions. Methodologically, the process included various approaches: statistical analysis to reveal mathematical patterns and correlations between indicators; cluster analysis to group respondents according to various criteria to determine common trends; factor analysis to investigate the influence of various factors on the final indicators; text analysis to process open responses.

RESULTS

The addressees in this study were representatives of local authorities; the filled questionnaires providing current information, containing answers to questions as well as suggestions from the regional executive branch officials were received from 59 subjects of the Russian Federation, which is more than two thirds (68.4%) of the total number of regions of the country. In general, this fact indicates that the heads of executive government agencies on the considered level pay significant attention to the urgent and important social, economic and medical problem of managing the physical health of adults and children.

The respondents were officials holding various positions in regional ministries (committees, departments, and complexes) responsible for managing matters related to physical culture and sports, healthcare, education, and social development. A single region could have several employees of the governing bodies participating in the study.

At the same time, representatives of organizations subordinate to regional government bodies participated in the preparation of responses to the questionnaires.

Overall, this fact indicates that the involved heads of executive government agencies intentionally focus on the the urgent and important social, economic and medical problem of managing the physical health of adults and children.

It should be noted that in the tables giving the results of the survey question by question, the total number of responses in percents may exceed 100%, since some of the questionnaire items allowed choosing several response options.

Table 1 gives the results of the analysis of the regions' responses to the question "Which of the main directions of development of methodology and technologies for managing the physical health of adults and children in the context of developing a national (regional, municipal) system of promotion of physical culture, popularization of sports, GTO, and training of elite athletes are being implemented in your region (short-term)?".

Thus, the regions pay the most attention to the implementation of regional (municipal, corporate, territorial) programs with the aim to develop the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes., then regional (municipal, industrial, territorial) projects, then methodological documents, then pilot projects, and, finally, the development and implementation of new organizational and information and communication technologies.

Table 2 gives the regions' responses to the question "What conditions have been created in the interests of developing the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in your region?"; the responses revealed a well-developed regional infrastructure serving the development of the said system.

Table 1. The main directions of development of methodology and technologies for managing the physical health of adults and children in the context of developing a national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes (short-term)

№	Directions of development	Quantity (%)
1	Implementation of a regional (municipal, corporate, territorial) project	59.3
2	Implementation of a regional (municipal, corporate, territorial) program	77.9
3	Development and implementation of corporate programs	22
4	Implementation of methodological documents	50.8
5	Development and implementation of new organizational technologies	25.4
6	Development and implementation of new information and communication technologies	23.7
7	Pilot projects	37.3
8	International cooperation	16.9
9	Other	16.9

Table 2. The results of the regions' responses to the question "What conditions have been created in the interests of developing the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in your region?"

№	Terms	Number of regions (%)
1	Availability of stadiums	100
2	Availability of swimming pools	98.3
3	Availability of sports grounds	100
4	Availability of sports centers	93.2
5	Availability of fitness centers	84.8
6	Availability of sports clubs	96.7
7	Availability of sports schools for children and youth	98.3
8	Conducting sports events	100
9	Implementation of specialized corporate programs	72.9
10	Availability of coaching staff	98.3
11	Availability of medical support	91.5
12	Creation of optimal sanitary, hygienic, ecological, and ergonomic conditions for the development of the national (regional, municipal, corporate, territorial) system of physical culture and sports popularization, the GTO movement, and training of elite athletes	81.4

The analysis of the filled questionnaires also allowed identifying the main factors currently somewhat constraining the development of the physical health management system for adults and children in the regions. We compiled the "Consolidated list of factors that currently hinder the management of the physical health of adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in the regions of the country"; it includes the factors in the following areas: the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes; regional infrastructure for physical culture and sports activities; availability of experts specializing in physical culture, health improvement, and sports for the masses; medical support; motivation of managers; motivation of the population; financial support; existing restrictions.

As for the factors that promote the development of the regional physical health management system for adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes, they are as follows:

– issues related to boosting the motivation of citizens to engage in systematic physical culture and sports activities, and to lead a healthy lifestyle;

– development of sports infrastructure;

– organization of physical culture and sports events, including major national and international competitions with increased audience reach;

– support and development of professional clubs (hockey, football, futsal, volleyball, basketball, etc.);

– creation of infrastructure (swimming pools) in the northern regions to teach children to swim and to give the population an opportunity to practice swimming systematically, including people with disabilities;

– improvement of the situation with procurement of resources in the field of physical culture and sports;

– additional funding, etc.

The regions' responses to the question "What impact has the introduction of digitalization had on the physical health management system for adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in your region?" showed that for 72.9% of them, this process is a positive influence.

DISCUSSION

Having analyzed the responses received, we compiled the "Classification of examples of the best management solutions at the level of the subject of the Russian Federation related to the motivation of managers at various levels to oversee the efforts aimed at maintaining and improving physical health of adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in the regions"; the classification included solutions in the fields of organization; introduction of the new types of sports and events; introduction of the new types of grants, ratings, and competitions; introduction of the new ways of work; establishment of the new performance indicators; introduction of the new motivational measures and insignia; financial support; medical care; promotion and popularization of physical culture and sports.

We have also compiled the "Consolidated list of proposals aimed at improvement of the physical health management system for adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes in the regions of the country"; this list covered the following areas: regulatory documents; organizational matters; the GTO system; sport for the masses; healthy lifestyle; corporate programs; education and training; informatization and digitalization; economic aspects; motivational aspects; propaganda.

In addition, the analysis of the filled questionnaires allowed identifying what type of assistance the regions of the country need from the federal authorities for successful development of the physical health management system for adults and children. We compiled the "Collection of assistance requests from the regions to the federal authorities related to the successful management of the physical health of adults and children in the context of development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes"; the requests pertain to the following areas: legislative support; administrative support at the federal level; improvement of infrastructure; education and training; methodological support; medical support; motivation of managers and the population; financial support; propaganda and mass media.

The results of the analysis of the responses from the representatives of the regions revealed the following: 76.3%

of the regions believe that use of adults and children's physical health management technologies in the context of development of the national (regional, municipal) system of promotion of physical culture, popularization of sports, GTO, and training of elite athletes in their regions contributes to the "preservation of healthy labor resources," and 49.1% of the regions believe that it contributes to "labor productivity growth." According to 47.5% of regions, such technologies help to "improve the image," while 42.4% of the regions claim they "reduce the volume of sick leaves," 20.3% of the regions — "reduce staff turnover", and 18.7% of the regions believe the technologies "reduce the number of accidents." A different answer was received from 5.1% of the regions.

As for the corporate entities, their efforts in the field of managing the physical health of adults and children yielded the following achievements: organized and conducted sports days and competitions both within one company and for several companies; support to sports and the corporate sports movement; a number of enterprises organize various corporate sports and recreation and mass sports events for their employees and their family members. Local authorities assist in organization of such events. Companies also develop and implement specialized corporate health promotion programs, including corporate programs for the development of physical culture and sports; promote and encourage the GTO system among their employees; conduct corporate games, departmental competitions (cross-country tracking, cross-country skiing, etc.), contests to establish the best corporate programs designed to involve employees in sports and a healthy lifestyle.

The proposals of the representatives of the regions related to the development of corporate programs include the following:

– development and implementation of mandatory corporate programs for the development of physical culture and sports;

– development of corporate sports through mass-oriented sports popularization efforts in companies of all patterns of ownership;

– extension of the Healthy Municipality program, implementation of corporate employee health promotion programs at all companies;

– development of corporate sports, etc.

CONCLUSIONS

The analysis of the responses received from 59 regions of the country revealed the main factors currently somewhat constraining the development of the adults and children's physical health management system in the regions; a number of factors contributing to the development of the said system; the types of assistance the regions need from the federal authorities for successful development of the national (regional, municipal) system of physical culture and sports popularization, the GTO movement, and training of elite athletes.

Based on the data obtained, we have also compiled the the "Classification of examples of the best management solutions at the level of the subject of the Russian Federation related to the motivation of managers at various levels to oversee the efforts aimed at maintaining and improving physical health of adults and children in the region," the "Consolidated list of proposals to improve the regional physical health management system for adults and children," and the "Collection of assistance requests from the regions to the federal authorities related to the successful management of the physical health of adults and children."

Another subject investigated in this study was the experience of large companies in the country's regions in what concerns management of the physical health of adults and children.

The analysis of the results of the survey clearly demonstrates the urgent need to intensify the work of the executive authorities at the level of the subjects of the Russian Federation that addresses organizational and socio-economic problems of further development of the system of physical culture and sports popularization, the GTO movement, and training of elite athletes in the regions of the country.

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TO THE ANNIVERSARY OF PROFESSOR YURY YU. ELISEEV

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The paper presents a scientific biography of the well-known scientist and teacher, Honored Scientist of the Russian Federation, Head of the Department of General Hygiene and Ecology of the Razumovsky Saratov State Medical University, Dr Sci. (Med.), Professor Yury Yu. Eliseev, on the occasion of his 70th birthday. The main stages of the Professor's activities over the entire period of his research and teaching work are analyzed. Yu.Yu. Eliseev carries out extensive research, educational, methodological, expert and consulting work. Under the Professor's supervision, more than 70 doctoral and PhD theses have been prepared and successfully defended. A total of 76 monographs, textbooks, and teaching aids have been issued, 32 copyright certificates for inventions, Russian Federation patents, certificates for registration of electronic databases, computer programs have been implemented, a number of production regulations, pharmacological articles, instructions for the use of new preventive medical immunobiological preparations (vaccines and diagnostic serums), and hygienic regulatory documents have been developed. The launch of two postgraduate courses in the specialties "Hygiene" and "Allergology and Immunology" managed by Yu.Yu. Eliseev has been initiated. Professor is a member of editorial boards of seven journals, he has state awards of various levels. The results of the Yu.Yu. Eliseev's work presented have made it possible to respond to numerous challenges faced by scientific community in different years, and the vector of scientific and pedagogical work that he has set is promising in terms of solving hygienic problems, as well as resolving the issues of training and education.

Keywords: Yuri Eliseev, Razumovsky Saratov State Medical University, Department of General Hygiene and Ecology, anniversary, biography

Author contribution: Voitovich AA — literature review, study planning, data acquisition, analysis, and interpretation, manuscript draft writing; Alekseeva NA, Leskovets ES, Pichugina NN, Sergeeva ES — data acquisition, analysis, and interpretation, manuscript draft writing; Derin VN — study planning, data interpretation, manuscript draft writing; Eliseeva YuV — literature review, study planning, data acquisition and analysis.

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К ЮБИЛЕЮ ПРОФЕССОРА ЮРИЯ ЮРЬЕВИЧА ЕЛИСЕЕВА

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В статье представлена научная биография известного ученого и педагога, Заслуженного деятеля науки РФ, заведующего кафедрой общей гигиены и экологии Саратовского государственного медицинского университета имени В. И. Разумовского, доктора медицинских наук, профессора Юрия Юрьевича Елисеева, в связи с его 70-летним юбилеем. Проанализированы основные этапы деятельности профессора за весь период научно-педагогической работы. Ю. Ю. Елисеев проводит огромную научную, учебно-методическую, экспертно-консультативную работу. Под руководством профессора подготовлены и успешно защищены более 70 докторских и кандидатских диссертаций. Изданы 76 монографий, учебников и учебных пособий, внедрены 32 авторских свидетельства на изобретения, патента РФ, свидетельства на регистрацию электронных баз данных, программ ЭВМ, разработан ряд регламентов производства, фармакологических статей, инструкций по применению новых профилактических медицинских иммунобиологических препаратов (вакцин и диагностических сывороток), гигиенических нормативных документов. Инициировано открытие двух аспирантур по специальностям «Гигиена» и «Аллергология и иммунология», руководителем которых является Ю. Ю. Елисеев. Профессор состоит в редакционной коллегии семи журналов, имеет государственные награды различного уровня. Представленные результаты деятельности Ю. Ю. Елисеева позволили ответить на многочисленные вызовы, стоявшие перед научным сообществом в разные годы, а заданный им вектор научно-педагогической работы является перспективным для решения гигиенических проблем, а также вопросов обучения и воспитания.

Ключевые слова: Юрий Юрьевич Елисеев, Саратовский государственный медицинский университет имени В. И. Разумовского, кафедра общей гигиены и экологии, юбилей, биография

Вклад авторов: А. А. Войтович — анализ литературы, планирование исследования, сбор сбор, анализ и интерпретация данных, подготовка черновика рукописи; Н. И. Алексеева, Е. С. Лесковец, Н. Н. Пичугина, Е. С. Сергеева — сбор, анализ и интерпретация данных, подготовка черновика рукописи; В. Н. Дерин — планирование исследования, интерпретация данных, подготовка черновика рукописи; Ю. В. Елисеева — анализ литературы, планирование исследования, сбор и анализ данных.

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Fig. Yury Yu. Eliseev

September 8, 2025 marks the 70th anniversary of the outstanding scientist and teacher, Honored Scientist of the Russian Federation, Head of the Department of General Hygiene and Ecology of the Razumovsky Saratov State Medical University, Professor, Dr Sci. (Med.), Yuri Yu. Eliseev (Fig.).

The paper describes the main stages of the Professor's activities throughout the entire period of his scientific and pedagogical work. In different periods, the areas of the Yu.Yu. Eliseev's activities changed in accordance with the current demands and challenges of the time.

Our aim was to describe the Professor Yu.Yu. Eliseev's research and teaching activities in order to demonstrate their importance and relevance.

Yuri Yuryevich was born in Saratov on September 8, 1955 in the family of the military officer. On September 1, 1972, he entered his first year of the medical faculty of the Saratov Medical Institute (SMI). In 1978–1981, he studied full-time as a postgraduate student at the Department of Hygiene of SMI under the supervision of Professor Evgeny V. Shtannikov.

In those years, E.V. Shtannikov was Head of the Department of General Hygiene, the main areas of activity of which were water supply hygiene and scientific basis of environmental hygiene. Professor E.V. Shtannikov founded a novel research area: hygiene of ion exchange resins and economic importance of those for water supply hygiene. He developed the construction of domestic electrical deionizer desalination plants.

In 1981, Professor Yu.Yu. Eliseev defended his candidate thesis "Study of the hygienic Efficiency of Water Treatment Plants in Terms of Pesticide Transformation Products" ahead of schedule at the Erisman Moscow Research Institute of Hygiene. In 1981–1986, he was an assistant at the Department of Hygiene of SMI. In 1986, he was elected as a senior research fellow at the All-Soviet Research Anti-Plague Institute "Microbe". In 1990, he was awarded the academic title of senior research fellow in the specialty "Microbiology". The same year, Yu.Yu. Eliseev was appointed Head of the Department of Preventive Drugs at the Russian Research Anti-Plague Institute "Microbe". In 1994, in the Research Anti-Plague Institute "Microbe" (Saratov), he successfully defended his doctoral thesis "Improvement of the Oral Tablet Cholera Vaccine". In 1998, he was elected by competition to the position of Head of the Department of General Hygiene at the Saratov State Medical University (SSMU). In 1999, he was awarded the academic title of Professor of Hygiene. In 2002–2007, Yu.Yu. Eliseev worked as a Vice-Rector for Science, and then as a Vice-Rector for Public Relations and Educational Work at the Razumovsky Saratov SMU. Today, Professor Yu.Yu. Eliseev, Dr Sci. (Med.), is Head of the Department of General Hygiene and Ecology at the Razumovsky Saratov SMU.

