SUBSTANTIATION OF PROGRAMS FOR HYGIENIC TRAINING ON PREVENTION OF DISORDERS OF THE MUSCULOSKELETAL SYSTEM AND THE EYE AND ADNEXA

Khorosheva IV ✉

Astrakhan State Medical University, Astrakhan, Russia

The impact of modern factors of educational environment and extracurricular factors results in the risk of the development and progression of functional impairment and chronic diseases of the musculoskeletal system, as well as the diseases of the eye and adnexa in students. The study was aimed to substantiate the programs of hygienic education in terms of compliance with hygienic recommendations on prevention of the diseases of the musculoskeletal system and the eye and adnexa based on the analysis of scientific papers. The review of studies conducted in 2011–2023 by the Russian and foreign experts that were focused on the impact of the educational environmental factors and the daily routine components on the students' health status was performed using the E-Library, PubMed, Web of Science electronic databases. The impact of such risk factors, as irrational daily routine organization, on the health of students attending general schools, professional and higher educational institutions has been shown. The risk of disorders of the musculoskeletal system and the eye and adnexa resulting from the excess stay in digital environment, lack of physical activity, irrational leisure time organization has been assessed. It is necessary to develop the hygienic training programs involving teachers, lecturers and parents to prevent the effects of the risk factors for disorders of the mysculoskeletal system and the eye and adnexa.

Keywords: students, healthy lifestyle, hygiene education

Author contribution: Khorosheva IV — study concept and design, data acquisition and processing, manuscript writing and editing.

✉ **Correspondence should be addressed:** Irina V. Khorosheva
Bakinskaya, 121, Astrakhan, 414000, Russia; iraida.xoroho78@mail.ru

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ОБОСНОВАНИЕ ПРОГРАММ ГИГИЕНИЧЕСКОГО ВОСПИТАНИЯ ПО ПРОФИЛАКТИКЕ БОЛЕЗНЕЙ КОСТНО-МЫШЕЧНОЙ СИСТЕМЫ, ГЛАЗА И ЕГО ПРИДАТОЧНОГО АППАРАТА

И. В. Хорошева ✉

Астраханский государственный медицинский университет, Астрахань, Россия

Воздействие современных факторов образовательной среды и внеучебных факторов обуславливает риски возникновения и прогрессирования функциональных отклонений и хронических заболеваний костно-мышечной системы, болезней глаза и его придаточного аппарата у обучающихся. Целью работы было обосновать программы гигиенического воспитания в части соблюдения гигиенических рекомендаций по вопросам профилактики возникновения болезней костно-мышечной системы, глаза и его придаточного аппарата посредством анализа научных публикаций. Проведен обзор выполненных в 2011–2023 гг. исследований российских и зарубежных специалистов, рассматривающих влияние факторов образовательной среды и компонентов режима дня на состояние здоровья обучающихся, с использованием электронных баз данных E-Library, PubMed, Web of Science. Показано влияние таких факторов риска, как нерациональная организация режима дня на здоровье обучающихся общеобразовательных организаций, организаций среднего профессионального и высшего образования. Оценены риски развития нарушений костно-мышечной системы, болезней глаза и придаточного аппарата, обусловленные избыточным нахождением в условиях цифровой среды, недостатком двигательной активности, нерациональной организацией досуга. Необходима разработка предполагающих участие педагогов, преподавателей и родителей программ гигиенического воспитания обучающихся, направленных на предупреждение влияния факторов риска развития болезней костно-мышечной системы, глаза и его придаточного аппарата.

Ключевые слова: обучающиеся, здоровый образ жизни, гигиеническое воспитание

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✉ **Для корреспонденции:** Ирина Владимировна Хорошева
ул. Бакинская, д. 121, г. Астрахань, 414000, Россия; iraida.xoroho78@mail.ru

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Health preservation and creation of favorable environment for the students' growth and development are among the most important directions of the state policy of the Russian Federation [1].

Today, when speaking about the students' health status, a trend towards the decrease in morbidity can be noted that is reported by both Russian and foreign researchers [2, 3].

The learning period is characterized by the prolonged exposure to a combination of environmental factors. Educational process becomes more and more difficult every year, digital educational devices are widely used, and the amount of academic material to be learned is increased [4–6].

These circumstances, along with other factors of educational environment, lifestyle and the features of the diet, can significantly affect the students' health formation [7–9].

The daily routine of adolescents (high school seniors and college students) cannot be called rationally organized due to insufficient or no physical activity, insufficient night sleep and day rest, irregular and unbalanced diet, and prolonged stay in the conditions of digital environment [10–12].

The above deficiencies, in turn, can be predisposing risk factors for occurrence and development of the disorders resulting from non-compliance with the hygienic recommendations on the rational daily routine organization, such as the musculoskeletal system functional impairment and chronic disorders, diseases of the eye and adnexa [13–16].

The study was aimed to substantiate the hygienic education programs in terms of compliance with the hygienic recommendations on prevention of the diseases of the musculoskeletal system and the eye and adnexa by analysis of scientific papers.

The review of the scientific papers focused on the impact of factors of educational environment and daily routine components on the students' health status that were published

in 2011–2023 in the E-Library, PubMed, Web of Science databases was performed.

