

DOI: <https://doi.org/10.17816/PTORS626498>

Journal Article



# Incidence of the musculoskeletal system diseases in children and the organization of specialized care in Saint Petersburg

Alexey G. Baidurashvili, Sergei V. Vissarionov, Anna V. Zaletina, Yuri A. Lapkin, Elena N. Shchepina

H. Turner National Medical Research Center for Children's Orthopedics and Trauma Surgery, Saint Petersburg, Russia

## ABSTRACT

**BACKGROUND:** The high prevalence of musculoskeletal system and connective tissue diseases, effects on the quality of life of children, and disability level are among the main medical and social problems.

**AIM:** To assess the morbidity rates and provision of medical care to St. Petersburg children with musculoskeletal diseases between 2017 and 2021.

**MATERIALS AND METHODS:** Data on the incidence of musculoskeletal diseases in children of St. Petersburg were analyzed based on the Federal statistical observation forms submitted by the St. Petersburg State Budgetary Institution Medical Center for Information and Analysis, collections of N.N. Priorov National Medical Research Center for Traumatology and Orthopedics of the Ministry of Health of the Russian Federation "Trauma, orthopedic morbidity, the state of trauma and orthopedic care for the population," edited by Acad. S.P. Mironov, RAS, and data from the Federal State Statistics Service.

**RESULTS:** In Saint Petersburg, the morbidity rate of musculoskeletal and connective tissue diseases from 2017 to 2021 was 13%, excluding 2020, which was most likely due to the introduction of measures aimed at counteracting the spread of COVID-19 and the suspension of planned outpatient specialized care. The number of orthopedic beds for children decreased by 58, whereas the availability of beds for children remained at the same level and amounted to 4.3 beds per 10,000 children, which exceeded the indicator for the Russian Federation (1.0). The number of children with these disabilities increased 1.4-fold. Deaths of children due to musculoskeletal and connective tissue diseases were recorded in 2019 and 2020.

**CONCLUSIONS:** The results of the 5-year observation period of musculoskeletal and connective tissue diseases in children in St. Petersburg revealed increasing incidence because of the increase in the number of children newly diagnosed with these diseases.

**Keywords:** orthopedic morbidity; musculoskeletal system; statistical rates; children.

## To cite this article

Baidurashvili AG, Vissarionov SV, Zaletina AV, Lapkin YuA, Shchepina EN. Incidence of the musculoskeletal system diseases in children and the organization of specialized care in Saint Petersburg. *Pediatric Traumatology, Orthopaedics and Reconstructive Surgery*. 2024;12(1):43–52. DOI: <https://doi.org/10.17816/PTORS626498>

Received: 05.02.2024

Accepted: 22.03.2024

Published: 29.03.2024

УДК 616.71/.74-053.2(083.41):313.13  
DOI: <https://doi.org/10.17816/PTORS626498>

Научная статья

## Анализ заболеваемости костно-мышечной системы у детей и организация специализированной помощи в Санкт-Петербурге

А.Г. Баиндурашвили, С.В. Виссарионов, А.В. Залетина, Ю.А. Лапкин, Е.Н. Щепина

Национальный медицинский исследовательский центр детской травматологии и ортопедии имени Г.И. Турнера, Санкт-Петербург, Россия

### АННОТАЦИЯ

**Обоснование.** Высокая распространенность болезней костно-мышечной системы и соединительной ткани, их влияние на качество жизни детей, уровень инвалидности представляют одну из основных медико-социальных проблем.

**Цель** — оценить показатели заболеваемости и оказание медицинской помощи детям Санкт-Петербурга с болезнями костно-мышечной системы с 2017 по 2021 г.

**Материалы и методы.** Проанализированы данные о заболеваемости болезнями костно-мышечной системы у детей Санкт-Петербурга на основании анализа форм Федерального статистического наблюдения, опубликованных СПбГБУЗ «МИАЦ», сборников ФГБУ «НМИЦ ТО им. Н.Н. Приорова» Минздрава России «Травматизм, ортопедическая заболеваемость, состояние травматолого-ортопедической помощи населению» под редакцией акад. РАН С.П. Миронова и данных Федеральной службы государственной статистики.