When working at the Russian Research Anti-Plague Institute "Microbe", Yu.Yu. Eliseev was the first to demonstrate a considerable difference in estimates of the effects of parenteral and oral cholera vaccines on the development of the anti-cholera immune response in laboratory settings, then in pre-clinical and clinical trials. The immunological effectiveness, harmlessness and immunological safety of the new chemical bivalent tablet cholera vaccine were proven for the first time during vaccination and revaccination of adults, adolescents and children; the optimal vaccine doses necessary to develop the immunity were determined [1]. As a result, Yu.Yu. Eliseev together with the team under his direction ensured introduction of the novel bivalent tablet cholera vaccine into healthcare practice (invention patent RU 2159128 C1, 20.11.2000). Mass production of the vaccine was organized. Today, it is successfully used in the Russian Armed Forces.

The cycle of the research work on the sanitary and toxicologic assessment of the acetylacetonates of iron, cobalt, chromium used in the glass industry done at the Department made it possible to determine safe levels of those in environmental objects, to develop and introduce the "List of Estimated Safe Levels (OBUV) of Hazardous Substances" approved by the Ministry of Health of the USSR (№ 12-21a/198 dated 4.10.1983) [2, 3]. Among other research projects managed by Yu.Yu. Eliseev, the study focused on determining the levels of aflatoxin M1 in cow milk and safety of cow milk sales by the districts of the Saratov Region should be highlighted. It was found that the levels of aflatoxin M1 in milk in the region did not exceed its maximum permissible concentration (MPC = 50.0 ng/kg). However, in a number of districts of the Saratov Region the average aflatoxin M1 concentrations were 2–3 times higher than the MPC (20.0 ng/kg) regimented for dairy products produced for baby food [4, 5]. This research study was supported by grant of the Russian Foundation for Fundamental Research.

The large-scale study of the environmental and hygienic situation in districts of the Saratov Region in terms of the possibility of the presence of ecotoxicants in environmental objects made it possible to determine the priority pollutants of water objects, soil, and air of 38 studied districts of the Saratov Region [6–8]. The data obtained during implementation of this research project provided the basis for a number of further promising research works focused on the objective hygienic assessment of the impact of environmental factors on public health and the development of the system of preventive measures.

Professor Yu.Yu. Eliseev still conducts large-scale research work. Under the leadership of Yuri Yuryevich, a new scientific hygienic school was founded, which is based on the priority areas of fundamental and experimental medical and preventive research in the field of hygiene, ecology, and immunology. Under the direct supervision of the professor, more than 50 doctoral and candidate theses have been prepared and successfully defended. Among his dissertators there are directors and deputy directors of the research institutes (A.N. Mikerov, Dr. Sci. (Med.), I.V. Kutyrev, Cand. Sci. (Med.)), Heads of the Rospotrebnadzor directorate, their deputies, heads of departments (N.N. Pavlov, Cand. Sci. (Med.), S.V. Sergeeva, Cand. Sci. (Med.), N.A. Merkulova, Cand. Sci. (Med.)), heads of university departments (Professor I.N. Lutsevitch, Dr. Sci. (Med.), S.Yu. Chekhomov, Cand. Sci. (Med.)). Modern research managed by Professor represents a priority corresponding to the area of science 3.4 "Preventive Medicine" and is part of the fundamental and exploratory research (3.4.1) aimed at developing health preservation technologies in accordance with the "Programme for Basic Scientific Research in the Russian Federation for the Long-Term Period (years 2021–2030)" (Order of the Government of the Russian Federation dated 31.12.2020 № 3684-r).

Yu.Yu. Eliseev is the author of more than 530 scientific works, including 76 monographs, textbooks, and teaching aids [9, 10]. He contributed to introduction of 32 copyright certificates for inventions, Russian Federation patents, certificates for registration of electronic databases, computer programs [11–13]. Professor is the author and co-author of a number of production regulations, pharmacological articles, and instructions for the use of new preventive medical immunobiological drugs (vaccines and diagnostic serums) that are used or included in the country's mobilization reserve, hygienic regulatory documents — OBUV (estimated safe levels of hazardous substances) approved by the Ministry of Health of Russia.

For 15 years, Yuri Yuryevich was a member of the expert council for medical and preventive sciences of the Higher Attestation Commission of the Russian Federation, representing the following specialties: "Hygiene" (3.2.1) and "Allergology and Immunology" (3.2.7). Professor Yu.Yu. Eliseev worked in dissertation councils at the Orenburg State Medical University in the specialty "Hygiene"; Russian Research Anti-Plague Institute "Microbe" of Rospotrebnadzor in the specialty "Epidemiology". He is currently a member of the dissertation council at the Volgograd State Medical University in the specialty "Hygiene".

Yu.Yu. Eliseev initiated the launch and became an active Head of the Department of General Hygiene and Ecology at the Razumovsky SSMU, two postgraduate courses in the specialties "Hygiene" and "Allergology and Immunology".

Yuri Yuryevich is a member of editorial boards of seven journals, among which six are in the list of HAC RF: Russian Bulletin of Hygiene (Moscow), Saratov Scientific Medical Journal, Postgraduate Bulletin of the Volga Region (Samara), Volgograd Scientific Medical Journal, Science and Innovation in Medicine (Samara), Archives of Clinical and Experimental Medicine (Donetsk).

Significant research carried out under the leadership of Yuri Yuryevich, high achievements in scientific and teaching areas, and his leadership talent were recognized with state awards at various levels. Professor Yu.Yu. Eliseev has honorary titles "Honored Inventor of the Russian Federation", "Honorary Worker of Higher Education of the Russian Federation", "Honored Scientist of the Russian Federation", medals "For Strengthening Military Cooperation", "Participant in the Emergency Situation Liquidation", "100th Anniversary of the Russian Research Anti-Plague Institute "Microbe", "100th Anniversary of the Sanitary and Epidemiological Service of Russia", "Silver medal named after P. Ehrlich". Numerous diplomas, certificates of honor and letters of gratitude emphasize the impeccable work, the enormous creative contribution to preventive medicine, and the great social work.

The results of the Professor Yu.Yu. Eliseev's work presented have made it possible to respond to numerous challenges faced by scientific community in different years, and the vector of the research and teaching work he has set is promising in terms of solving hygienic problems and resolving the issues of training and education.

On behalf of our colleagues, we congratulate Yuri Yuryevich on his next anniversary and wish him strength and health to continue his creative, scientific and pedagogical work for many, many years.

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CURRENT EDUCATIONAL TECHNOLOGIES IN TEACHING MEDICAL STUDENTS WITH DISABILITIES

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The number of young people with disabilities is steadily growing, which means there is a natural increase in the number of students belonging to this category entering higher educational institutions teaching medicine. Under the Federal Law No. 181-FZ of November 24, 1995 (amendments of May 29, 2024) "On Social Protection of Persons with Disabilities in the Russian Federation (with amendments and additions of September 1, 2024)," the state supports the eduction of the physically impaired individuals and guarantees such individuals receive the said education in appropriate conditions. Studying at a medical university is associated with significant intellectual and psychological stress; therefore, it is extremely challenging for students with disabilities and requires a certain level of physical and mental health. To date, the problems of teaching such students in medical universities have not been studied sufficiently, nor have the related educational technologies been duly systematized. The article examines the most common issues associated with teaching medical students with disabilities as reported in Russian and foreign papers, and suggests solutions for them.

Keywords: student health, education of medical students with disabilities, inclusive education, social integration

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СОВРЕМЕННЫЕ ОБРАЗОВАТЕЛЬНЫЕ ТЕХНОЛОГИИ В ОБУЧЕНИИ СТУДЕНТОВ С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ ЗДОРОВЬЯ В МЕДИЦИНСКИХ ВУЗАХ

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В настоящее время отмечают неуклонный рост числа молодых людей с ограниченными возможностями здоровья и инвалидностью, в связи с чем закономерен рост числа обучающихся этой категории в медицинских высших учебных заведениях. Согласно Федеральному закону от 24 ноября 1995 г. № 181-ФЗ (редакция от 29 мая 2024 г.) «О социальной защите инвалидов в Российской Федерации» (с изменениями и дополнениями, вступившими в силу с 1 сентября 2024 г.), государство поддерживает получение инвалидами образования и гарантирует создание необходимых условий для его получения. Обучение в медицинском вузе связано со значительными интеллектуальными, психическими нагрузками, в связи с чем оно является крайне сложным для обучающихся с ограниченными возможностями здоровья и инвалидностью и требует определенного уровня здоровья — как физического, так и психического. На сегодняшний день недостаточно изучен вопрос проблем обучения таких студентов в медицинских вузах, а также не в полной мере систематизированы современные образовательные технологии, используемые в их обучении. В статье рассмотрены наиболее распространенные проблемы, возникающие при обучении студентов с ограниченными возможностями здоровья или инвалидностью в медицинских вузах согласно данным отечественных и зарубежных исследований, приведены предполагаемые пути их решения.

Ключевые слова: здоровье студентов, обучение студентов-медиков с ограниченными возможностями здоровья, инклюзивное образование, социальная интеграция

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The number of young people with disabilities and health limitations (HL) is steadily growing, which means there is a natural increase in the number of students belonging to this category who enter higher educational institutions [1–10]. Official statistics and research data show that in Russia, from 2013 to 2019, the number of children with disabilities increased by more than 102 thousand people, which is about 18% of the disabled population [1–10].

Under the Federal Law No. 181-FZ of November 24, 1995 (amendments of May 29, 2024) "On Social Protection of Persons with Disabilities in the Russian Federation (with amendments and additions of September 1, 2024)," the state supports the eduction of the impaired individuals and guarantees them proper conditions allowing realization of this right [11]. Article 79 of Federal Law No. 273-FZ of December 29, 2012 "On Education in the Russian Federation" enshrines the rights of people with disabilities and HL to receive higher professional education and provides related guarantees while prescribing creation of the special conditions for the students with disabilities [12]. Various higher education institutions, including medical universities, provide people with disabilities and HL with the opportunity to study in all areas. Currently, assorted elements of inclusive and integrated approaches to education are being actively introduced into the educational process at medical universities in Russia and abroad [1–10].

According to the collected data, higher education plays a key part in successful socialization, professional and social self-realization, realization of the potential, and full-fledged

participation in public life [1, 2]. However, despite the widespread implementation of inclusive education programs and creation of special training opportunities for people with disabilities and HL, in medical schools, there are several serious obstacles and problems hindering the said implementation. It should be noted that inclusive education itself is an extremely complex and multidirectional process that has a large number of crucial educational, organizational, and legal aspects. Currently, numerous scientists and educators in various countries of the world are actively engaged in the study of this problem. It should be noted that in European countries and the USA, the elements and concepts of inclusive education have been studied and implemented for a considerable period of time: years, and in some cases decades. In Russia, however, inclusive education is a relatively new field, which translates into a number of problems in the implementation of this model of education: the associated educational process is complex and specific in medical universities, there is a huge amount of information to be consumed, an equally large amount of practical skills to be mastered, as well as prolonged stay at the bedside of patients, excessive stress, etc. [1, 2]. At the same time, the requirements for inclusive education vary significantly depending on the level and type of educational organization. In the future, educational approaches and requirements for the learning process itself will be transformed to fit the said levels and types [1–5]. For example, in general education schools, the requirements will be much lower than in higher education establishments. In medical schools, the educational and practical work loads are high, which necessitates a wide range of requirements for the implementation of inclusive education.

It should be understood that, for the reasons given above, it is currently impossible to shift higher medical education institutions to the inclusive education model. In addition, studying in such an institution requires solid physical and mental health due to the implied professional duties, which is another significant obstacle on the path of introduction of the inclusive model of education there [1, 2]. It has been shown that people with disabilities and HL are not always able to start working properly after completing their studies [2].

According to the sets of human rights and freedoms legally established in most countries of the world, students with disabilities and HL should be guaranteed the possibility to practice these rights and freedoms; they need special support and assistance [11–14]. At the same time, currently, a number of modern technologies, such as distance learning, are being actively developed, which promotes successful social adaptation and professional integration of students with disabilities. To date, there has been conducted only a few studies that investigated the issues of teaching students with disabilities and HL at medical universities. This scarcity justified this work.

This study analyzed the available research papers and literature with the aim to identify and systematize the current fields of application of educational technologies adapted for students with disabilities and HL in the domain of higher medical education.

METHODS

The materials used in this study were the scientific publications indexed in international databases (Web of Science, Scopus, PubMed) and the Russian RSCI scientific research database. We searched for them using the keywords "medical students + health limitations" and "medical students + disability + education"; the publication period was limited to years 2014 through 2024.

Among the Russian papers, we preferred those published in the journals forming the core of the RSCI. In the domain of foreign papers, the preference was given to those indexed in the Web of Science and Scopus.

The search results were as follows.

- keywords "medical students," "disabilities" returned 2089 foreign and 136 Russian studies.
- a clarified search for "medical students," "disability," "health limitations," "education" reduced the number of foreign publications to 918, and publications in the RSCI to 34.

Eventually, we selected 32 relevant sources published over the past decade as the basis for the analytical review. The data therein show that researchers are steadily growing more interested in the issues related to the modern educational technologies for students with HL attending medical schools. This trend is evident both on the Russian national and global levels.

Teaching medical students with HL: main problems

Giving higher medical education to people with disabilities and HL requires a specialized teaching environment. This need arises from the specific nature of the educational process in medical universities, which includes intensive practice of acquired skills, bedside training in clinical settings, and the necessity to adapt traditional pedagogical approaches to the special needs of students [2]. Educating people with disabilities and HL requires highly skilled professors and support staff, as well as updated curricula and teaching materials that meet the modern requirements of inclusive pedagogy and address the specific needs of students with various types of disabilities [11]. In addition, this process often implies additional financial costs, which must also be taken into account when organizing educational programs at medical universities [1, 2, 13]. Today, medical education is considered one of the most difficult ones. In Russia, the minimum duration of a medical specialist program is six years, and in most cases, they are followed by additional training under residency programs. This approach is primarily justified by the need to train highly qualified professionals who can treat patients and bear responsibility for their lives and health [1, 2, 5, 7, 10, 13, 14]. Attending medical schools, students need to master a significant number of diverse disciplines and simultaneously learn a variety of necessary practical skills, which involves consumption of large amounts of information [1, 2, 7, 13, 14]. Obviously, an educational process this complex requires certain physical and mental prowess from students. The studying at the higher education establishment itself becomes an adverse factor affecting a student's health, which is especially noticeable if that student has secondary employment [15]. All of the above makes attending a medical school impossible for a significant part of people with HL, even when the elements of inclusive education are implemented properly and effectively [1, 2].

Some foreign researchers highlight surgery practice and lessons at the operating rooms as the most significant problem [13, 14]. Russian researchers also point out a number of critical issues in the development of inclusive education at Russian medical schools, all of which are supported by scientific evidence [1–4, 16–17]. The most urgent of them are as follows.

- Inadequacy of the infrastructure to the accessibility requirements: many academic buildings are unfit for individuals with HL, which necessitates modernization of spaces, from installing ramps to creation of special zones.