Studying in general schools (secondary comprehensive schools, gymnasiums, lyceums) and secondary professional and higher educational institutions is characterized by the prolonged exposure to a combination of factors that can be roughly divided into educational and after-school risk factors. The former include the increase in educational load along with irrational organization of educational process, inadequate knowledge about healthy lifestyle formation and students' health preservation among teachers and lecturers, lack of communication between educational and medical institutions. It should be noted that the school, college and higher education often fails to consider individual characteristics of certain student's health status [17–20].

The researchers, both Russian and foreign, point out that among numerous after-school risk factors the most common are irrational organization of the daily routine components, such as physical activity, work-rest regime, night sleep, prolonged and often uncontrolled stay in digital environment, non-compliance with the basic principles of rational nutrition, stress resulting from the educational process intensification, and the fact that there are assessments in schools and the test/exam periods in the secondary professional and higher educational institutions [21–24].

Irrational daily routine organization, specifics and amount of educational materials that has to be learned by students within tight deadlines increase the risk of anxiety disorders and depression, functional impairment, disorders of the musculoskeletal system and the eye and adnexa [25–27].

The prolonged use of various electronic gadgets by schoolchildren and students both when preparing for lessons and training sessions and in their spare time results in postural distortion due to incorrect working posture. Poor working posture when reading or writing for a long time can lead to the lower back pain, paravertebral muscle fatigue, changes in biomechanics and impaired function of the spine [28, 29].

A significant increase in the "on-screen" time spent when doing homework using gadgets or playing games on computer or tablet, communicating in various messengers installed on the smartphones in leisure time results in the significant decrease in physical activity and night sleep duration, as well as in virtual exclusion of napping from the daily routine on weekends. The prolonged stay in digital environment disrupts optimal sleep pattern, multiplies the risk of sleep disorders and adversely affects the function of the visual analyzer and the musculoligamentary system [30–32].

Functional disorders of the musculoskeletal system, such as poor posture, arch disorders, flat foot, occupy one of the leading places in the morbidity structure of students [33]. Poor posture, the progression of which can result in scoliosis, can have a significant effect on the development of the respiratory, digestive, cardiovascular, and endocrine system disorders [34]. Flat foot is one of the factors limiting physical education, it leads to earlier tiredness and fatigue [35].

Low levels of motor activity, wearing shoes that are non-compliant with the hygienic recommendations and educational supplies, the weight of which significantly exceeds the levels recommended by sanitary rules are among the causes of the increased incidence of foot deformities among high school seniors and students [36, 37].

Physical education classes conducted in educational institutions with no physical activity during extracurricular time fail to sufficiently fill the natural need for movement required for students of various age groups. At the same time the share of physical training and game sports in the time budget of the daily routine decreases considerably. The reasons for changes in the daily routine are often subjective. The today's students do not think that motor component is essential for the development of adherence to healthy lifestyle. In some students, both schoolchildren and undergraduates, understanding of healthy lifestyle is limited to abandoning conventional harmful habits, such as smoking and consuming various alcoholic beverages. Considering the fact that high school seniors and the youth attending colleges and higher educational institutions shape their daily routine and the duration of certain daily routine components on their own, in some cases physical activity is almost completely replaced by the prolonged stay in digital environment [38, 39].

Certain studies confirm the adverse effects of electronic gadgets on vision in schoolchildren and students. The prolonged use of electronic devices during the day results in the reduced duration of other daily routine components, such as sleep, physical activity, meals. Working in the digital space is not limited by the time spent in educational institutions and goes on at home [40, 41].

It has been found that students spending more than 4 h on their electronic gadgets when doing homework and in their leisure time more often complain of headache and the decrease in visual acuity throughout the year [42].

The findings of the study involving 2,238 schoolchildren aged 12–15 confirmed the high risk of myopia in students due to using computer for 4–6 h or more per week compared to students working on their computers for less than 4 h [43].

The subjective sensations experienced by users of various electronic gadgets, among which the most common are eyestrain and fatigue, eyes red and burning, are referred to as "computer vision syndrome" in the today's scientific literature. The researchers use the word "computer" to mean not only personal computer, but also other devices for information and communication technology with similar technical characteristics. An image displayed on the screen (for example, of smartphone or tablet), is a small, intensely bright raster image. Excess light can result in the glare that impedes perception of information. Working on computer involves the user's continuous engagement with the monitor and keybord through constant change in the visual perception focus moving from one component to another, thereby leading to the eye muscle fatigue. Smartphone and tablet are gadgets designed for working in the near-field; these can become significant risk factors of myopia in case of prolonged use [44, 45].

Among benefits of the currently used gadgets, students also note usability in any place and at any time of the day regardless of the availability of organized workplace at home. At the same time, weakness of the erector and extensor muscles of the spine resulting from poor posture when reading of writing contributes to eyestrain and accommodative spasm that lead to myopia [46].

The review demonstrates a significant impact of today's environmental and lifestyle factors on students regardless of the schooling level. The intense prolonged use of various electronic gadgets during training in educational institutions, at home and in leisure time is a significant risk factor of functional impairment and chronic disorders of the musculoskeletal system and the eye and adnexa. The prolonged stay in digital environment results in significant reduction of time spent outdoors, physical activity and exertion, as well as in changes of the students' diet. All the above can be prevented by means of hygienic training and shaping adherence to healthy lifestyle [47–50].