**Результаты.** В Санкт-Петербурге показатели заболеваемости болезнями костно-мышечной системы и соединительной ткани у детей с 2017 по 2021 г. увеличились на 13 %. Исключением стал 2020 год, что, скорее всего, связано с мероприятиями, направленными на противодействие распространению новой коронавирусной инфекции (COVID-19), а также приостановкой оказания плановой амбулаторной специализированной помощи. Произошло сокращение коечного фонда на 58 коек ортопедического профиля для детей, при этом обеспеченность детского населения койками данного профиля сохраняется на прежнем уровне и составляет 4,3 койки на 10 000 детского населения города, что превышает показатели обеспеченности по Российской Федерации (1,0). Количество детей-инвалидов по данному классу заболеваний увеличилось в 1,4 раза. Смерть детей по причине болезней костно-мышечной системы и соединительной ткани зафиксирована в 2019 и 2020 гг.

**Заключение.** За пятилетний период наблюдения заболеваемость болезнями костно-мышечной системы и соединительной ткани у детей в Санкт-Петербурге повысилась, в том числе за счет увеличения числа детей с впервые в жизни установленным диагнозом.

**Ключевые слова:** ортопедическая заболеваемость; костно-мышечная система; статистические показатели; дети.

### Как цитировать

Баиндурашвили А.Г., Виссарионов С.В., Залетина А.В., Лапкин Ю.А., Щепина Е.Н. Анализ заболеваемости костно-мышечной системы у детей и организация специализированной помощи в Санкт-Петербурге // Ортопедия, травматология и восстановительная хирургия детского возраста. 2024. Т. 12. № 1. С. 43–52. DOI: <https://doi.org/10.17816/PTORS626498>

## BACKGROUND

Currently, musculoskeletal system diseases (MSSDs) represent a serious medical and social problem. MSSDs are common in children of all ages [1]. Modern research proves that MSSDs are one of the indicators of the general state of human health and affect the functioning of other body organs and systems [2, 3]. Musculoskeletal injuries and MSSDs result in limited performance of normal living activities, quality of life deterioration, limited choice of profession, conscription into military service, and disability. The treatment and rehabilitation of severe cases incur large financial costs [2, 4, 5]. Various etiological factors that lead to the development of MSSDs determine their high prevalence in the population. In recent years, the number of school-age children with MSSDs tended to increase [6–8].

Many scientific publications have focused on this condition in general and on individual nosological units because of the widespread prevalence of MSSDs and the high risk among all age groups [5, 9–14]. MSSDs are one of the leading causes of childhood morbidity [15].

Russian and international researchers note that MSSDs during childhood affect significantly the quality of life, morbidity, and disability of the adult population [16–18].

**The study aimed** to assess morbidity rates and the provision of medical care to children with MSSDs from 2017 to 2021 in St. Petersburg.

## MATERIALS AND METHODS

The incidence rates of MSSDs in St. Petersburg from 2017 to 2021 were analyzed according to the Medical Information Analytical Center. The study used records of the N.N. Priorov National Medical Research Center of Traumatology and Orthopedics of the Ministry of Health of Russia “Injuries, orthopedic morbidity, the state of traumatological and orthopedic care to the population,” edited by RAS academician S.P. Mironov, which annually provide data on injuries in adults and children in the Russian Federation and for each region separately, and data from the Federal State Statistics Service (Rosstat).

The pediatric population of St. Petersburg in 2021 reached 963,262, including 839,321 children aged 0–14 years and 123,941 adolescents aged 15–17 years. Since 2017, the pediatric population (0–17 years old) has increased by 99,870, that is, by 84,604 children in the group aged 0–14 years inclusive and by 15,266 adolescents in the group aged 15–17 years. The ratio of boys (51%) to girls (49%) remained unchanged.

Six medical organizations in the city, including three city children’s hospitals, H.I. Turner National Medical Research Center for Children’s Orthopedics and Trauma Surgery of the Ministry of Health of Russia, and two clinics based on Federal State Budgetary educational institutions of higher education (N.I. Pirogov Clinic of High Medical Technologies at St. Petersburg State University and Clinic of St. Petersburg State Pediatric Medical University) provided inpatient orthopedic care for children in St. Petersburg in 2021.

## RESULTS

In St. Petersburg, MSSDs in children ranked third by incidence until 2019 and were registered on average in 203 per 1000 children, inferior to respiratory diseases (1558 per 1000 children) and diseases of the eye and its appendages (211 per 1000 children). Since 2019, MSSDs rank second among the main classes of diseases and account for 7% of the total number of diseases registered in children in St. Petersburg.

In St. Petersburg, the average incidence of MSSDs is 225 per 1000 children. For comparison, its incidence in the Russian Federation is 89 per 1000 children. The dynamics of the incidence of MSSDs in children in the Russian Federation and St. Petersburg is presented in Table 1.

MSSDs among children aged 0–14 years in St. Petersburg rank second by incidence in the Russian Federation, whereas they rank first among adolescents aged 15–17 years in all Russian regions.