• Staff shortage: many establishments report insufficient number of professors and support staff (tutors, assistants) skilled in inclusive education, which calls for systemic additional and advanced training and introduction of programs designed to enable educators to work with special students.

• Problems of professional integration: organizing clinical practice for students with disabilities involves logistical and methodological difficulties, and their subsequent employment bumps against the limited willingness of employers to create inclusive conditions in medical institutions.

• Socio-psychological barriers, controversial perception of inclusion in higher school and society: some experts doubt the effectiveness of implementation of the inclusive education approach in medical academia, supporting their stance with the specifics of the profession and high requirements for graduates' competencies.

These problems are systemic, they require complex solutions that include legislation, interdepartmental cooperation, and a sensible approach to the implementation of the inclusive methodology at all levels of the educational process.

A survey of medical students that inquired about various aspects of their studies revealed the following: no respondents have ever experienced negative attitude from their professors; 7% of the respondents faced such from their peers; all respondents received additional assistance offers when they needed it; 97% of them reported having everything they need to study, including technical means; all respondents recalled being offered to join various student organizations and events. When contemplating specialization, 93% of the participants in this survey expressed a wish to become general practitioners, while 7% wanted to become surgeons [1].

It should be understood that at the level of higher school, the requirements for educational arrangements that support studies of people with HL cover aspects transcending far beyond infrastructural solutions. According to the available evidence, in addition to ensuring accessibility and adaptation of the environment from the technical viewpoint, these requirements call for integration of the following key components [2, 7, 13, 14]:

• specialized pedagogical technologies that factor in the nosological characteristics of students;

• optimized communication processes to overcome barriers in academic and social interaction;

• innovative socialization strategies aimed at the development of professional identity and independent professional skills in an inclusive learning environment.

Thus, the effective inclusion of students with disabilities in the educational process involves elimination of physical barriers and development of flexible methodologies that enable adaptation to the individual growth trajectories.

The rights of students in the context of professional education are guaranteed by the respective regulations [11, 12]. The existing problems of inclusive education of students with disabilities and HL in medical schools cause new challenges and shape the criteria for professional and personal readiness of all participants of the educational process [16–19].

The current requirements associated with inclusive education, as they concern the competencies and skills of the educators, prescribe mastery of the inclusive pedagogical methods, including adaptation of the programs to the nosological profiles of students; advanced knowledge of special psychology and educational process ergonomics; well-developed emotional intellect, patience, flexibility that ultimately create a supporting academic environment [16–19].

There are also some inclusion-promoting requirements imposed on the students: they should foster the ethic of mutual assistance within study groups; actively participate in collaborative practices aimed at integration of the fellow students with disabilities; develop clinical thinking through empathic interaction, thus laying the foundation of their future professional activity [16–19].

The quality of inclusive education of students with disabilities directly correlates with the level of competencies of the professors. However, despite them being instrumental to the creation of an adaptive environment, the current university professor education system has a number of systemic gaps, which translate into [1–7, 16–19] a lack of specialized skills, lack of a deep understanding of the nosological features and methods of individualization of curricula; limited access to innovative methods, the predominance of theoretical approaches over practice-oriented support tools; problems and difficulties of interdisciplinary interaction, insufficient integration of knowledge from the fields of special pedagogy, rehabilitation and digital didactics.

These problems translate into a significant deterioration of the quality of education [1–7, 16–19]. A 2019 Russian study has shown that there are contradictory tendencies in the perception of inclusive education, with a certain discordance in the awareness. For example, 86% of the respondents failed to give the definition of inclusive education, but 90% supported the idea of developing it in higher education establishments. Hybrid model, which merges in-person and distant learning blocks, was acknowledged as the most effective for students with disabilities and HL by 89% of the respondents. The study has also revealed positive trends in the readiness of the society for inclusive practices. In particular, 92% of the students reported their openness to attending classes with peers with disabilities, and 75% refused the idea of establishing specialized educational institutions for them. Moreover, 91% of the respondents expressed readiness to help such peers with their studies, which indicates the establishment of the culture of assistance. The majority of the participants in the survey (90%) claim inclusive approaches do not hinder the educational process, pointing to their neutral or positive effect felt by the entire group. The survey has shown that 85% of the students support the equal rights principle: professors should not be overcaring about students with disabilities, but can give them individual advice when needed. Ultimately, the study revealed a certain ambiguity: 90% of the respondents declared support of the inclusive practices, but 86% lack the conceptual knowledge thereabout [16]. These results add urgency to the task of development and implementation of the programs designed to give systemic understanding of the principles of inclusion to all participants of the educational process [16]. According to the survey, the most important problems are environmental barriers (lack of ramps, tactile navigation, elevators); lack of equipment for various disabilities (deafness, visual impairments); prejudice and stigmatization of health limitations in the academia that cause social isolation; underdeveloped culture of inclusion among students and professors, negative attitude towards this approach; educational material comprehension and consumption difficulties associated with sensory, motor, or cognitive impairments; insufficiency of personalization of the training trajectories (lack of adjustments to the specific disabilities of every student with HL) [16].

Several foreign studies revealed a certain level of education-related isolation of students with HL despite the implemented

measures aimed at introduction of the inclusive practices in the higher education institutions [5, 6, 20–22]. In addition to the problems described above, in a medical school, such students commonly have no map that could guide them through the departments during practice, and there is no coordinated effort aimed at solving the accommodation and other issues stemming from the disabilities [20, 21]. The bachelor programs in the field of medicine often disregard the needs of people with disabilities [21]. A study highlighted difficulties with access to the educational materials of technical, physical, and organizational nature: lack of special versions of digital platforms, specialized software and hardware for various disabilities; lack of books, lab equipment, library resources adapted to sensory impairments; lack of flexible formats of provision of information (recorded lectures, interactive 3D models) made for students with motor and sensory disabilities [23].

In addition to the abovementioned problems of integration of students with disabilities and HL, some participants of the process are superficial about their roles, which ultimately devalues the very concept of inclusive education [20–24]. Analyzing the problems of the stages of inclusion, several researchers suggest that the integration thereof into the educational process should be long-term and discrete-less: the key are consistency, structure, and a complex approach [1–3]. In general, most authors agree that the problems of implementing inclusive education programs for students with disabilities in various educational institutions, including medical schools, are quite universal.

Using modern educational technologies for teaching students with disabilities in medical universities: issues and problems

To improve the effectiveness of teaching students with disabilities at medical universities, it is necessary to develop a specialized comprehensive support system. This need arises from the unique requirements of the medical profession, which impact both the learning process and subsequent practical activities. The key features of teaching the profession of a doctor are as follows [25].

• The high educational and professional requirements, the need to acquire a significant amount of highly specialized knowledge and the constant development of practical skills, which translate into an increased burden on students and young graduates, especially against the background of health limitations.

• The significant physiological and psycho-emotional stress, often associated with extreme work intensity, legal responsibility and moral and ethical tension, which contribute to increased stress and negatively affect the mental and physical condition of students with disabilities.

• Occupational hazards (cynicism, emotional detachment), susceptibility to emotional burnout, and the diseases related to working conditions (infections, chronic fatigue syndrome).

• The need for specific personal qualities, empathy, patience, stress tolerance, benevolence, tact, and the ability to self-regulate, which may be especially difficult for some students with disabilities.

• Communicative competence, the ability to create conflict-free interaction with patients of different social groups, work in multidisciplinary teams and effectively resolve difficult situations, all of which require a high level of emotional intelligence and adaptive skills, which can be difficult for some people with disabilities.

Based on the above, the support system for this category of students should extend beyond the academic issues and also seek to minimize professional risks, develop personal and ethical skills, and help adapt to the specifics of medical activity.

In Russia, medical academia is more used to the term "integrated education," and the concept of "inclusive education" is less widespread. These two concepts have fundamental differences, and it is important to take them into account. For one, inclusive education is a systematic approach aimed at adapting the educational environment to the needs of all students, including people with disabilities. The goal of inclusive education is to ensure equal access to knowledge and comfortable conditions for every student, regardless of their physical, cognitive, or social characteristics [1, 2]. Integrated education, on the other hand, implies mixed groups where students with disabilities or minor developmental disabilities study together with healthy peers. The main emphasis in this case is on the socialization of people with disabilities through interaction in the academic environment, which contributes to their integration into the professional community [1, 2]. Thus, inclusion implies the transformation of the system to meet the needs of students, while integration implies the inclusion of students with disabilities in the existing system. To form an effective educational policy, especially in medicine, where the requirements for adaptability and socialization of future specialists are particularly high, it is necessary to clearly see the differences between integration and inclusion.

In Russia, higher education institutions are checked for the measures taken to realize the provisions of the regulations prescribing creation of the conditions to ensure effective education (basic programs) of students with disabilities and HL [1, 2]. The state guarantees the disabled person the right to receive the necessary information. It should be noted that most higher medical schools are actively developing and implementing inclusive education approaches aimed at creating an accessible and comfortable environment for students with disabilities. The main strategic directions of this are as follows [1–4, 7, 8].

• Strategic resource planning, development of a system of psychological, pedagogical, and logistical support that factors in the special needs of students (provision of literature in formats adapted for visually impaired people, etc.); the system should rely on federal funding.

• Coordination of educational programs, creation of adapted educational programs and methods of social and psychological support.

• Professional orientation and employment support for graduates with disabilities and HL.

• Introduction of assistive technologies, use of the federal electronic library and the portal of inclusive resources.

• Consultation and methodological services, giving advice to the higher education establishments regarding accessibility of education, adaptation of infrastructure, and quality of education.

• Support in the context of organization of integrated learning, planning of educational work, and improvement of rehabilitation processes, as well as assistance in procurement of specialized equipment.

• Professional development of professors and the support staff; seminars, training sessions, lectures giving skills needed to work with students with disabilities, as well as adaptation of educational materials (translation of lectures, textbooks, graphs and tables into alternative formats like audio, electronic versions, Braille books) at the level of departments.

• Career guidance and adaptation, assistance and support to applicants with disabilities in preparing for university admission, as well as accompanying graduates in finding employment and adapting to professional activities.

• Gradual digital transformation of the education system, development and optimization of electronic educational resources that satisfy the needs of people with disabilities (platforms supporting subtitles, audio transcription, adaptive interfaces, etc.).

• Creation of an accessible barrier-free environment, ensuring convenient access to buildings and classrooms.

• Improvement of the guidance system (inscriptions, markings, signs, etc.).

• Creation of special work stations for students with musculoskeletal disorders (for example, specially marked stations with access to an electronic scientific library).

Cooperation remains key to the overall success, bringing together the efforts by universities, government agencies, and public organizations. The work in the described directions will ensure equal access to education and create favorable conditions for the successful social and professional integration of students with disabilities.

It should be noted that the process of taking exams to enter a medical school and studying there requires special conditions, adaptation to the individual needs of each student with disabilities and HL. [1–4, 7, 8, 17–25].

For example, for blind students, it is recommended to provide educational materials and exam assignments in Braille system on paper or in electronic form compatible with specialized software (for example, speech synthesizers); install computers with adaptive software, and give writing materials and paper for Braille; and ensure presence of an assistant who is able to help them complete the assignments (in exceptional cases) [1–4, 7, 8, 17–25].

For visually impaired students, the workplaces should be with individual lighting (at least 300 lux), the educational materials printed in enlarged font, and they need access to magnifying devices, regular or electronic [1–4, 7, 8, 17–25].

For students with hearing impairments (deaf and hard of hearing), it is recommended to equip classrooms with sound-amplifying equipment (collective use) and personal hearing aids (if necessary); some cases require involvement of sign language interpreters, and for deafblind students — tactile interpreters [1–4, 7, 8, 17–25].

Students with speech impairments, if necessary, can take exams and control papers in writing [1–4, 7, 8].

For students with musculoskeletal disorders, it may be recommended to perform written work on computers with adaptive software (voice control programs, on-screen keyboards), take exams orally, if necessary; they should also be allowed to dictate answers to an assistant (in some cases) [1–4, 7, 8, 17–28]. There are regulations and research in the field of inclusive education that support these requirements [1–4, 7, 8, 17–28].

According to the foreign studies, most medical education institutions, including those training assistants, have developed means of adapting their programs and simulation equipment [20, 21]. Most foreign researchers note that in the future, the main goal should be to develop curricula that can be adapted to teach students of various types while achieving the results defined by the program [20, 21]. The high degree of complexity and social responsibility inherent in the medical profession necessitates a systematic approach to career guidance for applicants with disabilities. Thus, some of the key aspects of such work should be: provision of the detailed information about the specifics of medical specialties, including the requirements for the physical and psycho-emotional capabilities of a specialist; informing about the specifics of professional activity in various fields (clinical practice, laboratory diagnostics, rehabilitation, etc.); highlighting the need to develop competencies related to communication, stress tolerance and ethical and legal literacy.

The career guidance programs for applicants with disabilities should include familiarization with the profession and an assessment of the possibilities of adaptation to its conditions for each individual. This approach will minimize the risks of academic maladaptation and ensure an informed choice of specialty that meets both personal abilities and the requirements of the medical field [28].

According to a Russian study, provided that the learning conditions described above are met, it is possible for students with disabilities to co-attend classes with healthy peers, on a general basis, eliminating the need for adapted curricula [28]. However, some foreign researchers demonstrate the need to introduce specialized adapted training programs for students with disabilities [20–22].

There is an ongoing discussion about choosing the most optimal model for teaching students with disabilities both theoretical and practical skills, especially in the context of morphological disciplines [29]. Some studies indicate the effectiveness of the concept of step-by-step formation of mental patterns, which involves the consistent development of skills through algorithmization of processes and repeated consolidation. This approach is highly efficient when working with students with disabilities, as the learning is structured and adaptive, taking into account the individual needs of such students [29, 30]. However, successful implementation of this model depends on the professors meeting a number of key criteria [1, 2, 7, 8, 29, 30]:

• they understand modern psychological and pedagogical concepts, including the specifics of the formation of skills in people with disabilities;

• they have a clear understanding of the specifics of professional competencies required by students with disabilities in the medical field;

• they have mastered adaptive educational technologies and techniques supporting inclusive learning;

• they can use specialized equipment and digital tools professionally to demonstrate and practice skills;

• they are experts in the discipline taught, ensuring the accuracy of the transfer of clinical and morphological knowledge.

It has been proven that teaching students with disabilities and HL requires specialized pedagogical approaches that take into account their individual needs. Currently, it is believed that making this process effective requires adherence to the following principles [29].

Updating of the practical skills: it is necessary to regularly adjust the programs of departments in accordance with the current requirements for the professional training of doctors, systematically review the list of practical skills against modern standards of medical practice, classify skills by complexity, frequency of application in clinical activities, and possibility of adaptation for students with disabilities.

Stepwise mastering of the necessary disciplines and skills: the complexity of tasks should increase gradually, with basic skills as the starting point; thus, the cognitive and emotional load on students with disabilities can be minimized.

The use of innovative tools to increase the visibility and digestibility of the material: algorithmic diagrams (simplifying the understanding of the sequence of actions), phantoms and simulators for manipulations practice, multimedia resources (videos, presentations, interactive tasks), situational tasks simulating real clinical scenarios.