CONCLUSION

It is necessary to develop programs for hygienic training of schoolchildren, students of colleges and higher educational institutions in terms of developing the knowledge and skills related to compliance with the hygienic recommendations on prevention of disorders of the musculoskeletal system and the eye and adnexa to prevent the effects of risk factors. Participation of teachers, lecturers and the students'parents in preventive activities is appropriate.

References

1. Kuchma VR, Suhareva LM, Rapoport IK, Shubochkina EI, Skoblina NA, Milushkina OJu. Populjacionnoe zdorov'e detskogo naselenija, riski zdorov'ju i sanitarno-jepidemiologicheskoe blagopoluchie obuchajushhihsja: problemy, puti reshenija, tehnologii dejatel'nosti. Gigiena i sanitarija. 2017; 96 (10): 990–5 (in Rus.). DOI: 10.18821/0016-9900-2017-96-10-990-995.
2. Kuchma VR, Rapoport IK, Suhareva LM, Skoblina NA, Sedova AS, Chubarovskij VV, et al. Zdorov'e detej i podrostkov v shkol'nom ontogeneze kak osnova sovershenstvovanija sistemy medicinskogo obespechenija i sanitarno-jepidemiologicheskogo blagopoluchija obuchajushhihsja. Zdravoohranenie Rossijskoj Federacii. 2021; 65 (4): 325–33 (in Rus.).
3. Garcia-Perez-de-Sevilla G, Perez-Chao EA, Pareja-Galeano H, Martinez-Jimenez EM, de-la-Plaza-San-Frutos M, Sanchez-Pinto-Pinto B, et al. Impact of lifestyle on health-related quality of life among young university students: a cross-sectional study. Sao Paulo Med J. 2021; 139 (5): 443–51. DOI: 10.1590/1516-3180.2021.0138.R2.120321.
4. Skoblina NA, Milushkina OJu, Tatarinchik AA, Fedotov DM. Gigienicheskie problemy ispol'zovanija informacionno-kommunikacionnyh tehnologij shkol'nikami i studentami. Zdorov'e naselenija i sreda obitanija — ZNiSO. 2017; 9 (294): 52–5 (in Rus.). DOI: 10.35627/2219-5238/2017-294-9-52-55.
5. Medvedeva NYu, Gunina SV, Urtenova AYu. Contributions of certain lifestyle factors to health status of contemporary schoolchildren. Russian Bulletin of Hygiene. 2023; (1): 18–22. DOI: 10.24075/rbh.2023.064.
6. Tarasov AV, Rakhmanov RS, Bogomolova ES, Skoblina NA, levleva OV. Modern factors determining the status of students' health. Russian Bulletin of Hygiene. 2022; (1): 4–9. DOI: 10.24075/rbh.2022.034.
7. Kordenko AN, Kovylova VI, Popov VI, Tarasenko PA. Kriticheskie faktory kachestva zhizni podrostkov. Gigiena i sanitarija. 2015; (9): 20–1 (in Rus.).
8. Setko IM, Setko NP. Sovremennye problemy sostojanija zdorov'ja shkol'nikov v uslovijah kompleksnogo vlijanija faktorov sredy obitanija. Orenburgskij medicinskij vestnik. 2018; T. VI, 2 (22): 4–13 (in Rus.).
9. Devrishov RD, Kolomin VV, Filjaev VN, Kudrjasheva IA. Gigienicheskie aspekty vozdejstvija faktorov sredy obitanija na formirovanie zdorov'ja uchashhihsja. Rossijskij mediko-biologicheskij vestnik imeni akademika I. P. Pavlova. 2019; 27 (4): 530–5 (in Rus.). DOI: 10.23888/PAVLOVJ2019274530-535.
10. Bokareva NA, Skoblina NA, Milushkina OJu. Gigienicheskaja harakteristika mediko-social'nyh faktorov i obraza zhizni sovremennyh moskovskih shkol'nikov. Zdorov'e naselenija i sreda obitanija – ZNiSO. 2015; 5 (266): 33–6 (in Rus.).
11. Shubochkina EI, Ivanov VJu, Cheprasov VV, Ajzjatova MV. Gigienicheskaja ocenka vlijanija faktorov cifrovoj sredy na organizm podrostkov v processe obrazovatel'noj i dosugovoj dejatel'nosti. Zdorov'e naselenija i sreda obitanija – ZNiSO. 2021; 6 (339): 71–7 (in Rus.). DOI: 10.35627/2219-5238/2021-339-6-71-77.
12. Wang J, Hao QH, Peng W, Tu Y, Zhang L, Zhu TM. Relationship between smartphone addiction and eating disorders and lifestyle among Chinese college students. Front Public Health. 2023; (11): 1111477. DOI: 10.3389/fpubh.2023.1111477.