In St. Petersburg, in 2017, 172,967 initial visits for medical help for diseases of the musculoskeletal system and connective tissue in children were recorded. In 2021, this figure increased to 218,850. In accordance with the data of

**Table 1.** Incidence of musculoskeletal system diseases per 1000 child population (0–17 years old) in the Russian Federation and St. Petersburg in 2017–2021 (‰)

Territories/age	2017	2018	2019	2020	2021
<i>Children aged 0–14 years</i>					
Russian Federation	75.7	78.8	82.3	71.7	76.7
Saint Petersburg	167.2	174.8	190.9	167.8	190.4
<i>Adolescents aged 15–17 years</i>					
Russian Federation	160.7	163.9	167.8	149.0	177.8
Saint Petersburg	430.5	419.3	449.2	409.5	476.6

**Table 2.** Incidence of musculoskeletal system diseases per 1000 child population (0–17 years old) in St. Petersburg in 2017–2021 (‰)

Name of classes and individual diseases	2017	2018	2019	2020	2021
<b>Diseases of the musculoskeletal system and connective tissue (M00–M99)</b>	200.3	205.9	224.1	199.04	227.2
Arthropathies (M00–M25)	84.6	86.7	91.4	85.04	95.6
Pneumococcal arthritis and polyarthritis (M00.1)	–	–	0.1	0.05	0.06
Reactive arthropathies (M02)	1.04	1.2	1.1	1.1	0.9
Rheumatoid arthritis (seropositive and seronegative) (M05–M06)	0.12	0.2	0.31	0.15	0.2
Juvenile arthritis (M08)	1.6	1.6	1.5	1.3	1.35
Arthrosis (M15–M19)	0.6	0.54	1.02	0.3	0.4
Systemic connective tissue disorders (M30–M35)	1.02	1	1.4	1.2	1.1
Systemic lupus erythematosus (M32)	0.008	0.005	0.004	0.01	0.02
Deforming dorsopathies (M40–M43)	56	52.5	58.1	47.8	56.2
Spondylopathies (M45–M48)	0.7	0.55	0.7	0.4	0.5
Ankylosing spondylitis (M45)	0.01	0.005	0.02	0.001	0.001
Damage to synovial membranes and tendons (M65–M67)	1.5	1.7	2.2	1.6	1.73
Osteopathies and chondropathies (M80–M94)	6.8	7	7.9	7.1	8
Osteoporosis (M80–M81)	0.04	0.001	0.05	0.05	0.01

**Table 3.** Incidence of diseases of the musculoskeletal system and connective tissue in adolescents aged 15–17 years in St. Petersburg in 2017–2021 (‰)

Registered diseases	2017	2018	2019	2020	2021
<b>Deforming dorsopathies</b>					
<i>n</i>	21,038	20,118	21,326	18,928	22,692
Per 1 thousand (‰)	193.6	176	179.4	154.4	183.1
<b>Arthropathies</b>					
<i>n</i>	14,096	15,282	16,904	16,952	19,532
Per 1 thousand (‰)	129.7	133.7	142.3	138.3	157.6
<b>Osteopathies and chondropathies</b>					
<i>n</i>	1092	1202	1334	1240	1314
Per 1 thousand (‰)	10	10.5	11.2	10.1	10.6
<b>Other</b>					
<i>n</i>	10,563	11,331	13,813	13,074	15,538
Per 1 thousand (‰)	97.2	99.1	116.2	106.7	125.4
<b>Total number of diseases of the musculoskeletal system and connective tissue</b>					
<i>n</i>	46,789	47,933	53,377	50,194	59,076
Per 1 thousand (‰)	430.5	419.3	449.2	409.5	476.6

Statistical Form No. 12, the federal statistical observation "Information on the number of diseases registered in patients" showed the incidence of MSSDs per 1000 children in St. Petersburg from 2017 to 2021 (Table 2).

The data analysis revealed that the incidence of diseases of the musculoskeletal system and connective tissue per 1000 children increased by 13% over 5 years in St. Petersburg.