According to the studies, there are currently two main approaches to learning and skill formation: spontaneous learning, i.e., mastering the actions without a clear identification of their key stages, which often leads to fragmentation of the acquired knowledge; and guided learning, which is a structured process where the emphasis is on understanding the essence of actions through the analysis of their indicative basis (highlighting significant features, conditions of execution and algorithms) [29, 30].

It should be noted that for students with disabilities, it is the guided type of learning that is preferable, since it involves provision of a systematic understanding of professional actions, allows adaptation of the pace and methods of learning to the individual characteristics of each student, and reduces the risk of errors due to the gradual consolidation of skills.

The implementation of these principles can contribute to the successful development of practical competencies and the formation of professional confidence, which is especially important for students who are forced to overcome additional barriers in the learning process [29, 30].

CONCLUSION

Professional training at medical universities is associated with intense intellectual and emotional stress and the need to master a wide range of practical competencies. Such difficult conditions create significant barriers for students with disabilities who have chosen the path of a medical professional. The unique psychophysiological features of this category of students, including the specifics of information perception, motor functions and social interaction, often make the process of educational adaptation difficult, and reduce the effectiveness of their social integration and subsequent professional socialization, which makes it extremely urgent to search for specialized pedagogical strategies aimed at mitigation of these limitations. Despite the proven effectiveness of inclusive education worldwide, compiling educational programs at medical universities requires factoring in the specifics and requirements for both teaching staff and students. Effective training of students with disabilities calls for a number of interrelated conditions, including organizational, logistical and psychological components, while taking into account the individual characteristics of each student. Currently, despite the successful implementation of a number of elements of inclusive education, there remain several problems that significantly reduce the effectiveness of education of people with disabilities. It is necessary to solve infrastructure problems, improve the skills of the staff working with students with disabilities, and to develop and implement adapted curricula.

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FACTORS INFLUENCING THE QUALITY OF DRINKING WATER IN VORONEZH

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Making the supplied drinking water safe is one of the keys to keeping the population in good health. The Voronezh city water supply system is a complex that includes various facilities, from an underground water intake to distribution networks. The characteristics of the territory require relying on groundwater, the reserves of which are limited. Moreover, the same source is used by plants and factories for technological needs, although there is a special purpose-built pool in the city center. That pool also affects the structural composition of groundwater. This study aimed to assess the hygienic quality of water intended for future use, taking into account the characteristics of the underground aquifer. We retrospectively examined the epidemiological characteristics of drinking water based on standardized laboratory test results. The findings indicated compliance with hygienic standards, except for elevated concentrations of iron, manganese, nitrates, and total hardness. The growth of concentrations of these elements as well as the hardness have first been registered in 1972, which gives reason to associate this fact with artificial adjustment of the flow of the Voronezh River. The tests have shown that considering the condition of water, the specifics of its use, the anthropogenic interference with the natural status thereof should not be discounted. The changes influence each other in a complex way, with the hygienic requirements for the quality of drinking water taken into account.

Keywords: drinking water, features of groundwater formation, public health, hygienic requirements for drinking water quality, drinking water supply optimization

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ОСОБЕННОСТИ ФОРМИРОВАНИЯ КАЧЕСТВА ПИТЬЕВОЙ ВОДЫ В Г. ВОРОНЕЖЕ

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Безопасность питьевого водоснабжения является одним из основных направлений в сохранении здоровья населения. Система водоснабжения г. Воронежа представляет собой комплекс сложных сооружений — от поземного водозабора до распределительных сетей. Ее особенностью является использование подземных вод, запасы которых ограничены. При этом имеет место использование в большом объеме подземных вод для технологических нужд промышленными предприятиями, хотя в центре города находится предназначенное для промышленных нужд водохранилище. Само водохранилище влияет на структурный состав подземных вод. Целью работы было выполнить гигиеническую оценку условий формирования воды для дальнейшего использования с учетом особенностей подземного водоносного горизонта. Проведены ретроспективные эпидемиологические исследования качества питьевой воды по протоколам лабораторных исследований, которые показали отсутствие превышения гигиенических нормативов в пробах, подлежащих мониторингу, по большинству показателей, за исключением общей жесткости, железа, марганца, нитратов. Рост содержания указанных химических соединений впервые отмечен в 1972 г., что дает основание связать этот факт со временем зарегулирования стока р. Воронеж. Исследования показали, что состояние водопользования необходимо рассматривать, учитывая антропогенное вмешательство в природный, естественный статус. Наблюдается сложная структура взаимного влияния изменений с учетом гигиенических требований к качеству питьевой воды.

Ключевые слова: питьевая вода, особенности формирования подземных вод, здоровье населения, гигиенические требования к качеству питьевой воды, оптимизация питьевого водоснабжения

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Today, one of the urgent problems is contamination of drinking water due to the intensive development of industry and transport, which implies bringing ever-increasing amounts of harmful substances into the natural environment. A modern city is a complex source of anthropogenic strain on the environment, so the problem of drinking water quality is multidimensional, and it affects many aspects of human life [1–6]. The health of the population depends on the quality of water, on the daily intake of trace elements and minerals [7–9].

In general, the condition of water bodies, especially surface ones, is deteriorating. Rivers are one of the main sources of drinking water, but they are polluted, ad purification of water from them requires multifunctional filters [10, 11]. For many years now, the government reports have been assess the sanitary and epidemiological condition of water bodies that are used for drinking purposes as polluted or even contaminated [6, 12, 13].

The hygienic standards that entered into force in 2021 (SanPiN 2.1.3684 "Sanitary and epidemiological requirements for the maintenance of urban and rural settlements, for water bodies, drinking water and drinking water supply, atmospheric air, soils, living quarters, operation of industrial and public premises, organization and conduct of sanitary and anti-epidemic (preventive) measures", SanPiN 1.2.3685-21 "Hygienic standards and requirements for ensuring the safety and (or) harmlessness of environmental factors for humans") impose stricter requirements on the organization of laboratory quality control of drinking water supplied to the population [14]. Improving the quality and reliability of drinking water supply

to the population is one of the urgent social problems, since the health of the population largely depends on how safe their drinking water is [7, 15].

There are several factors and conditions that, combined, bring about underground water supply sources, including intersecting aquifers and concave landforms, certain geological and structural features of the area, and filtration heterogeneity of the water-bearing material [16, 17].

Trace elements migrating from the soil into the water largely shape its composition. The conditions of such migration are one of the most difficult subjects: it is a continuous process the rate of which is determined by the thermodynamic environment [18]. It has always been believed that water is involved in all geochemical processes, including migration, destruction of rocks, and release of trace elements.

Unlike surface waters, groundwater is well protected from various kinds of anthropogenic pollution [19], but its closeness to artificial reservoirs can negatively affect water quality.

One of the key pollutants of groundwater is return water with its increased mineralization, high content of mineral fertilizers, pesticides, and industrial waste, which boosts the overall hardness of the aquifer [16, 17, 20]. The peculiarities of the formation of the qualitative composition of groundwater may require an integrated approach to the purification of water drawn therefrom before it is supplied to the public.

Violation of regulations concerning the sanitary and epidemiological well-being of the population creates a potential risk of harm to health, including various infectious and non-infectious diseases [21, 22].

The above supports the relevance of further investigation of the hygienic features of groundwater formation conditions.

This study aimed to assess the hygienic quality of water intended for future use, taking into account the characteristics of the underground aquifer.

METHODS

Through the lens of the hygienic properties, we assessed the priority risk factors of drinking water using statistical forms and reports that describe the sanitary and epidemiological state of the region.

The quality of water supplied in Voronezh was evaluated through retrospective epidemiological studies that factored in the changing anthropogenic and hydrogeological conditions. We analyzed samples of drinking water taken both at Voronezh water lifting stations and from the water supply network, and statistically processed 1200 water sample laboratory control protocols (samples from the supply network) and 850 protocols reflecting the quality of water collected at the lifting stations. The data were processed as prescribed in GOST R 59024-2020 "Water. General requirements for sampling", with estimation of the confidence interval and confidence probability. The studied parameters were graded against the requirements of SanPiN 1.2.3685-21 "Hygienic standards and requirements for safety and/or harmlessness of an individual's environment".

For statistical data analysis, we used Microsoft Excel (Microsoft, USA). We calculated the mean (M) and relative values, the standard error (m), and established the significance of differences using Student's t-test and the chi-square (χ^2) at $p < 0.05$.

RESULTS

In the context of implementation of the Clean Water Federal Project of the Housing and Urban Environment National Project, Voronezh Region realizes the State Program "Provision of high-quality housing and communal services to the population of the Voronezh Region in 2025"; one of the key target indicators of this Program is "the proportion of the population provided with high-quality drinking water from the centralized drinking water supply system".

The main source of drinking water in Voronezh is the groundwater of the Neogene-Quaternary aquifer. Its water-bearing material is inequigranular sand. The thickness of these deposits is 40–50 m.

The depth of the exploited aquifer ranges from 10 to 80 m. Under the classification of water supply sources, this aquifer belongs to the upper zone. Consequently, exchanges water with other bodies actively and is poorly protected from anthropogenic pollution.

Analysis of the water showed that its mineralization ranged from 0.18 to 0.47 g/dm^3. In the studied region, mineralization is determined by such components as sulfates, bicarbonates, calcium and magnesium. The role of chlorides is insignificant.

Based on the studied chemical composition of the drawn groundwater, four geochemical types of water have been identified:

– calcium-magnesium;
– calcium sulfate;
– mixed;
– calcium-sodium.

The analysis showed significant fluctuations in the concentration of iron and manganese throughout the year, season-dependent. The maximum content was registered from March to September (Fig.).

The most common well design in the region:

- depth from 74 to 80 m;
- working part 12 m;
- the mesh strainer with gravel filling.

All wells are equipped with hermetically sealed holes in the strainer column for measuring the dynamic water level, and a sampling tap for sanitary and chemical analysis. Pavilions protect the well heads from contamination; the heads themselves are in a sunken well. There are also designated sanitary protection zones, which contribute to the preservation of water quality.

The drinking water supplied to the population is purified by nonchemical deironization using simplified aeration followed by filtration and neutralization.

Laboratory tests conducted in recent years (2019–2023) revealed that the water meets hygiene standards for most indicators, except for total hardness, iron, manganese, and nitrates. Hardness is defined by a set of physical properties and chemical components related to the content of alkaline earth metal salts dissolved in the water, mainly calcium and magnesium. They are also called the "hardness salts." Water acquires calcium through the dissolution of limestone and gypsum. Magnesium enters the water during the dissolution of dolomites ($MgCO_3$ + $CaCO_3$) under the action of carbonic acid from the water itself.

Every year, the concentration of iron and manganese compounds in the water is registered as increased.

A retrospective analysis of the aquifer water quality showed that the levels of these compounds were first registered above the expected values in 1972, which gives reason to associate this fact with the adjustment of flow of the Voronezh River. The Voronezh Reservoir was built in 1972, and it affected the sanitary and hygienic conditions of water bodies. The area for the Reservoir is in the zone of high anthropogenic load, and its construction was accelerated. From the hydrotechnical viewpoint, the body has acquired the properties of a shallow lake with slow water exchange.

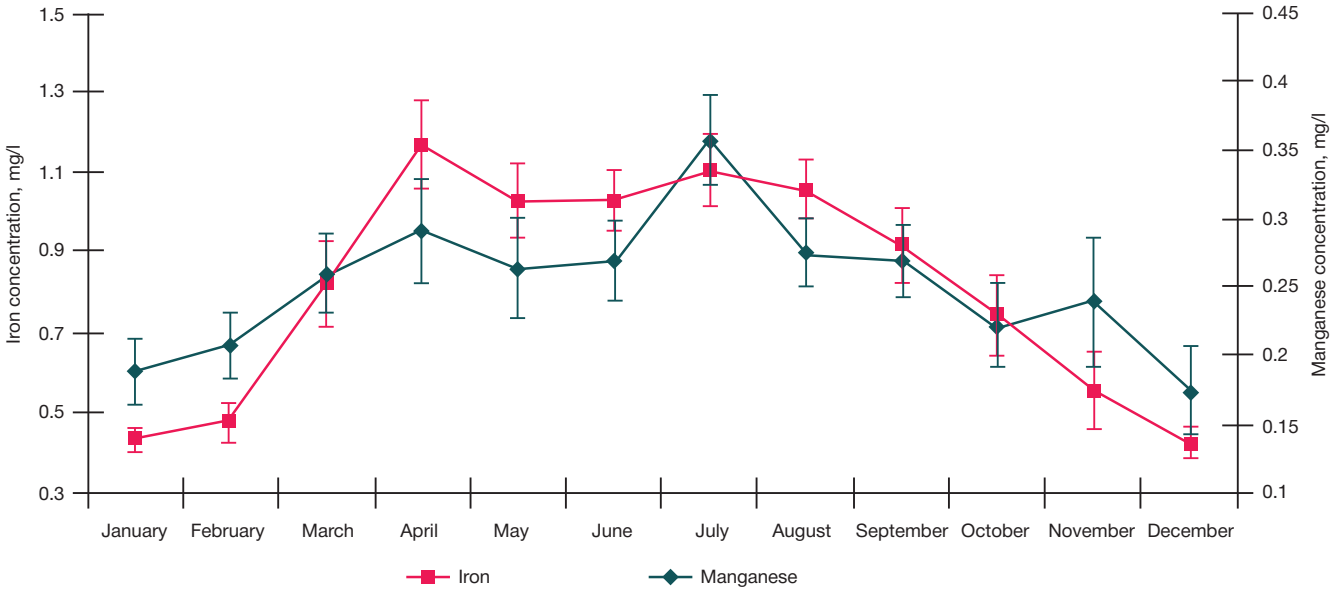

Fig. Seasonal dynamics of iron and manganese concentrations in water

The quality of water in this artificial reservoir deteriorated rapidly due to slow water exchange and purification, which translated into the increased deposition of sediments. These sediments have good conditions for accumulation of heavy metal salts.

The situation lead to the deterioration of the aquifer water used for drinking purposes.

The adverse effect of the reservoir on the quality of water supplied to the city's population was confirmed by the locations of the lifting stations: the further away from the reservoir they were, the better the water was.

Currently, the reservoir's water is partially used as process water, for irrigation and landscaping of the coastal recreation zone. However, there is still no solution that would allow rationally using groundwater for drinking purposes only and water from surface bodies — for industrial purposes.

DISCUSSION

The construction of an artificial reservoir within the city limits changed the natural geochemical background, which altered the volumes and the rate of migration of iron and manganese.

The reservoir, which was originally created to provide process water to industrial facilities in the region, has become a receiver for a huge amount of domestic, industrial and stormwater runoff.

The results of the study, the analysis of regulatory legal acts, and the data from the scientific literature [8, 11, 23, 24] show that the quality of drinking water and the general condition of domestic drinking water supply cannot be considered without taking into account anthropogenic interference with the natural status of the environment.

Microbiological monitoring of drinking water should also be continuous, since microorganisms are a direct indicator of environmental pollution and its sanitary and epidemiological condition.