13. Skoblina NA, Popov VI, Eremin AL, Markelova SV, Milushkina OJu, Obrubov SV, et al. Riski razvitija boleznej glaza i ego pridatochnogo apparata u obuchajushhihsja v uslovijah narushenija gigienicheskih pravil ispol'zovanija jelektronnyh ustrojstv. Gigiena i sanitarija. 2021; 100 (3): 279–84 (in Rus.). DOI: 10.47470/0016-9900-2021-100-3-279-284.
14. Popov VI, Milushkina OJu, Skoblina NA, Markelova SV, Sokolova NV, Dementev AA. Povedencheskie riski zdorov'ju studentov v period provedenija distancionnogo obuchenija. Gigiena i sanitarija. 2020; 99 (8): 854–60 (in Rus.). DOI: 10.47470/0016-9900-2020-99-8-854-860.
15. Valina SL, Shtina IE, Maklakova OA, Ustinova OJu, Jejsfeld DA. Zakonomernosti razvitija u shkol'nikov boleznej kostno-myshechnoj sistemy v uslovijah kompleksnogo vozdejstvija faktorov sredy obitanija i obraza zhizni. Analiz riska zdorov'ju. 2021; (3): 54–6 (in Rus.). DOI: 10.21668/health.risk/2021.3.05.
16. Yang J, Huang S, Cheng M, Tan W, Yang J. Postural habits and lifestyle factors associated with adolescent idiopathic scoliosis (AIS) in China: results from a big case-control study. J Orthop Surg Res. 2022; 17 (1): 472. DOI: 10.1186/s13018-022-03366-0
17. Skoblina NA, Milushkina OJu, Markelova SV, Fedotov DM, Dobruk IV, Cepljaeva KV, et al. Osvedomlennost' pedagogov ob osnovah zdorovogo obraza zhizni i gigienicheskih principah ohrany zrenija. Zhurnal mediko-biologicheskih issledovanij. 2020; 8 (3): 269–76 (in Rus.). DOI: 10.37482/2687-1491-Z018.
18. Al-Qahtani AM. Lifestyle habits among Najran University students, Najran, Saudi Arabia. Front Public Health. 2022; (10): 938062. DOI: 10.3389/fpubh.2022.938062.
19. Aminova OS. Lifestyle-associated risk factors affecting young people. Russian Bulletin of Hygiene. 2023; (2): 15–21 (in Rus.). DOI: 10.24075/rbh.2023.069.
20. Solovyova JuV. Hygienic profile of high school seniors, their parents and teachers. Russian Bulletin of Hygiene. 2023; (2): 9–14. DOI: 10.24075/rbh.2023.068.
21. Milushkina OJu, Skoblina NA, Markelova SV, Tatarinchik AA, Bokareva NA, Fedotov DM. Ocenka riskov zdorov'ju shkol'nikov i studentov pri vozdejstvii obuchajushhih i dosugovyh informacionno-kommunikacionnyh tehnologij. Analiz riska zdorov'ju. 2019; (3): 135–43 (in Rus.). DOI: 10.21668/health.risk/2019.3.16.
22. Jakubiec D, Kornafel D, Cygan A, Gorska-Klek L, Chromik K. Lifestyle of students from different universities in Wroclaw, Poland. Rocz Panstw Zakl Hig. 2015; 66 (4): 337–44.
23. Goncharova DG, Sokolova AI, Izotova LV. Self-assessment of health and lifestyle as a basis for understanding health preservation by schoolchildren. Russian Bulletin of Hygiene. 2023; (1): 4–8. DOI: 10.24075/rbh.2023.061.
24. Devrishov RD, Horosheva IV, Kudrjasheva IA, Dauletova LA, Dashdamirova NA. Gigienicheskaja harakteristika osnovnyh komponentov obraza zhizni studentov medicinskih vuzov. Medicina truda i jekologija cheloveka. 2022; 2 (30): 177–86 (in Rus.). DOI: 10.24412/2411-3794-2022-2-177-186.
25. Skoblina NA, Milushkina OJu, Popov VI, Markelova SV, Bokareva NA, Tatarinchik AA, et al. Ot tradicionnogo k distancionnomu obucheniju: gigienicheskie problemy ohrany zrenija obuchajushhihsja. Gigiena i sanitarija. 2021; 100 (4): 373–9 (in Rus.). DOI: 10.47470/0016-9900-2021-100-4-373-379.
26. Mirskaja NB, Kolomenskaja AN, Sinjakina AD. Mediko-social'naja znachimost' narushenij i zabolevanij kostno-myshechnoj sistemy detej i podrostkov (obzor literatury). Gigiena i sanitarija. 2015; 94 (1): 97–104 (in Rus.).
27. Matar Boumosleh J, Jaalouk D. Depression, anxiety, and smartphone addiction in university students — A cross sectional study. PLoS One. 2017; 12 (8): e0182239. DOI: 10.1371/journal.pone.0182239.
28. Kabysheva MI, Glazina TA. Funkcional'nye narushenija oporno-dvigatel'nogo apparata studentov (na primere Orenburgskogo