The distribution of diseases under MSSDs in children aged 0–17 years has been maintained over the past several years. Among the total number of this pathology, arthropathies rank first (40%–43%), dorsopathies rank second (24%–28%), and osteopathies and chondropathies rank third (3%). However, considering the incidence by age groups in St. Petersburg, among adolescents (15–17 years old), deforming dorsopathies rank first accounting for 38.4%–45%

**Table 4.** Incidence of diseases of the musculoskeletal system and connective tissue in children aged 0–14 years in St. Petersburg in 2017–2021

Registered diseases	2017	2018	2019	2020	2021
<b>Arthropathies</b>					
<i>n</i>	58,968	62,653	67,521	63,593	72,568
Per 1 thousand	78.1	79.8	83.8	77.1	86.5
<b>Deforming dorsopathies</b>					
<i>n</i>	27,216	27,059	32,319	26,311	31,474
Per 1 thousand	36.1	34.5	40.1	32	37.5
<b>Osteopathies and chondropathies</b>					
<i>n</i>	4751	4992	5948	5454	6414
Per 1 thousand	6.1	6.3	7.4	6.6	7.6
<b>Others</b>					
<i>n</i>	35,243	42,456	47,918	42,949	49,318
Per 1 thousand	46.7	54.1	59.5	52.1	58.8
<b>Total number of diseases of the musculoskeletal system and connective tissue</b>					
<i>n</i>	126,178	137,160	153,706	138,307	159,774
Per 1 thousand	167.2	175	191	168	190.4

of the total number of diseases of the musculoskeletal system and connective tissue, arthropathies rank second with 30%–34%, and osteopathies and chondropathies rank third with 2.5% (Table 3).

Over the past 5 years, the incidence of MSSDs in adolescents has increased by 11%. The incidence tended to increase among adolescents with arthropathies by 21%. In addition, the incidence of osteopathies and chondropathies increased by 6%. However, a positive trend was also observed, which was expressed as a decrease in the incidence of deforming dorsopathies by 5.5%.

The analysis of the incidence of MSSDs in children aged 0–14 years revealed that arthropathies rank first (45%–47%), dorsopathies rank second (19%–22%), osteopathies and chondropathies rank third (3%–4%). The incidence of MSSDs in children aged 0–14 years in St. Petersburg is presented in Table 4.

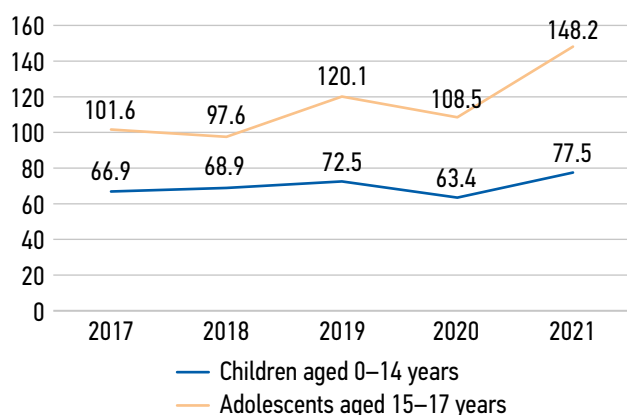
Over 5 years, in the group aged 0–14 years, the incidence of arthropathies increased by 11%, dorsopathies by 4%, and osteopathies by 24%. The overall incidence of MSSDs in children increased by 14% from 2017 to 2021.

The diagnosis of MSSDs in St. Petersburg in 2017 was established for the first time in 50,542 children. By 2021, this number increased to 65,068. The incidence of newly diagnosed MSSDs in children in St. Petersburg is presented in Figure.

The increasing number of children with newly diagnosed MSSDs in both age groups is of concern because MSSDs are chronic and children with MSSDs require long-term comprehensive inpatient and rehabilitation treatment and clinical monitoring by not only orthopedists but also neurologists, surgeons, and rheumatologists.

In St. Petersburg, six medical organizations in the city, including in federal centers, provided inpatient traumatology and orthopedic care for children. In 2017, 473 orthopedic beds were available for children, most of which (430 beds) were at federal clinics. Over 5 years, bed capacity has reduced, and by the end of 2021, the average number of orthopedic beds for children was 415, including 372 beds in federal centers. The performance indicators of orthopedic beds for children in St. Petersburg are presented in Table 5.

In the analysis of orthopedic beds specialized for children in 2017–2021, despite the reduction in orthopedic beds for children in St. Petersburg (by 58) by 2021, the number of hospitalizations increased by 25%, and the average bed day reduced from 15.4 to 10.4 and bed turnover increased from 17.1 to 24.6.