Some of the priority areas related to the provision of the population of the regional center with adequate quality water could be:

– the use of such sources of water supply that would not be exposed to the reservoir;

– reconstruction of the existing sewage treatment plants, which collect both industrial and domestic wastewater for subsequent purification and discharge into the reservoir;

– improvement of the drinking water treatment system with its purification at the lifting stations;

– effective control over the establishment of sanitary protection zones for underground water supply sources;

– careful attitude to the preservation of the necessary volumes of drinking water, excluding its use for technological purposes;

– use of collective and individual household filters for additional cleaning;

– timely updating of the water pipeline transportation system from the intake to the distribution network.

CONCLUSIONS

The creation of the reservoir was a trigger for the accumulation of large amounts of pollutants (iron and manganese compounds) in the sediments, which requires an integrated approach to its protection as well as management decisions to ensure the sanitary and epidemiological well-being of the population.

In order to bring the water supplied to the population up to hygienic requirements, it is necessary to implement new approaches to water purification and disinfection using nanoreagents, synthetic and natural nanosorbents. To optimize the city's drinking water supply, the following measures will be appropriate: finding water supply sources that will not be affected by the reservoir; using the underground aquifer only for drinking purposes, excluding use for process needs; improving the reliability of the water supply system through the implementation of technological, water protection and sanitary measures.

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ERGONOMIC WORKPLACE FACTORS AS INDICATORS OF OCCUPATIONAL RISK FOR COSMETOLOGISTS

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Currently, cosmetology is one of the fastest growing branches of medicine. Some of the factors contributing to the occupational hazards of cosmetology include static loads, repetitive small-scale hand and wrist movements, and prolonged sitting in uncomfortable positions. This study aimed to assess the ergonomics of the working posture of cosmetologists and the related risk of musculoskeletal disorders. We examined doctors' complaints about having to remain in an uncomfortable, rigid working posture for long periods. The variations in posture were assessed photogoniometrically, and the results were used to construct the distribution diagrams for "sitting" and "standing." The participants' shoulders were examined using the Artro-Pro hardware and software complex (digital goniometry). It was found that a cosmetologist stays in an uncomfortable and/or fixed position for about 85% of the working time, which puts the occupation into hardness class 3.2. Cosmetologists most often complain about pain in the neck (60.0–85.4%), back (33.1–82.1%), and shoulders (62.6–80.2%). Digital goniometry has shown that in the sitting position, almost all goniometric indicators deviate from the recommended values. For the standing position, the greatest deviations were established for neck, trunk, and elbow, especially among older specialists ($p \leq 0.05$). Thus, an aggravating factor related to the working posture of cosmetologists is the lack of an ergonomically adequate seat, which poses a significant occupational risk for developing musculoskeletal disorders.

Keywords: cosmetologists, digital goniometry, uncomfortable working position, ergonomics, musculoskeletal system

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Compliance with ethical standards: the study was approved by the Ethics Committee of Volgograd State Medical University (Minutes No. 005 of February 7, 2025). All participants submitted signed forms confirming their informed consent to participate in the study.

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ЭРГОНОМИЧЕСКИЕ ФАКТОРЫ УСЛОВИЙ ТРУДА ВРАЧЕЙ-КОСМЕТОЛОГОВ КАК ПОКАЗАТЕЛИ ПРОФЕССИОНАЛЬНОГО РИСКА

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В настоящее время косметология является одной самых быстроразвивающихся отраслей медицины. При этом потенциально вредными факторами, формирующими тяжесть труда косметологов, являются статическая нагрузка, мелкие стереотипные рабочие движения, периодическое нахождение в неудобной рабочей позе. Целью исследования было выполнить эргономическую оценку рабочей позы и риска нарушений опорно-двигательного аппарата у врачей-косметологов. Изучены жалобы медиков в связи с длительным удержанием неудобной фиксированной рабочей позы. Рабочую позу оценивали фотогониометрическим методом с последующим построением эпюров рабочих поз «сидя» и «стоя». Выполнена цифровая гониометрия плечевых суставов с использованием аппаратно-программного комплекса «Артро-Про». Установлено, что врач-косметолог около 85% времени смены находится в неудобной и/или фиксированной позе, что соответствует классу 3.2 по степени тяжести. Среди врачей-косметологов наибольшую распространенность имеют жалобы на боли в области шеи (60,0–85,4%), в спине (33,1–82,1%), в плечевом суставе (62,6–80,2%). Цифровая гониометрия показала, что во время работы косметолога в позе «сидя» практически все гониометрические показатели не соответствуют рекомендуемым значениям. При работе в позе «стоя» выявлены наибольшие отклонения в области шеи и туловища, а также локтевого сустава, особенно в старшей возрастной группе ($p \leq 0,05$). Таким образом, усугубляющим фактором, связанным с особенностями рабочей позы врачей-косметологов, является отсутствие эргономически адекватного сидения, что создает реальный профессиональный риск формирования нарушений опорно-двигательного аппарата.

Ключевые слова: косметологи, цифровая гониометрия, неудобная рабочая поза, эргономика, опорно-двигательный аппарат

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Cosmetology is one of the most rapidly developing branches of medicine. Its progress is driven by innovative technologies and improved methods for correcting aesthetic defects and age-related skin changes. Among other reasons are the changing needs of people to refine their appearance as a factor affecting their quality of life and social status. In many cases, aesthetic medicine improves not only the looks but also the feelings of the patients, their psychological state. Today, more than 35% of Russian citizens seek medical assistance from cosmetologists, and women do so four times as often as men. According to the BusinesStat agency, in 2023 Russians spent a record 269 billion rubles on cosmetology, and the number of cosmetology clinics and offices exceeded 28000 [1].

Cosmetology developed on the basis of dermatovenerology. As a discipline in higher medical education institutions, cosmetology appeared only in 2009, and the occupational standard "Cosmetologist" was approved in 2021 [2, 3].

The currently available research papers cover legal issues associated with cosmetology and the problems of assessment of quality of medical assistance rendered by cosmetologists

[4–6]. There are practically no publications exploring the subject of occupational health of cosmetologists, which justified the search for potentially harmful and (or) dangerous work-related factors, a methodological approach used by the occupational safety and health specialists in the context of assessment of working conditions [7].

The working posture was established as a potentially harmful factor shaping the overall degree of hardness of the cosmetologists' labor. Overall, studies investigating work-related ergonomic risks of musculoskeletal disorders (MD) among medical doctors of all specialties are considered relevant [8–10]. Thus far, the problem of MD has received the greatest attention in relation to the health of dentists. For them, the main reasons for becoming incapable of work are pain and the musculoskeletal disorders resulting from "incorrect, traumatic working posture" [11–14]. The unnatural body position, repetitive movements, and constant tension can lead to osteochondrosis, local neuroticisms, arthritis, tendovaginitis, and other related conditions. The most common of those unnatural body positions among dentists involve an excessive forward tilt of the head with strained neck, a tilted torso semi-rotated to one side, a raised shoulder or both shoulders, a less than 90° hip angle [15].

The assessment of the hardness of work of cosmetologists performed by the authors earlier substantiated adoption of the following indicators contributing to the said hardness, including: static loads in the context of the procedures (photo rejuvenation, ultrasound peeling, etc.) performed with one hand; a significant number of small-amplitude, local, repetitive movements that involve the hand and finger muscles; and periodical assumption of uncomfortable or unnatural working postures [16].

In connection with the above, the purpose of this study was to assess the ergonomic aspects of the working posture of cosmetologists and evaluate the risk of MD among them.

PATIENTS AND METHODS

The study involved three cosmetology clinics in Volgograd and spanned 2024 and 2025. We monitored the work of the cosmetologists for 12 man-shifts and assessed the collected data against the provisions of the "Guidelines for the Hygienic Assessment of Working Environment Factors and the Labor Process. Criteria and Classification of Working Conditions (R 2.2.2006-05)." There were two study groups: the first consisted of 35 people aged 28–39 years with an average work experience of 7.2 ± 3.75 years, and the second consisted of 33 people aged 40–59 years with an average work experience of 19.4 ± 7.12 years.

A questionnaire was developed to study medical complaints related to prolonged retention of an uncomfortable fixed working position. The participants were surveyed at the end of the working day.

The working posture of the cosmetologists was registered photogoniometrically. The total number of the examined participants was 12, five in the 1st group and seven in the 2nd; we have built distribution diagrams for all of them. Photographs were taken from the side, when the doctors assumed their working postures, sitting and standing. The parts and areas of interest on the pictures were as follows: the external auditory foramen, the great humerus, the outer condyle of the humerus, the styloid process of the ulna, the metacarpophalangeal joint of the third finger, the great trochanter of the femur, the outer epicondyle of the femur, the ankle of the fibula, the joint area of the second or third toe, the calcaneal tubercle. The values recorded for them were compared to the recommended ranges of goniometric angles [17].

We performed digital goniometry of the shoulder joints using the Artro-Pro hardware and software complex (certificate of state registration of the computer program No. 2023667718 of 17.082023) developed by the specialists from the Volgograd State Medical University (Russia). The assessment of the functional state of the shoulder joint involved computer registration of a number of bone landmarks, processing of the obtained data, and compilation of the conclusion on functional and/or structural deformities. We studied the flexion, extension, abduction, and adduction in the shoulder joint. The software drew a graph, goniometrogram, based on the values, which allowed evaluating the function of the joints.

For statistical processing of the results, we used the IBM SPSS Statistics Version 22 software package (IBM; USA). The Kolmogorov-Smirnov test was used to verify the normality of the distribution of the indicators, and the results confirmed that the distribution was normal. The mean (M), the standard error of the mean (*m*), and the 95% confidence interval (95% CI) were used to describe the quantitative data. The significance of the differences was calculated using the Student *t*-test. To compare the two independent study groups, we applied Fischer's *F*-test. The differences were considered statistically significant at $p \leq 0.05$.

RESULTS

The timed observation showed that for about 85% of the working time, the cosmetologists assume an uncomfortable and/or fixed position, which allows putting this occupation under the hardness class 3.2 [16]. We visually assessed the cosmetologist's working posture associated with the most common procedures, and evaluated the doctor's position relative to the patient on the treatment table. Injections, electrocoagulation, etc., require maintaining an uncomfortable pose because of the need to distinguish small (from 0.5 mm) features on the patient's face, neck, and decollete area that are no more than 0.4–0.5 m from the doctor's eyes. Thus, a cosmetologist stays seated for 55–60% of the shift time, and while standing, the specialist has the body tilted forward, straining, specifically, the cervical spine, and rotating spine and shoulder joint. The laboratory chair with height adjustment cannot be considered an adequate piece of workplace equipment.

The results of the survey taken by the study groups revealed that older doctors complained more often than their younger peers (Table 1). Neck was found to be the most common area of pain among cosmetologists: it as mentioned by 60.0% of the participants from the first group and 85.4% from the second group. There were also a high percentage of respondents complaining of back pain (33.1–53.3% in the first group and 53.5–82.1% in the second) and shoulder joint (62.6% and 80.2%, respectively).

Every third cosmetologist in the first group and almost 70% of doctors in the second group complained of a headache at the end of the working day; 36.67% and 39.28%, respectively, had the eyesight deteriorating. The high prevalence of complaints about MD justified the need to assess the morphofunctional state of joints and spine. We measured the main goniometric parameters of the sitting and standing working poses (Table 2). It was found that when a cosmetologist is working seated, almost all of these parameters are outside the recommended range. The greatest vertical deviations were seen in the neck and shoulder (head-forward position) area; another common discrepancy concerned excessive flexion of the hip and knee

Table 1. Comparison of the frequency of complaints, %

Indicators	Group 1, %; 95% CI	Group 2, %; 95% CI	*F* (Fischer's *F*-test)	Significance
Headache	33.34 (30.0–36.38)	67.85 (64.81–70.89)	7.568	0.008
Visual impairment	36.67 (33.56–39.78)	39.28 (36.10–42.46)	0.041	0.841
Neck pain	60 (56.82–63.18)	85.71 (83.88–87.54)	5.046	0.029
Pain in the upper spine	53.33 (50.07–56.59)	82.14 (79.67–84.61)	7.219	0.009
Pain in the lower spine	33.33 (30.25–36.41)	53.57 (50.31–56.83)	1.664	0.202
Shoulder pain	62.66 (59.45–65.34)	80.2 (77.27–83.26)	5.663	0.021
Leg pain	20 (17.39–22.61)	35.71 (32.60–38.82)	1.784	0.187

joints. For the standing position, we registered the greatest deviations from the recommended values in the neck and the trunk (deviations from the recommended verticality values) as well as the elbow joint.

Since, according to the doctors, pain in the shoulder joint area causes the greatest discomfort when performing manipulations, we did digital goniometry thereof to determine the amplitude of movements and diagnose the degree of overstrain of the muscular component of the shoulder joint complex.

Table 3 shows the results of digital goniometry of one of the examined doctors.

The analysis of the digital goniograms showed that in 87.2% of the doctors aged 28–39 years, the static and dynamic loads experienced during the working day did not significantly affect the functional state of the shoulder joint. At the same time, in the older age group (40–59 years old), this was true only for 31.6% of the respondents.

DISCUSSION

It was found that complaints of pain in the neck area are the most common among cosmetologists. This type of pain is known to occur in 20–70% of people during their lifetime, and its prevalence in the general population is 4.9%. The most common variety is non-specific neck pain, the risk factors for which include prolonged static loads in the neck area, failure to follow ergonomic rules at work, and being female [18–20]. The results of this study differ from the data describing the respective indicators in the general population, and this difference suggests occupational conditioning thereof: specifics of organization of the workplace and the need to maintain a working posture. Sitting, a cosmetologist has the body tilted forward and the gaze fixed on the features of face, decollete area below; consequently, the weight of the head increases relative to the cervical vertebrae, and that of the upper body — relative to the lumbar region. According to [21], when the angle of inclination of the head relative to the vertical axis is 30–45°, the load on the spine can reach 18–22 kg. At the same time, the load on the extensor muscles of the neck and spine increases, which leads to their early fatigue, overwork, and pain [22, 23]. In addition, the cosmetologist's working posture is characterized by a spiral curvature of the spine in the thoracic and lumbar regions, which leads to the development of pain in there, and headaches. For the standing position, we identified the angles of inclination from the neck, shoulder, and spine vertical are more than twice as great as the recommended values, which also creates a risk of straining the muscles of the shoulder girdle, occiput, and back [23]. The lack of an ergonomically adequate seat further exacerbates the established occupational risks associated with the specifics of the working posture of cosmetologists. It has been proven that ergonomic interventions, i.e., provisions of a chair that meets the requirements of the profession, can prevent excessive tension of the neuromuscular system, musculoskeletal pain and discomfort [24]. The "ergonomic" chair proposed by manufacturers, which has inclined surfaces, forces the person counter constant sliding down, which leads to a straighter position of the spine, but entails undesirable hyperactivity of the muscles of the upper and lower extremities [25, 26].