gosudarstvennogo universiteta). Vestnik Orenburgskogo gosudarstvennogo universiteta. 2017; (2): 129–34 (in Rus.).
29. Atia DT, Elsayed NI, Abdelmonem AF, Mahmoud SMS, Mahmoud MMM, Mohamed KES. et al. Prevalence of musculosceletal disorders among general and technical school students in Egypt. J Environ Public Health. 2023; 20 (2): 1465. DOI: 10.3390/ijerph20021465.
30. Ushakov IB, Popov VI, Skoblina NA, Markelova SV. Dlitel'nost' ispol'zovanija mobil'nyh jelektronnyh ustrojstv kak sovremennyj faktor riska zdorov'ju detej, podrostkov i molodezhi. Ekologiya cheloveka. 2021; (7): 43–50 (in Rus.). DOI: 10.33396/1728-0869-2021-7-43-50.
31. Obrubov SA, Markelova SV. Impact of life activity in conditions of digital environment on the students' organ of sight. Russian Bulletin of Hygiene. 2021; (2): 4–10. DOI: 10.24075/rbh.2021.014.
32. Ievleva OV. Hygienic assessment of the mode of using mobile electronic devices by medical students. Russian Bulletin of Hygiene. 2021; (3): 18–22. DOI: 10.24075/rbh.2021.023.
33. Averjanova NI, Pristupova VV, Semerikova AI, Starkova IL. Rasprostranennost' i struktura deformacij stop u mladshih shkol'nikov. Permskij medicinskij zhurnal. 2019; 36 (6): 33–40 (in Rus.). DOI: 10.17816/pmj36633-40.
34. Novikova II, Erofeev JuV, Denisov AV, Mylnikova IV. Metodicheskie aspekty ocenki potencial'nogo ushherba zdorov'ju shkol'nikov. Gigiena i sanitarija. 2019; 98 (10): 1124–8 (in Rus.). DOI: http://dx.doi.org/10.18821/0016-9900-2019-98-10-1124-1128.
35. Dohov MM, Sertakova AV, Rubashkin SA, Timaev MH. Kachestvo zhizni detej s ploskoj stopoj (ploskoval'gusnaja stopa, prodol'noe ploskostopie). Saratovskij nauchno-medicinskij zhurnal. 2019; 15 (2): 271–4 (in Rus.).
36. Mansurova GSh, Malcev SV, Rjabchikov IV. Osobennosti formirovanija oporno-dvigatel'noj sistemy u shkol'nikov: zabolevanija, prichiny i vozmozhnye puti korrekcii. Prakticheskaja medicina. 2019; 17 (5): 51–5 (in Rus.). DOI: 10.32000/2072-1757-2019-5-51-55.
37. Ibragimova JeJe. Skrining narushenij oporno-dvigatel'noj sistemy u obuchajushhihsja VUZa. Uchenye zapiski Krymskogo federal'nogo universiteta imeni V. I. Vernadskogo. Biologija. Himija. 2020; 6 (72), № 1: 63–72 (in Rus.).
38. Popov VI, Milushkina OJu, Skoblina NA, Tarasov AV, Markelova SV, Lovkis AA, et al. Vlijanie ispol'zovanija social'nyh setej na formirovanie internet-zavisimostej u studentov-medikov. Zdorov'e naselenija i sreda obitanija — ZNiSO. 2022; 30 (8): 51–6 (in Rus.). DOI: 10.35627/2219-5238/2022-30-8-51-56.
39. Ievleva OV. Medical students' physical activity as an indicator of their commitment to healthy lifestyle. Russian Bulletin of Hygiene. 2021; (2): 35–9. DOI: 10.24075/rbh.2021.009.
40. Alvarez-Peregrina C, Sanchez-Tena MA, Martinez Perez C, Villa-Collar C. The relationship between screen and outdoor time with rates of myopia in Spanish children. Front Public Health. 2020; (8): 560378. DOI: 10.3389/fpubh.2020.560378.
41. Mireku MO, Barker MM, Mutz J, Dumontheil I, Thomas MSC, Roosli M, et al. Night-time screen-based media device use and adolescents' sleep and healt-related quality of life. Environ Int. 2019; (124): 66–78. DOI: 10.1016/j.envint.2018.11.069.
42. Saxena R, Gupta V, Prasad P, Bhardwaj A, Vashist P. Prevalence of myopia and its risk factors in rural school children in North India: the North India myopia rural study (NIM-R Study). Eye (Lond). 2022; 36 (10): 2000–5. DOI: 10.1038/s41433-021-01797-3.
43. Jones-Jordan LA, Mitchell GL, Cotter SA, Kleinstein RN, Manny RE, Mutti DO, et al. Visual activity before and after the onset juvenile myopia. Invest Ophthalmol Vis Sci. 2011; 52 (3): 1841–50. DOI: 10.1167/iovs.09-4997.
44. Altalhi A, Khayyat W, Khojah O, Alsalmi M, Almarzouki H. Computer vision syndrome among health sciences students in Saudi Arabia: Prevalence and risk factors. Cureus. 2020; 12 (2): e7060. DOI: 10.7759/cureus.7060.
45. Skoblina NA, Shpakov AI, Markelova SV, Obelevskij AG, Kuznecov OE. Sub'ektivnaja ocenka studentami vlijanija faktorov riska na zrenie pri ispol'zovanii jelektronnyh ustrojstv. Zdorov'e naselenija i sreda obitanija — ZNiSO. 2020; 4 (325): 48–52 (in Rus.). DOI: 10.35627/2219-5238/2020-325-4-48-52.
46. Shubochkina EI, Vjatleva OA, Blinova EG. Riski uhudshenija zrenija i ego progressirovanija u detej i podrostkov v sovremennyh uslovijah obuchenija i vospitanija (nauchnyj obzor). Zdorov'e naselenija i sreda obitanija — ZNiSO. 2022; 30 (4): 22–30 (in Rus.). DOI: https//doi.org/10.35627/2219-5238/2022-30-4-22-30.
47. Milushkina OYu, Markelova SV, Ievleva OV, Skoblina NA, Khorosheva IV, Devrishov RD, et al. Hygiene training of schoolchildren and students using the "habit trackers — checklists" technology. Russian Bulletin of Hygiene. 2023; (2): 29–33. DOI: 10.24075/rbh.2023.071.
48. Bronskih NA, Sharenko EM, Popova OS, Nasybulina GM. Hygienic description of lifestyle factors among students of colleges. Russian Bulletin of Hygiene. 2022; (4): 19–25. DOI: 10.24075/rbh.2022.057.
49. Milushkina OYu, Skoblina NA, Markelova SV, Dubrovina EA, Ievleva OV. Medical students' hygiene training on healthy eating as part of classes at the department of hygiene. Russian Bulletin of Hygiene. 2022; (3): 4–8. DOI: 10.24075/rbh.2022.050.
50. Setko AG, Zhdanova OM, Tyurin AV. Scientific justification of the innovative approach to health control in students from general educational institutions of various types. Russian Bulletin of Hygiene. 2021; (3): 13–17. DOI: 10.24075/rbh.2021.024.