CONCLUSIONS

The data obtained indicate that the identified ergonomic deficiencies are the main factors conditioning the hardness of work of cosmetologists; they create a real occupational risk of disorders of the musculoskeletal system. It is necessary

Table 2. Goniometric parameters of cosmetologists' working posture, degrees

	Sitting position			Standing position	
Parameter (angles)	Recommended ranges	Hands propped M ± *m*, deg.	Hands unpropped M ± *m*, deg.	Recommended ranges	M ± *m*, deg.
Wrist joint	170–190	---	---	170–190	---
Elbow joint	80–110	91.5 ± 16.9	42 ± 3.1	80–100	87.5 ± 16.7
Hip joint	85–100	83.5 ± 13.1	75 ± 12.8	165–180	122.0 ± 7.2
Knee joint	95–120	89.5 ± 12.2	93 ± 15.4	----	----
Ankle joint	85–95	85 ± 4.2	95 ± 16.1	90–100	105.0 ± 3.8
Neck, vertical deviation	10–25	44.5 ± 2.9	40 ± 3.1	10–25	44.5 ± 2.6
Shoulder, vertical deviation	15–35	37.5 ± 4.8	36 ± 4.7	15–35	38.5 ± 4.5
Trunk, vertical deviation	15–25	15 ± 6.5	20 ± 5.5	0–15	30.5 ± 5.1

Table 3. Digital goniometry results (subject A)

Movement	Beginning of the working day		End of the working day	
	Right shoulder	Left shoulder	Right shoulder	Left shoulder
Abduction amplitude	167	164	140	144
Flexion	178	175	174	173
Extension	40	49	40	40
The difference in angles between the midline of the body and the axis of the upper limbs	Max up to 3 with shoulder joint retraction up to 60		Max up to 1.5 with shoulder joint retraction up to 60	
Symmetry of the graphs of changes in the angle of abduction of the right and left shoulder joints	Symmetrical		Symmetrical	

Conclusion: in the subject A (cosmetologist), the static and dynamic loads alter the functional state of the shoulder joint, overworking and overstraining its muscular component

to continue researching the subject of workplace optimization, since ergonomic interventions can be quite effective in reducing occupational risk and preventing diseases associated with the considered medical activity.

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REGARDING THE COMPREHENSIVE ASSESSMENT OF THE CONDITION OF SCHOOLCHILDREN WITH HEALTH LIMITATIONS

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In the context of demographic changes, the preservation of the health of all children, including those with health limitations, acquires particular importance. Children with health limitations are a special group that needs special conditions for effective education and upbringing. The comprehensive assessment of the health of such children lacks methodological uniformity because of poor communication between the bodies and agencies involved in assisting them, as well as insufficient harmonization of the applicable regulations. This study aimed to optimize the respective assessment process. The materials were medical records of students (n = 104), used as the sources of data. We revealed that children with health limitations tend to be ill often; the proportion of those developing normally in physical terms is low (57%); most of the children with abnormal physical development (20%) are short. The recommendation is to use two methods for assessing children's physical development: regression coefficients, which describe growth disorders, and body mass index (BMI), which reports the degree of excess body weight. We identified faults in the results of the comprehensive health assessment: 68 children belonging to the 5th health group were qualified for the preparatory physical education group, which creates a high risk of a severe clinical situation in a physical education lesson. From the perspective of optimization of the comprehensive assessment of the condition of children with health limitations, the recommendation is to make the wording of the Order of the Ministry of Health of the Russian Federation more clear and to harmonize it with the conceptual framework of the Orders of the Ministry of Labour and Social Affairs of the Russian Federation.

Keywords: children with health limitations, comprehensive health assessment, health group, physical education groups, physical development, regulations, harmonization

Author contribution: Gudinova ZhV — research supervision, study concept; development of methodology, data analysis and systematization, critical revision and editing of the manuscript; formulation of conclusions; Rybkin AA — collection, analysis and generalization of literature data, data collection, application of statistical and mathematical methods for data analysis; interpretation of the study results, manuscript authoring, graphics; Demakova LV — collection, analysis and generalization of literature data.

Compliance with ethical standards: the study was approved by the Ethics Committee of the Omsk State Medical University (Minutes No. 10 of September 19, 2023). Parents (guardians) of the participants submitted written informed consent forms.

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К ВОПРОСУ КОМПЛЕКСНОЙ ОЦЕНКИ ЗДОРОВЬЯ ШКОЛЬНИКОВ С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ ЗДОРОВЬЯ

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В условиях демографических изменений особое значение приобретает сохранение здоровья всех детей, включая детей-инвалидов и детей с ограниченными возможностями здоровья (ОВЗ). Дети-инвалиды представляют собой особую группу, требующую создания специальных условий для эффективного обучения и воспитания. Методические трудности комплексной оценки здоровья детей-инвалидов обусловлены ведомственным разобщением и недостаточной гармонизацией нормативных документов. Целью исследования было оптимизировать комплексную оценку здоровья детей с ОВЗ. Для проведения исследования были использованы данные медицинских карт обучающихся (n = 104). В ходе исследования установлены высокий уровень заболеваемости детей, низкий удельный вес детей с нормальным физическим развитием (57%), преобладание детей с низким ростом в структуре детей с нарушениями физического развития (20%). Рекомендовано использование двух методик оценки физического развития детей: шкалы регрессии информативны в отношении нарушений роста детей, индекс массы тела (ИМТ) — в отношении степени избытка массы тела. Выявлены противоречия результатов комплексной оценки здоровья: 68 детей 5-й группы здоровья отнесены к подготовительной группе физического воспитания, что предполагает высокий риск развития тяжелой клинической ситуации на уроке физкультуры. В целях оптимизации комплексной оценки здоровья детей-инвалидов рекомендованы более четкие формулировки в приказе Министерства здравоохранения Российской Федерации (МЗ РФ), их гармонизация с понятийным аппаратом приказов Министерства труда и социальной защиты РФ (Минтруд России).

Ключевые слова: дети с ограниченными возможностями здоровья, комплексная оценка здоровья, группа здоровья, группы физического воспитания, физическое развитие, нормативные акты, гармонизация

Вклад авторов: Ж. В. Гудинова — научное руководство, концепция исследования; развитие методологии, анализ и систематизация данных, критический пересмотр и редактирование текста рукописи; формулировка выводов; А. А. Рыбкин — сбор, анализ и обобщение данных литературы, сбор данных, применение статистических и математических методов для анализа данных; интерпретация результатов исследования, написание текста рукописи, работа с графическим материалом; Л. В. Демакова — сбор, анализ и обобщение данных литературы.

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Currently, children's health becomes an increasingly critical matter for the state because of the demographic problems: against the background of dropping birth rate, it is progressively important to preserve health and give education to every child as a potential economically active citizen, and that applies to children with health limitations, too [1–5]. It is generally accepted that children with disabilities are those with abnormalities in physical and/or psychological development, as confirmed by the psychological, medical and pedagogical commission; the said abnormalities prevent them from receiving education following regular patterns, and necessitate special conditions for the purpose, including, as prescribed for educational institutions, adapted curricula and teaching methods, textbooks and technical teaching aids, assistant services, facilitated access to the buildings, etc.) [6]. Some children with health limitations may be qualified as disabled individuals [7].

In the previous studies, we highlighted the methodological problems with a comprehensive assessment of the health of the disabled children; in particular, there are difficulties with determining which health group and physical education group such children should belong to [8–12]. There are several mandatory medical examinations and tests for disabled children (done by the expert board) that are designed to support development of an individual rehabilitation program for each such child [6, 13–15], but they do not devalue the comprehensive health assessment, which is an additional rehabilitation tool, an element of special conditions created in comprehensive schools and extracurricular education system's sports organizations.

One of the factors that complicate comprehensive health assessment is a certain misalignment of activities and positions of the agencies under the Ministry of Labour and Social Affairs and those under the Ministry of Health of the Russian Federation: inter alia, they disagree on the number of disabled children in the country; another such factor is insufficient harmonization of the conceptual frameworks supporting the documents and regulations issued by the said ministries and their agencies [9].

There are no works devoted to this problem in the available literature, which is why this study was conducted.

PATIENTS AND METHODS

At the first stage, we analyzed the regulations issued by the Ministry of Health of the Russian Federation, the Ministry of Labour, and the Ministry of Science and Higher Education that cover rehabilitation and comprehensive assessment of the health of disabled children, their general and physical education [6, 13–20].

At the second stage, we assessed the health of schoolchildren attending Ishim boarding school (city of Ishim, Tyumen Region) for children with disabilities. The assessment was based on the information from schoolchildren's medical records (form 026/u-2000), as well as the individual rehabilitation or habilitation programs kept in the school's medical office. The study was conducted in May 2024 and included all the children studying at the educational institution at that time (n = 104).

We investigated the morbidity of children, including disabling pathologies (the first of several diagnoses of the child). Earlier, based on the results of a medical examination, a pediatrician assigned the participants to health groups and physical education groups.

The assessment of physical development (PD) was based on the anthropometric measurements taken by the school's medical officer; we used two methods: 1) regression coefficients applied against the values standard for the Tyumen Region [21]; 2) the index method, including calculation of body mass index (BMI) and using the tables by the World Health Organization (WHO) [22].

Statistical processing of the results was carried out in Microsoft Excel (Microsoft; USA) and Statistica 6.0 (StatSoft; USA). For null hypotheses testing, the critical statistical significance level was accepted at $p < 0.05$; at values $0.05 \le p < 0.1$, we registered a significant trend.

RESULTS

One hundred and four schoolchildren aged from 8 to 18 years studied at the Ishim boarding school: 44 girls and 60 boys, all of them in primary and middle classes (69 and 35 children, respectively). Despite the age of the children, there are no senior classes in the school.

Morbidity among disabled children

All children have several diseases: the average number of diagnosed conditions in a participant is 3, the range is from 2 to 8. Fig. 1 shows the prevalence of the established diagnoses (ICD-10 groups).

As Fig. 1 shows, the most common are the diseases of the nervous system (G): 99.0 cases per 100 children. Mental disorders and behavioral disorders (F) are the next most

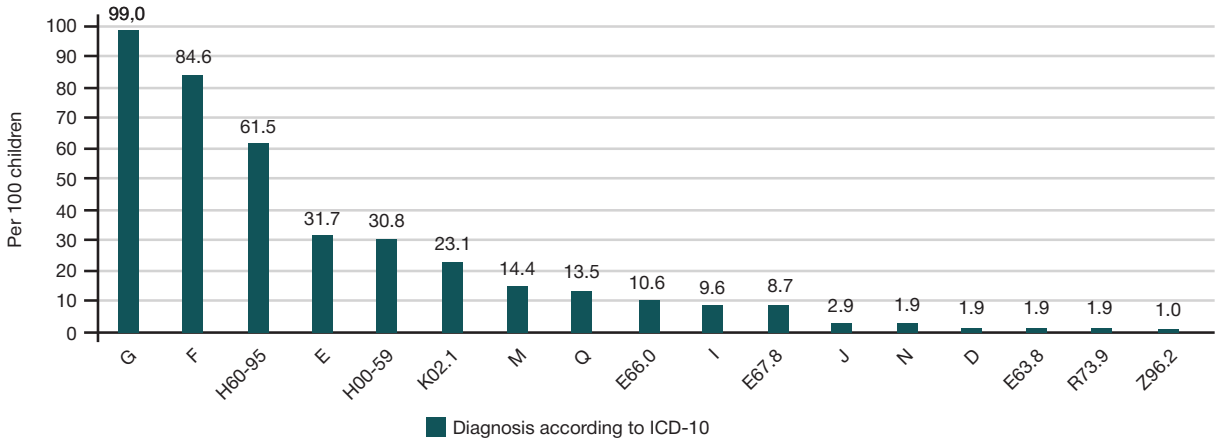

Fig. 1. Prevalence of diseases among boarding school children (ICD-10 groups), per 100 persons. Note: G — diseases of the nervous system; F — mental disorders; H60-95 — ear diseases; E — diseases of the endocrine system; H00-59 — eye diseases; K02.1 — caries; M — diseases of the musculoskeletal system and connective tissue; Q — congenital anomalies; E66.0 — obesity; I — diseases of the circulatory system; E67.8 — excessive nutrition; J — respiratory diseases; N — diseases of the genitourinary system; D — anemia; E63.8 — other specified nutritional deficiencies; R73.9 — unspecified hyperglycemia; Z96.2 — installed implant

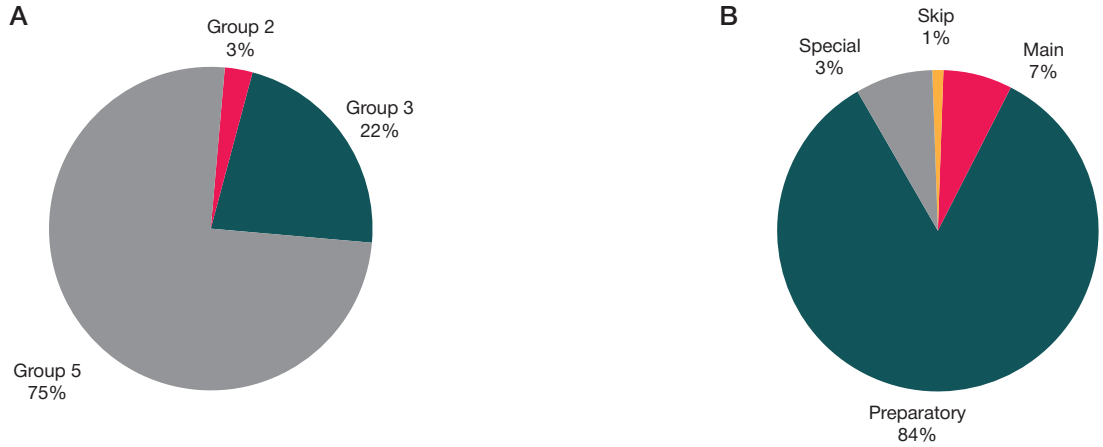

Fig. 2. Distribution of children by health groups and medical physical education groups: **(A)** health groups; **(B)** medical physical education groups

common conditions: 84.6 cases per 100 children. They are mainly ailments caused by damage or dysfunction of the brain, a somatic disease (F06.8), and flawed speech articulation (F80.0). There are also children with mental retardation (MR). The third are ear diseases, registered in 61.5 cases per 100 children; the prevailing diagnosis in this category was "H90.3 Sensorineural hearing loss, bilateral", established in 63 schoolchildren (60.6 cases per 100). All these children are wearing cochlear implants.

Diseases of the endocrine system (E) were the fourth most common among the participants: 31.7 cases per 100 children. In this category, the prevailing conditions were obesity (E66.0) and overeating (E67.8), which amounted to 10.6 and 8.7 cases per 100 children, respectively (a total of 20 schoolchildren, that is, 19.2 cases per 100 children). E63.8 Other specified nutritional deficiencies were found in 1.9 cases per 100 children (2%).

Physical development

Regression coefficients [21] revealed that physical development of 57% of the schoolchildren was normal. Twelve percent had a body weight deficit, 9% — excessive body weight; 20% were short, while 2% — tall; under the Minor's Preventive Medical Examination Card (form No. 030-PO/u-17, enshrined by order No. 514h), the child's physical development can be normal or compromised, the latter caused by deficient or excessive body weight, short stature or tall stature).

Considered through the lens of BMI, 61% of the schoolchildren were growing normally, 13% had body weight deficiency (including severe deficiency in 3%), and 26% — excessive body weight (including grade 1 obesity in 6% and grade 2 obesity in 4%).

Health status groups

The school doctor assigned the schoolchildren to three health groups: group 5 (78 cases, or 75% of the total number of children), group 3 (23 cases, 22%), and group 2 (3 cases, 3%), the latter comprised of three junior school boys (Fig. 2).

Physical education groups

The school doctor established three physical education groups: the preparatory group — 88 cases (84%), the special group — 8 cases (8%), the main group — 7 cases (7%). One child was allowed to not attend physical education lessons (Figure 2). The special group was not further divided into subgroup A and subgroup B.

Eight children from health group 5 were assigned to the special physical education group, and 68 to the preparatory group; one child from this cohort joined the main group, and another was allowed to skip physical education.

As for health group 3, the majority of children (20 persons) were assigned to the preparatory physical education group, and the remaining three — to the main group.

Three schoolchildren from health group 2 joined the main physical education group.

DISCUSSION

In the course of the study, we found a high level of morbidity and unsatisfactory physical development among children attending the Ishim boarding school, which can be attributed to the nature of the institution, as it was established for children with disabilities. A prominent particularity is the large number of children of short stature (20% of all the students). The WHO experts consider low child height to be a big problem [23, 24]. The percentage of short children varies throughout the world: in East Asia, they make up 4.5% of the respective population, while in East Asia — up to 34.5% [24, 25]. The deceleration trend is also seen in Russia, i.e., children may be generally shorter than in the previous decades [26], but it is rather weak and does not reach high values.

The comparison of the assessments of physical development yielded by two methods revealed no discrepancies in the tallying of children whose development is normal (57 ± 4.8% and 61 ± 4.8%, p = 0.558) and those with body weight deficiency (12 ± 3.2% and 13 ± 3.3%, $p = 0.827$).

The discrepancy was found in the figures reflecting the percentage of children with excessive body weight: the regression coefficients method gave 9%, and the index method — 26% ($p = 0.002$). Considered from the standpoint of diagnoses, per 100 hundred children, there were 8.7 and 10.6 cases of other specified hyperalimentation (E67.8) and obesity (E66.0), respectively. These cases sum up to almost 19.3%, which makes the BMI-based assessment (26%) more accurate, and the result of the regression coefficients method (9%) can be explained by the known increase of the upper limit of the norm ($M_{av} + 2\delta$). However, BMI disregards stature, which is factored in by the regression coefficients method, and in this study, 23% of the children were either significantly short or significantly tall. Therefore, it is obvious that the most accurate assessment of the physical development of children with disabilities can be obtained by using both methods, as they incorporate different information: regression coefficients — stature, the index method — excessive body weight. Regression coefficients can probably be used first, and if a child has excessive body weight, low or high height, BMI should be calculated.

As for the results of a comprehensive assessment of the health of children with disabilities, we established certain contradictions in this school. On the one hand, 75% of its students belong to health group 5, which, according to Order No. 514n, means they are chronically ill and frequently suffer from exacerbations and recurrences. On the other hand, 84% of the school's pupils were assigned to the preparatory physical education group, which, according to the same order, should include children with chronic diseases in stable remission. In absolute numbers, 68 children from health group 5 are in the preparatory physical education group in the Ishim boarding school. This means that either the health groups were defined incorrectly, or the physical education groups received unfitting members, which creates a risk of severe clinical conditions manifesting during physical education lessons [27, 28]. In our opinion, the first assumption is more likely to reflect the reality: the children are incorrectly classified as health group 5, as they attend secondary schools, many of them live at home and commute to and from school on their own every day, some attend sports clubs (Paralympic), and they generally lead a very normal lifestyle for children of their age. In other words, their disabilities hinder the educational process only slightly, so they do not belong with health group 5. On the other hand, assigning most pupils in this school to the preparatory physical education group is also incorrect. The right solution would have been creating a subgroup A, which would be fitting for the majority of schoolchildren, but here, in violation of the order of the Ministry of Health of the Russian Federation [19], subgroups A and B have not been distinguished. Continuing the above thought, one of the main reasons for the incorrect assigning of pupils to physical education groups is the imperfect wording of the order of the Ministry of Health of the Russian Federation [19], the descriptions of the concepts of "hindered education or work capabilities" in particular. In the context of establishing the health group for a person, these concepts allow creating a group 3 (unhindered capabilities), a group 4 (hindered capabilities), and a group 5 (significantly hindered capabilities). The order does not specify how a pediatrician should establish the hindrance and distinguish between its significant and minor variations. In assigning individuals to the physical education groups, the concept of hindered learning capabilities are is not applied, which means the definition of the said groups has not been harmonized (here, harmonization means coordination, unification, ordering, and ensuring mutual compliance) and, in this regard, mismatches even the definition of health groups.

Obviously, resolution of this problem requires use of the regulatory framework of the Ministry of Labour and the Ministry of Education and Science of Russia. Order No. 374n of the Ministry of Labour regulates not only the process of qualification of disabled children but also disability groups that factor in quantitative assessments of the severity of persistent disorders of body functions (in percents), which increases the objectivity and accuracy of diagnostics [17]. There are other orders of the Ministry of Labour that stipulate the degrees of limitation of the ability to learn and conduct other activities [14, 15]. In this regard, it seems advisable to determine the health group and the physical education group of a disabled child with disability group (from I to III) and the degree of activity limitations accounted for. The optimal approach would be to determine the said groups in the context of development of the individual rehabilitation program in a medical and social examination institution. In addition, there is a document by the Ministry of Education that deserves special attention: it regulates physical education of sick schoolchildren and contains recommendations for determining medical health groups, establishes the types of reaction of the cardiorespiratory system to controlled physical activity, describes monitoring of the condition of students during physical education lessons, etc [20].

CONCLUSIONS

All children studying in the Ishim boarding school have several diseases: the average number of the diagnosed conditions in a participant is 3, the range is 2–8. The most common conditions were diseases of the nervous system, mental disorders, and ear diseases.

We established that the physical development of the pupils was unsatisfactory, with only 57% of children considered normal in this regard. The most common (20%) disorder preventing qualification of the physical development as normal was short stature. The comparison of the assessments of physical development based on the regression coefficients and body mass index methods and their subsequent collation with the morbidity indicators suggest use of both methods: regression coefficients are informative in relation to children's growth disorders and body mass deficit, and BMI — in relation to the degree of excess of body weight. Regression coefficients should be used first, and BMI should be calculated if the child has abnormal physical development.

We have identified certain contradictions in the results of the comprehensive health assessment: the validity of assigning 68 children from health group 5 to the preparatory physical education group is questionable, which, in our opinion, implies a high risk of severe clinical situations that may occur during physical education lessons. There is no division of the special physical education group into subgroups A and B, which creates difficulties in organizing the said lessons.

A possible reason why it was difficult for the school's medical staff to assigning children to groups based on the results of a comprehensive health assessment is the imperfect wording of Order No. 514n and its misalignment with the conceptual framework of the Ministry of Labour of Russia. In our opinion, optimization of the comprehensive assessment of health of children with disabilities, requires clarification of the descriptions of health groups 3 and 5, as well as those of the physical education groups. Assigning children to the groups should factor in their disability group (from I to III) and the degree of activity limitations. The optimal approach would be to determine the said groups in the context of development of the individual rehabilitation program in a medical and social examination institution.

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HYGIENE EDUCATION IN DISEASE PREVENTION FOR CHILDREN, ADOLESCENTS, AND YOUNG ADULTS

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In the future, the state of health of children, adolescents, and young adults will require continuous attention from healthcare professionals. The stably high prevalence of the school-related diseases associated with the learning conditions and lifestyle components requires introduction of new approaches into prevention of health problems in the younger generation. The study aimed to summarize the results of the research focused on the features of lifestyle of children, adolescents, and young adults, as well as on the approaches to their hygiene education. The review of scientific papers deposited in the eLibrary, PubMed, CyberLeninka databases in 2010–2024 was accomplished. The literature data analysis showed the need to refocus attention on the methods for primary prevention of health problems in the youth, not on the secondary prevention methods. One effective mechanism of such work is the hygiene education system, which in this case should be directed towards individuals engaged in the youth training and education system, healthare professionals, and parents.

Keywords: children, adolescents, youth, school-related diseases, hygiene education, disease prevention

Author contribution: Khorosheva IV, Devrishov RD — data acquisition, manuscript draft writing; Kudryasheva IA — structuring and finalizing the manuscript; Markelova SV, Skoblina NA — shaping the paper concept, structuring and finalizing the manuscript; Reshetnikova IO — data acquisition.

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ГИГИЕНИЧЕСКОЕ ВОСПИТАНИЕ В ПРОФИЛАКТИКЕ ЗАБОЛЕВАНИЙ ДЕТЕЙ, ПОДРОСТКОВ И МОЛОДЕЖИ

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В будущем состояние здоровья детей, подростков и молодежи потребует постоянного внимания медицинских работников. Стабильно высокая распространенность школьно-обусловленных болезней, связанных с условиями обучения и компонентами образа жизни, требует введения новых подходов в профилактику нарушений здоровья подрастающего поколения. Целью настоящей работы было обобщить результаты научных исследований особенностей образа жизни детей, подростков и молодежи и подходов к их гигиеническому воспитанию. Выполнен обзор научных статей, размещенных в библиографических базах данных eLibrary, PubMed, КиберЛенинка в период с 2010 по 2024 г. Анализ литературных данных продемонстрировал необходимость перенести фокус внимания с методов вторичной профилактики на методы первичной профилактики нарушения здоровья молодого поколения. Одним из действенных механизмов такой работы является система гигиенического воспитания, которая должна быть в данном случае ориентирована на лиц, причастных к системе воспитания и образования молодого поколения, медицинских работников и родителей.

Ключевые слова: дети, подростки, молодежь, школьно-обусловленные заболевания, гигиеническое воспитание, профилактика заболеваний

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Negative trends of social and economic processes in the first quarter of the 21st century were manifested by noticeable changes in the quality of life of the population, including the quality of life of the younger generation. The incidence of all disease categories grows; the demographic situation worsens [1–3].

The term “school-related diseases” is still relevant. The rate of those remains stable. These diseases include musculoskeletal disorders, diseases of the eye and adnexa, gastrointestinal disorders, diseases affecting the cardiovascular and nervous systems [4–7]. Secondary prevention of such disorders demonstrates its inconsistency over a long time.

The study aimed to summarize the results of the research focused on the features of lifestyle of children, adolescents, and young adults, as well as on the approaches to their hygiene education.

The review of scientific papers deposited in the eLibrary, PubMed, CyberLeninka databases in 2010–2024 was accomplished.

The results of multiple studies suggest that there are a number of risk factors for the health problems associated with the conditions of the children’s and adolescents’ stay in the educational institution. The control of their effects on the students’ bodies is accomplished in accordance with the current regulatory and procedural documents. Among most important factors that can affect the health of the younger generation since preshool age, parameters of microclimate and lighting in the educational institution, fullness of the group or class, compliance of furniture

with anthropometric measures, curriculum, and adherence to the daily routine are reported [8–12].

The prevalence of school-related diseases among children and adolscents in the last seven years demonstrate a trend towards slight growth in the groups of both 7–11-year-old and 16–17-year-old students. The diseases typical for this group include diseases of the eye and adnexa, nervous system disorders, gastrointestinal and carviovascular disorders. A slight decrease in the disease prevalence in this period has been reported for musculoskeletal disorders [4].

The increase in the rate of school-related diseases in the group of 7–11-year-old children can be considered as an unfavorable prognostic marker indirectly showing the increase in the prevalence of this disease type among preschool children.

Currently, the use of digital technology in the educational system is a promising area contributing to faster information acquisition, enabling shaping a personalized learning trajectory, making the educational system more accessible (time, terms, and site) and clear [13].

Researchers from different countries agree that the society digitalization processes are reflected in the organization of educational and leisure activities for children and adolescents, as well as in the construction of educational programs. The electronic devices used and the conditions under which they are used must be safe, which is possible with strict adherence to sanitary and hygienic standards [15–17].

Scientists report a decrease in the age of children, who use various electronic devices regularly. The study [18] has shown that every second child (53.7%) starts using an electronic device under the age of two, every fifth (21.9%) at the age of 2–3 years, every thirtheenth (7,6%) at the age of 3–4 years; only every sixth (16.8%) child starts using an electronic device over the age of four. Furthermore, according to the data provided by the authors, the number of children who received access to an electronic device under the age of four doubled over the two years of the study.

Today, the number of scientific papers on the pattern of the impact of electronic devices on preschool children is limited; the risk of health problems in children is poorly understood [19–21].

During the study [22] it was found that high-school students spend 3.0 h a day using smartphones for learning and leisure, while senior students spend as much as 5.3 h on this. In university students, the time spent on the smartphone exceeds 6.9 h a day.

The papers by other authors report that more that 90% of adolescents use electronic devices for more than two hours a day [23].

Among the longest (more than three hours a day) leisure activities, watching TV and videos is reported for the majority (74%) of adolescents aged 15–17 [24]. Furthermore, it has been found that the long-term watching of video content and visiting social networks contribute to disruption of the sleep quality and structure: the process of falling asleep is disrupted, the duration of sleep is reduced, and anxiety and depressive conditions occur [22, 25].

The long-term static tension is an integral part of the educational process; it is also caused by the use of electronic devices. Such activities are accompanied by maintaining a forced working posture, which creates prerequisites for the development of musculoskeletal disorders.

The literature sources provide information on the factors of the intra-school environment, also associated with the increase in static load and predetermining scoliosis in students. Such factors include the reduced duration of breaks, reduced frequency of physical education classes. A negative role of deficit of certain foods in the students' diet, in particular wheat and rye bread, potatoes, fresh vegetables, milk and dairy products, fish, is noted [26].

Scoliosis is one of the most common musculoskeletal system disorders in children and adolescents. A school backpack that is too heavy for the child, uneven length and width of the straps, being engaged in elite sports, insufficient physical activity, and a number of other factors are distinguished among the factors interrelated with lifestyle and contributing to scoliosis.

The analysis of the musculoskeletal system functional state in elementary school students of the gymnasium and lyceum in Maykop revealed various postural disorders in a half of the assessed children. In particular, 27.3% of school students had a slouching posture and 14.1% had a winged scapula [27].

Other researchers report that among elementary school children (6–10 years) postural disorders are reported in every second child (48.2%). The most common disorder is a scoliotic posture reported in 43.4% of cases. As children get older, the prevalence of scoliotic posture among them increases. Thus, the prevalence of this disorder in 10-year-old children reaches 65.1% [28].

One educational space factor affecting the development of musculoskeletal disorders is the students' furniture. Regulatory and methodological documents stipulate the need for the size of school furniture to correspond to the student's body length. At the same time, the scientists' papers provide information that every second set (45.3%) of school furniture does not correspond to the student's body length. This is due to incorrect furnishing of school classrooms, equipping classrooms with furniture of the same size [29].

Thus, one more study has shown that the vast majority of student places for first-year (86.7%) and fourth-year (62.4%) students do not correspond to the students' body length [30].

Among the detected musculoskeletal system disorders, foot arch malformations are one of the most common. Thus, among children aged 7–10 years who attend sports sections, the overwhelming majority (more than 90%) have a diagnosis of flat feet of varying severity. Some of them (10%) also have postural disorders of scoliotic type [31].

According to the data from another source, flat feet are reported in every fifth first-year (22.6%) and third-year (23.8%) school student [32].