Литература

1. Кучма В. Р., Сухарева Л. М., Рапопорт И. К., Шубочкина Е. И., Скоблина Н. А., Милушкина О. Ю. Популяционное здоровье детского населения, риски здоровью и санитарно-эпидемиологическое благополучие обучающихся: проблемы, пути решения, технологии деятельности. Гигиена и санитария. 2017; 96 (10): 990–5. DOI: 10.18821/0016-9900-2017-96-10-990-995ю.
2. Кучма В. Р., Рапопорт И. К., Сухарева Л. М., Скоблина Н. А., Седова А. С., Чубаровский В. В. и др. Здоровье детей и подростков в школьном онтогенезе как основа совершенствования системы медицинского обеспечения и санитарно-эпидемиологического благополучия обучающихся. Здравоохранение Российской Федерации. 2021; 65 (4): 325–33.
3. Garcia-Perez-de-Sevilla G, Perez-Chao EA, Pareja-Galeano H, Martinez-Jimenez EM, de-la-Plaza-San-Frutos M, Sanchez-Pinto-Pinto B, et al. Impact of lifestyle on health-related quality of life among young university students: a cross-sectional study. Sao Paulo Med J. 2021; 139 (5): 443–51. DOI: 10.1590/1516-3180.2021.0138.R2.120321.
4. Скоблина Н. А., Милушкина О. Ю., Татаринчик А. А., Федотов Д. М. Гигиенические проблемы использования информационно-коммуникационных технологий школьниками и студентами. Здоровье населения и среда обитания — ЗНиСО. 2017; 9 (294): 52–5. DOI: 10.35627/2219-5238/2017-294-9-52-55.
5. Медведева Н. Ю., Гунина С. В., Уртенова А. Ю. Вклад отдельных факторов образа жизни в формирование состояния здоровья современных школьников. Российский вестник гигиены. 2023; (1): 18–22. DOI: 10.24075/rbh.2023.064.
6. Тарасов А. В., Рахманов Р. С., Богомолова Е. С., Скоблина Н. А., Иевлева О. В. Современные факторы, определяющие состояние здоровья студенческой молодежи. Российский вестник гигиены. 2022; (1): 4–9. DOI: 10.24075/rbh.2022.034.
7. Корденко А. Н., Ковылова В. И., Попов В. И., Тарасенко П. А. Критические факторы качества жизни подростков. Гигиена и санитария. 2015; (9): 20–1.
8. Сетко И. М., Сетко Н. П. Современные проблемы состояния здоровья школьников в условиях комплексного влияния факторов среды обитания. Оренбургский медицинский вестник. 2018; 4 (2): 4–13.
9. Девришов Р. Д., Коломин В. В., Филяев В. Н., Кудряшева И. А. Гигиенические аспекты воздействия факторов среды обитания на формирование здоровья учащихся. Российский медико-биологический вестник имени академика И. П. Павлова. 2019; 27 (4): 530–5. DOI: 10.23888/PAVLOVJ2019274530-535.

10. Бокарева Н. А., Скоблина Н. А., Милушкина О. Ю. Гигиеническая характеристика медико-социальных факторов и образа жизни современных московских школьников. Здоровье населения и среда обитания — ЗНиСО. 2015; 5 (266): 33–6.
11. Шубочкина Е. И., Иванов В. Ю., Чепрасов В. В., Айзятова М. В. Гигиеническая оценка влияния факторов цифровой среды на организм подростков в процессе образовательной и досуговой деятельности. Здоровье населения и среда обитания — ЗНиСО. 2021; 6 (339): 71–7. DOI: 10.35627/2219-5238/2021-339-6-71-77.
12. Wang J, Hao QH, Peng W, Tu Y, Zhang L, Zhu TM. Relationship between smartphone addiction and eating disorders and lifestyle among Chinese college students. Front Public Health. 2023; (11): 1111477. DOI: 10.3389/fpubh.2023.1111477.
13. Скоблина Н. А., Попов В. И., Еремин А. Л., Маркелова С. В., Милушкина О. Ю., Обрубов С. В. и др. Риски развития болезней глаза и его придаточного аппарата у обучающихся в условиях нарушения гигиенических правил использования электронных устройств. Гигиена и санитария. 2021; 100 (3): 279–84. DOI: 10.47470/0016-9900-2021-100-3-279-284.
14. Попов В. И., Милушкина О. Ю., Скоблина Н. А., Маркелова С. В., Соколова Н. В., Дементьев А. А. Поведенческие риски здоровью студентов в период проведения дистанционного обучения. Гигиена и санитария. 2020; 99 (8): 854–60. DOI: 10.47470/0016-9900-2020-99-8-854-860.
15. Валина С. Л., Штина И. Е., Маклакова О. А., Устинова О. Ю., Эйсфельд Д. А. Закономерности развития у школьников болезней костно-мышечной системы в условиях комплексного воздействия факторов среды обитания и образа жизни. Анализ риска здоровью. 2021; (3): 54–6. DOI: 10.21668/health.risk/2021.3.05.
16. Yang J, Huang S, Cheng M, Tan W, Yang J. Postural habits and lifestyle factors associated with adolescent idiopathic scoliosis (AIS) in China: results from a big case-control study. J Orthop Surg Res. 2022; 17 (1): 472. DOI: 10.1186/s13018-022-03366-0
17. Скоблина Н. А., Милушкина О. Ю., Маркелова С. В., Федотов Д. М., Добрук И. В., Цепляева К. В. и др. Осведомленность педагогов об основах здорового образа жизни и гигиенических принципах охраны зрения. Журнал медико-биологических исследований. 2020; 8 (3): 269–76. DOI: 10.37482/2687-1491-Z018.
18. Al-Qahtani AM. Lifestyle habits among Najran University students, Najran, Saudi Arabia. Front Public Health. 2022; (10): 938062. DOI: 10.3389/fpubh.2022.938062.
19. Аминова О. С. Факторы риска для здоровья, связанные с образом жизни молодежи. Российский вестник гигиены. 2023; (2): 15–21. DOI: 10.24075/rbh.2023.069.
20. Соловьева Ю. В. Гигиенический профиль школьников старших классов, их родителей и педагогов. Российский вестник гигиены. 2023; (2): 9–14. DOI: 10.24075/rbh.2023.068.
21. Милушкина О. Ю., Скоблина Н. А., Маркелова С. В., Татаринчик А. А., Бокарева Н. А., Федотов Д. М. Оценка рисков здоровью школьников и студентов при воздействии обучающих и досуговых информационно-коммуникационных технологий. Анализ риска здоровью. 2019; (3): 135–43. DOI: 10.21668/health.risk/2019.3.16.
22. Jakubiec D, Kornafel D, Cygan A, Gorska-Klek L, Chromik K. Lifestyle of students from different universities in Wroclaw, Poland. Rocz Panstw Zakl Hig. 2015; 66 (4): 337–44.
23. Гончарова Д. Г., Соколова А. И., Изотова Л. В. Самооценка состояния здоровья и образа жизни как основа формирования представлений школьников о здоровьесбережении. Российский вестник гигиены. 2023; (1): 4–8. DOI: 10.24075/rbh.2023.061.
24. Девришов Р. Д., Хорошева И. В., Кудряшева И. А., Даулетова Л. А., Дашдамирова Н. А. Гигиеническая характеристика основных компонентов образа жизни студентов медицинских вузов. Медицина труда и экология человека. 2022; 2 (30): 177–86. DOI: 10.24412/2411-3794-2022-2-177-186.
25. Скоблина Н. А., Милушкина О. Ю., Попов В. И., Маркелова С. В., Бокарева Н. А., Татаринчик А. А. и др. От традиционного к дистанционному обучению: гигиенические проблемы охраны зрения обучающихся. Гигиена и санитария. 2021; 100 (4): 373–9. DOI: 10.47470/0016-9900-2021-100-4-373-379.
26. Мирская Н. Б., Коломенская А. Н., Синякина А. Д. Медико-социальная значимость нарушений и заболеваний костно-мышечной системы детей и подростков (обзор литературы). Гигиена и санитария. 2015; 94 (1): 97–104.
27. Matar Boumosleh J, Jaalouk D. Depression, anxiety, and smartphone addiction in university students — A cross sectional study. PLoS One. 2017; 12 (8): e0182239. DOI: 10.1371/journal.pone.0182239.
28. Кабышева М. И., Глазина Т. А. Функциональные нарушения опорно-двигательного аппарата студентов (на примере Оренбургского государственного университета). Вестник Оренбургского государственного университета. 2017; (2): 129–34.
29. Atia DT, Elsayed NI, Abdelmonem AF, Mahmoud SMS, Mahmoud MMM, Mohamed KES. et al. Prevalence of musculosceletal disorders among general and technical school students in Egypt. J Environ Public Health. 2023; 20 (2): 1465. DOI: 10.3390/ijerph20021465.
30. Ушаков И. Б., Попов В. И., Скоблина Н. А., Маркелова С. В. Длительность использования мобильных электронных устройств как современный фактор риска здоровью детей, подростков и молодежи. Экология человека. 2021; (7): 43–50. DOI: 10.33396/1728-0869-2021-7-43-50.
31. Обрубов С. А., Маркелова С. В. Влияние жизнедеятельности в условиях цифровой среды на состояние органа зрения обучающихся. Российский вестник гигиены. 2021; (2): 4–10. DOI: 10.24075/rbh.2021.014.
32. Иевлева О. В. Гигиеническая оценка режима использования мобильных электронных устройств студентами-медиками. Российский вестник гигиены. 2021; (3): 18–22. DOI: 10.24075/rbh.2021.023.
33. Аверьянова Н. И., Приступова В. В., Семерикова А. И., Старкова И. Л. Распространенность и структура деформаций стоп у младших школьников. Пермский медицинский журнал. 2019; 36 (6): 33–40. DOI: 10.17816/pmj36633-40.
34. Новикова И. И., Ерофеев Ю. В., Денисов А. В., Мыльникова И. В. Методические аспекты оценки потенциального ущерба здоровью школьников. Гигиена и санитария. 2019; 98 (10): 1124–8. DOI: http://dx.doi.org/10.18821/0016-9900-2019-98-10-1124-1128.
35. Дохов М. М., Сертакова А. В., Рубашкин С. А., Тимаев М. Х. Качество жизни детей с плоской стопой (плосковальгусная стопа, продольное плоскостопие). Саратовский научно-медицинский журнал. 2019; 15 (2): 271–4.
36. Мансурова Г. Ш., Мальцев С. В., Рябчиков И. В. Особенности формирования опорно-двигательной системы у школьников: заболевания, причины и возможные пути коррекции. Практическая медицина. 2019; 17 (5): 51–5. DOI: 10.32000/2072-1757-2019-5-51–55.
37. Ибрагимова Э. Э. Скрининг нарушений опорно-двигательной системы у обучающихся ВУЗа. Ученые записки Крымского федерального университета имени В. И. Вернадского. Биология. Химия. 2020; 6 (72), № 1: 63–72.
38. Попов В. И., Милушкина О. Ю., Скоблина Н. А., Тарасов А. В., Маркелова С. В., Ловкис А. А. и др. Влияние использования социальных сетей на формирование интернет-зависимостей у студентов-медиков. Здоровье населения и среда обитания — ЗНиСО. 2022; 30 (8): 51–6. DOI: 10.35627/2219-5238/2022-30-8-51-56.
39. Иевлева О. В. Двигательная активность студентов-медиков как индикатор их приверженности здоровому образу жизни. Российский вестник гигиены. 2021; (2): 35–9. DOI: 10.24075/rbh.2021.009.
40. Alvarez-Peregrina C, Sanchez-Tena MA, Martinez Perez C, Villa-Collar C. The relationship between screen and outdoor time with rates of myopia in Spanish children. Front Public Health. 2020; (8): 560378. DOI: 10.3389/fpubh.2020.560378.
41. Mireku MO, Barker MM, Mutz J, Dumontheil I, Thomas MSC, Roosli M, et al. Night-time screen-based media device use and adolescents' sleep and healt-related quality of life. Environ Int. 2019; (124): 66–78. DOI: 10.1016/j.envint.2018.11.069.
42. Saxena R, Gupta V, Prasad P, Bhardwaj A, Vashist P. Prevalence of myopia and its risk factors in rural school children in North India:

the North India myopia rural study (NIM-R Study). Eye (Lond). 2022; 36 (10): 2000–5. DOI: 10.1038/s41433-021-01797-3.
43. Jones-Jordan LA, Mitchell GL, Cotter SA, Kleinstein RN, Manny RE, Mutti DO, et al. Visual activity before and after the onset juvenile myopia. Invest Ophthalmol Vis Sci. 2011; 52 (3): 1841–50. DOI: 10.1167/iovs.09-4997.
44. Altalhi A, Khayyat W, Khojah O, Alsalmi M, Almarzouki H. Computer vision syndrome among health sciences students in Saudi Arabia: Prevalence and risk factors. Cureus. 2020; 12 (2): e7060. DOI: 10.7759/cureus.7060.
45. Скоблина Н. А., Шпаков А. И., Маркелова С. В., Обелевский А. Г., Кузнецов О. Е. Субъективная оценка студентами влияния факторов риска на зрение при использовании электронных устройств. Здоровье населения и среда обитания — ЗНиСО. 2020; 4 (325): 48–52. DOI: 10.35627/2219-5238/2020-325-4-48-52.
46. Шубочкина Е. И., Вятлева О. А., Блинова Е. Г. Риски ухудшения зрения и его прогрессирования у детей и подростков в современных условиях обучения и воспитания (научный обзор). Здоровье населения и среда обитания — ЗНиСО. 2022; 30 (4): 22–30. DOI: https//doi.org/10.35627/2219-5238/2022-30-4-22-30.
47. Милушкина О. Ю., Маркелова С. В., Иевлева О. В., Скоблина Н. А., Хорошева И. В., Девришов Р. Д. и др. Гигиеническое воспитание школьников и студентов с использованием технологии «трекеры привычек — чек-листы». Российский вестник гигиены. 2023; (2): 29–33. DOI: 10.24075/rbh.2023.071.
48. Бронских Н. А., Шаренко Е. М., Попова О. С., Насыбуллина Г. М. Гигиеническая характеристика факторов образа жизни учащихся колледжей. Российский вестник гигиены. 2022; (4): 19–25. DOI: 10.24075/rbh.2022.057.
49. Милушкина О. Ю., Скоблина Н. А., Маркелова С. В., Дубровина Е. А., Иевлева О. В. Гигиеническое воспитание студентов-медиков по вопросам здорового питания в рамках занятий на кафедре гигиены. Российский вестник гигиены. 2022; (3): 4–8. DOI: 10.24075/rbh.2022.050.
50. Сетко А. Г., Жданова О. М., Тюрин А. В. Научное обоснование инновационного подхода к управлению здоровьем обучающихся общеобразовательных организаций различного типа. Российский вестник гигиены. 2021; (3): 13–17. DOI: 10.24075/rbh.2021.024.