The prevalence of flat foot in university students is 44.5%. A half of these students (24.3%) also have a postural disorder [33].

The data from foreign sources suggest high prevalence (65%) of flat feet in children aged 6–8 living in Slovakia [34].

The study conducted by other researchers has shown that scoliotic alterations (OR = 4.9), flat foot (OR = 17.4), and hallux valgus (OR = 10.6) in children are associated with insufficient physical activity [35].

The paper [36] reports the increased prevalence of visual impairment among students of various levels of education, which is due to the use of electronic devices (smartphone, computer, TV). The 8.6-fold increased likelihood of developing myopia is reported for those, who use a laptop (computer) for more that four hours a day.

CONCLUSION

The available literature data suggest an adverse effect of the irrationally organized lifestyle components, learning conditions of the health of children, adolescents, and young adults. Prevention of musculoskeletal, eye, nervous system disorders and sleep-awake cycle disturbances is still relevant. The risk factors

of health problems in children, adolescents, and young adults attending educational institutions persist, so it is necessary to develop more effective preventive measures of both personalized and group type. The list of such measures should be expanded to include hygiene education programs for individuals involved in educational processes. Continuity is a particularly significant aspect of developing a healthy lifestyle and preventing diseases in students. This means that knowledge and lifestyle of children and adolescents largely depend on the awareness and formation of healthy lifestyle skills in their family members, teaching staff and healthcare professionals in educational institutions. In the hygiene education programs, it is important to use various information presentation methods taking into account the interests of children and adolescents, as well as of their inner circle.

Thus, the scientific data acquired on the risk factors of health problems in the younger generation, including those associated with the educational process at the preschool, general and vocational education organizations, must provide a reliable scientific and methodological basis for the development of preventive measures aimed at preserving the health of the younger generation.

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NUTRITIONAL STATUS OF PEOPLE WITH DISABILITIES: CURRENT RESEARCH AND ASSESSMENT

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This review article examines the effect of nutrition on the functional state of an organism with persistent disorders. The assessment of nutrition given in the current research shows that it does not match the needs of such an organism. Statistics for the Russian Federation reveal that the number of disabled people in the country is on an upward trend, which is of high prognostic significance in the context of investigating their nutritional status. Seeking to raise awareness about the nutritional problems of disabled persons in specialized boarding communities, we analyzed research papers on the subject published within the last 20 years. The analysis of works by Russian and foreign authors revealed the need for a unified methodology and scientific substantiation of the nutritional status assessment criteria. We have also found that the assessment of anthropometric indicators in this population is fraught with difficulties: using body mass index (BMI) as the sole measure for diagnosing eating disorders is insufficient. Current scientific literature on nutrition for people with disabilities is diverse and covers a wide range of aspects, highlighting the complexity of the considered problem. Still, the number of studies investigating the features of nutrition and health status of people with chronic diseases is insufficient, which underlines the importance of continuing scientific work in this direction. This will allow for a deeper understanding of the specifics of maintaining an optimal level of health and meeting the nutritional needs of people with disabilities, taking into account existing socio-economic difficulties.

Keywords: disabled person, nutritional status, balanced nutrition, diet, prevention, body mass index, bioelectrical impedance analysis, health

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ПИЩЕВОЙ СТАТУС ЛЮДЕЙ С ОГРАНИЧЕННЫМИ ВОЗМОЖНОСТЯМИ ЗДОРОВЬЯ: СОВРЕМЕННЫЕ ИССЛЕДОВАНИЯ И ОЦЕНКА

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В обзорной статье рассмотрено влияние питания на функциональное состояние организма, имеющего устойчивые нарушения. Оценка фактического питания, представленная в современных исследованиях, демонстрирует несоответствие потребностям организма, имеющего устойчивые нарушения. Учитывая статистические данные по Российской Федерации, наблюдается негативная тенденция увеличения числа людей с инвалидностью, что имеет высокую прогностическую значимость для изучения их пищевого статуса. Нами выполнен анализ научных публикаций за последние 20 лет с целью повышения осведомленности о вопросах питания инвалидов, находящихся под опекой в специализированных домах-интернатах. Изучение работ отечественных и зарубежных авторов демонстрирует необходимость разработки единой методики и научного обоснования критериев оценки пищевого статуса. В ходе работы установлено, что оценка антропометрических показателей у данной группы населения сопряжена с некоторыми трудностями: применение индекса массы тела (ИМТ) в качестве единственного критерия для диагностики нарушений питания оказывается недостаточно эффективным. Современная научная литература, посвященная вопросам питания людей с ограниченными возможностями, отличается многообразием и затрагивает широкий спектр аспектов, подчеркивая сложность рассматриваемой проблемы. Тем не менее, недостаточное количество исследований, направленных на изучение особенностей питания и состояния здоровья людей с хроническими заболеваниями, подчеркивает важность продолжения научной работы в данном направлении. Это позволит глубже разобраться в особенностях поддержания оптимального уровня здоровья и удовлетворения пищевых потребностей инвалидов, принимая во внимание существующие социально-экономические трудности.

Ключевые слова: инвалид, пищевой статус, рациональное питание, рацион, профилактика, индекс массы тела, биоимпедансометрия, здоровье

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Соблюдение этических стандартов: исследование одобрено этическим комитетом ФГБОУ ВО СамГМУ Минздрава России (протокол № 297 от 20 ноября 2024 г.).

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A balanced diet plays a key role in maintaining health and preventing nutritional-related diseases. It provides the body with essential nutrients, vitamins and minerals, and supports the proper functioning of all systems and organs. Proper nutrition allows balancing and optimizing consumption of all essential nutrients; it efficiently works to prevent the occurrence of chronic pathologies. According to the World Health Organization (WHO), an unbalanced diet significantly increases the risk of developing various diseases, including cardiovascular, digestive, and endocrine disorders, respiratory conditions, cancers, as well as neuropsychiatric and infectious diseases [1]. The principles of rational nutrition are based on the individual characteristics of the body: age, gender, general state of health, level of physical activity, daily routine specifics, food preferences, and climatic conditions. In addition, rational nutrition factors in the need for proper water intake, alignment of the energy value of food to energy expenditure, optimization of the ratio of proteins, fats and carbohydrates, and prevention of vitamin and mineral deficiencies [2].

Today, some of the key external risk factors for public health are nutritional: lack of fruits and vegetables in the diet, consumption of dishes high in saturated fat, etc. Active longevity largely depends on the correctness of diet, which also involves prevention of alimentary-dependent diseases. It is especially important to study the nutritional status of socially vulnerable populations.

According to Article 1 of the UN Convention, persons with disabilities are those with long-term health conditions that limit their daily activities and social participation, regardless of whether they have been formally recognized as disabled [3]. The problem of population disability is relevant in many countries: according to WHO (2011), about 16% of the world's population are disabled individuals, and 7.5% of them live in the Russian Federation (RF). In 2023, the Federal State Statistics Service reported about 800 thousand disabled Russians, of whom almost 9% suffer from mental illnesses and behavioral abnormalities such as mental retardation and congenital developmental pathologies.

Severe neurological diseases, such as congenital malformations of the brain and cerebral palsy, continue to significantly contribute to disability and largely determine high mortality rates. Various scientific papers have discussed eating disorders peculiar to mental retardation, including cerebral palsy and Down'syndrome. Some of them are insufficient body weight, height abnormalities, lack of protein and energy, deficiency of trace elements, low bone density, and overweight. These disorders are caused by a complex of medical factors — loss of appetite, difficulty swallowing food, gastroesophageal reflux, poor nutrient absorption and constipation, etc. — as well as social conditions, including poor diet, financial constraints preventing provision of quality nutrition, physical disability and cognitive limitations observed in some adult patients with these diagnoses [4].

The nutritional status of people with disabilities determines how well this population eats and how balanced their diet is; there are many social, medical, and economic aspects associated therewith. In people with mental disorders, an unbalanced diet, along with poor housing conditions, is the most important risk factor for the development of chronic diseases [5].

Russian and foreign papers point to the lack of recommendations for people with disabilities that would suggest dietary changes with the aim to improve the overall condition of their health; same papers highlight severe shortage of routine approaches to nutrition of this population [6–8].

Currently, in the Russian Federation, there are no approved, generally accepted, and mandatory methodological guidelines for the diet of people with disabilities, which creates certain difficulties in organizing medical examinations for individuals with persistent health problems [9].

Monitoring of meal services in Russian boarding communities for individuals with disabilities revealed a lack of specially adapted dishes on the menus. The approach to catering there differs from the standard practices only in the caloric value (it is higher) and the frequency of meals in a day [10].

Given that the health of people with disabilities tends to deteriorate, it is important to strengthen the care system with preventive medical routines that help reduce the risk of developing, worsening, or exacerbating nutrition-related pathologies.

MATERIALS AND METHODS

This work is a systematic review of papers published in journals accessible in RSCI (https://elibrary.ru/) and PubMed (https://pubmed.gov/). The period of publication is the past 20 years; the purpose was to raise awareness of nutrition problems faced by individual with disabilities residing in specialized boarding communities.

In view of the lack of specialized programs and regulations addressing this issue, and in order to substantiate the urgency of optimizing the diet of disabled individuals, including those living in specialized boarding communities, we conducted a systematic review of the relevant scientific literature available in abstract databases of randomized controlled trials published between 2000 and 2024.

The 2021 guidelines "Norms of physiological energy and nutritional needs for various groups of the population of the Russian Federation" present the normal amounts of proteins, fats, carbohydrates, vitamins, and minerals, as well as the recommended amounts of food, for a number of populations defined by gender, age, profession, living conditions, etc., but not for people with disabilities [11].

Examinations of the actual diets of people with disabilities revealed significant deviations from current physiological norms: these diets lack essential macro- and micronutrients [12].

Risk factors for the development of alimentary pathologies in people with persistent health problems

The problem of the nutritional status of people with disabilities attracts the attention of many researchers, as it includes aspects of health, nutrition, social integration, and quality of life. They can be considered through the lens of their components: physical limitations, social conditions, concomitant chronic pathologies [13].

As noted in research papers, physical limitations can significantly hinder the ability to cook and receive proper nutrition [14–16].

Studies have shown that a wide range of components that enter the body with food not only condition the functioning of internal organs and physical health, but also affect the individual's emotional state and behavior. In people with mental disorders, the nervous system has certain peculiarities that are closely related to their dietary patterns. Several studies confirm the association of increased consumption of carbohydrates and simple sugars with manifestations of aggression or depression in the patients. In addition, this cohort tends to eat less meat and fish products, which are essential components of a balanced diet [16–18].

The individual's level of physical activity plays a significant role. Recent studies have shown that insufficient physical activity and an unbalanced diet are two key factors contributing to the deterioration of the health of people with disabilities. Combined, they create additional risks for the physical and psychological state of this population. Lack of physical activity reduces metabolic rate, which may contribute to overweight and obesity, particularly when accompanied by a high-calorie diet [18].

Modern nutritional status assessment methods

There are several ways to evaluate a person's nutritional status, like the Quetelet index (body mass index, BMI), which is based on the anthropometric indicators, and the bioimpedance analysis, which examines the body's composition.

Collection and analysis of anthropometric data is a simple approach that yields the protein and energy status of the body in addition to the total body weight. The anthropometric study of body structure includes general indicators such as weight, height, and body surface area, as well as the circumference

of specific parts of the trunk and limbs, and the thickness of skinfolds in certain regions. Indices calculated using BMI have the greatest diagnostic value [19].

The Quetelet-Gould-Kaup index, also known as BMI, is one of the most common tools. It is the ratio of body weight to the square of body height. There are set norms linked to this index, and established connections to a number of serious diseases that should be controlled medically [20]. However, BMI has significant drawbacks: for example, it does not distinguish muscle, fat and bone components of body weight, which reduces its value and limits its use for the diagnosis of certain pathological conditions, since patients with the same BMI may have completely different body composition. For example, on the scale of the nation's population, latent obesity is rather common; it is characterized by excessive body fat amount while the BMI remains within the acceptable range, which makes the index a diagnostic tool not accurate enough.

Like “conventional” obesity, hidden obesity is associated with the increased risk of metabolic syndrome, cardiovascular and other disorders [21].

Bioimpedance analysis is the most accurate way to assess body composition [22]. This method allows determining the level of basal metabolism, the body fluid volume, the development of muscles and subcutaneous fat layer, and enables a detailed segmented examination of the body structure.

The bioimpedance method (BIM) is a non-invasive method that involves measuring the electrical conductivity of biological tissues, thus allowing to evaluate a wide range of morphological and physiological parameters of the body. The indicators analyzed are the active and reactive resistances (bioimpedance) of the human body or its parts at different frequencies. This method allows calculating the body composition parameters and the rate of metabolic processes, which are compared to individual norms. The phenomenon underlying BIM is the electrical conductivity of body tissues that is conditioned by the content of fluids and electrolytes. Thus, impedance measurements yield conclusions about the quantitative ratio of various structural elements of the body [23, 24].

Because of improper diets, people with disabilities often have their body composition changing: fat tissues grow and muscle mass decreases, etc. [25]. BIM helps to track these changes and develop individual nutritional and physical activity plans. The index can also be used to evaluate the effectiveness of these plans when implemented. Regular measurements of body component composition can help monitor the condition of concomitant chronic diseases, such as osteoporosis and cardiovascular diseases, which is important in the context of prevention and timely treatment.

Applying the review findings to improve the dietary patterns of people with disabilities

The reviewed studies help to better understand the difficulties faced by people with disabilities in nutrition-related matters, and focus on an integrated approach to eliminating this problem. Referring to the listed literary sources may be useful in continued investigation of the subject and development of strategies to improve the nutritional status of this population.

Assessment of the nutritional status of people with disabilities is an important and multidimensional scientific problem, and it requires an integrated approach that factors in various criteria — physiological, psychological, medical, and social.

Currently, researchers show significant interest in studying the factors that provoke eating disorders in people with disabilities. At the same time, comprehensive studies dedicated to this subject are extremely rare. The review of the available Russian and foreign papers and analysis of the generally accepted methods for assessing nutritional status allowed arriving at a conclusion that there is a need to develop a universal disorders diagnosing approach and scientifically substantiated assessment criteria that could be used in the process.

In order to obtain a complete picture of the nutritional status and compile personalized therapeutic diets, it is important to add bioimpedance measurements to the examination routine designed for this population of patients.

CONCLUSION

The review allows applying the results to make recommendations for nutrition correction aimed at elimination of the deficiency of key macronutrients and micronutrients in the studied population. Assessment of nutritional status plays a key role in studying the nutritional characteristics of people with persistent health disorders, although the use of only anthropometric methods disallows getting the real picture of the body's condition. Early diagnosing and regular monitoring of nutritional disorders using BIM, which reveals body composition, allow for a more accurate identification of risks of malnutrition, help prevent complications associated therewith, and timely initiate the necessary supportive therapy measures for people with disabilities. The modern literature on nutrition for people with disabilities is diverse and covers various aspects, reflecting the complex nature of the considered problem. However, small number of research papers investigating the nutritional status of people with persistent health disorders, as well as the relevance of this topic, necessitate further research in this area designed to give understanding of how best to support the health and nutritional needs of this population taking into account the social and economic challenges they face.

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