**Figure.** Incidence of diseases of the musculoskeletal system newly diagnosed in children aged 0–17 years in St. Petersburg in 2017–2021 (‰)

**Table 5.** Performance indicators of orthopedic beds specialized for children in St. Petersburg in 2017–2021

Indicator	2017	2018	2019	2020	2021
Number of beds	473	471	480	421	415
Patients admitted	8119	8563	10,169	8154	10,196
Average bed day	15.4	14.7	13.1	12.2	10.4
Bed turnover	17.1	18.2	21.2	19.4	24.6
Bed work per year	263.6	268.6	277.7	237.1	256.2
Bed occupancy, %	72.2	73.6	76.1	64.8	70.2

**Table 6.** Surgical interventions on the musculoskeletal system in children in St. Petersburg in 2017–2021

Type of surgical intervention	2017	2018	2019	2020	2021
<b>TOTAL* surgeries on the musculoskeletal system</b>	<b>20,729</b> <b>(4414)</b>	<b>22,618</b> <b>(5222)</b>	<b>23,369</b> <b>(5745)</b>	<b>21,812</b> <b>(5442)</b>	<b>24,502</b> <b>(5432)</b>
Corrective osteotomies	1245	999	1289	1600	1508
Maxillofacial area surgery	9394	9345	9097	8882	10,037
Spine surgery	661	615	608	611	694
Congenital hip dislocation surgery	458	553	505	381	465
Amputation and disarticulation	3	13	32	81	65
Endoprosthetics, total	51	47	58	49	58
Hip joint surgery	44	41	43	37	49
Knee joint surgery	5	2	4	3	1
Chest wall surgery	198	150	197	191	193
Thoracomyoplasty	130	81	102	110	133
Thoracostomy	14	1	0	5	0
Others	8526	10,771	11,434	9862	11,299

\* In brackets including the number of surgeries using high-tech medical care.

**Table 7.** Children with disability in St. Petersburg for 2017–2021

Indicator	2017		2018		2019		2020		2021	
	M	F	M	F	M	F	M	F	M	F
<b>Total number of children with disability</b>	<b>16,341</b>		<b>17,143</b>		<b>17,902</b>		<b>18,510</b>		<b>19,360</b>	
	9828	6513	10,396	6747	10,930	6972	11,314	7196	11,845	7515
Including those with newly diagnosed disabilities	1980		1971		2077		1741		1999	
	1178	802	1249	722	1289	788	1060	681	1248	751
Including those with diseases of the musculoskeletal system and connective tissue	369		418		414		447		517	
	175	194	186	232	186	228	183	264	201	316

**Table 8.** Distribution of children with disability related to diseases of the musculoskeletal system by sex and age in St. Petersburg in 2017–2021

Year	Children with disability related to diseases of the musculoskeletal system									
	Total		Children aged 0–17 years (inclusive)							
			0–4 years		5–9 years		10–14 years		15–17 years	
	M	F	M	F	M	F	M	F	M	F
2017	175	194	15	10	61	48	56	70	43	66
2018	186	232	13	18	68	50	48	86	57	78
2019	186	228	14	22	69	49	52	79	51	78
2020	183	264	12	20	66	65	54	89	51	90
2021	201	316	9	24	73	81	68	111	51	100

The results of the analysis of surgical data by medical organizations in St. Petersburg providing assistance to children with various MSSDs are presented in Table 6.

Along with the increase in the number of hospitalizations by orthopedic beds for children, the number of surgeries performed on children during hospitalizations also increased, except for thoracostomy and knee replacement. The number of musculoskeletal surgeries in children using high medical technologies in 2020–2021 decreased, which may be due to the restrictive measures aimed at countering the spread of COVID-19.

Along with the increase in morbidity rates among children in St. Petersburg, the number of children with disability tended to increase by 15.6% over the past 5 years. Information about children with disability in St. Petersburg is presented in Table 7.

The incidence of MSSD-related disability in children accounts for 2.7% of the total number of all children with disability in St. Petersburg. The prevalence of MSSD-related disability is 5.3 per 10,000 children aged 0–17 years. From 2017 to 2021, the number of children with MSSD-related disability increased by 1.4 times. Among 517 children with MSSD-related disability registered in St. Petersburg in 2021, there were more girls (61%) than boys. The structure of children with MSSD-related disability in St. Petersburg with distribution by sex and age groups is presented in Table 8.

In the analysis by sex, over 5 years, 122 girls had MSSD-related disability in all age groups, including 14 children aged 0–4 years, 33 aged 5–9 years, 41 aged 10–14 years, and 34 aged 15–17 years compared with 2017 data. Over the past 5 years, the number of girls with juvenile arthritis (M08) had increased by 2.5 times and that with osteopathies and chondropathies by 1.4 times (M80–M94). The number of boys with MSSD-related disability from 2017 to 2021 increased by only 26, and an increase of 1.2 times was noted girls with MSSD-related disability.

The mortality in children due to MSSD is low. In St. Petersburg, in 2019, a boy in the age group 5–9 years died of MSSDs, which accounted for 0.3% of the total mortality in children ( $n = 376$ ). In 2020, a teenage boy died of MSSD (1 child out of 396 deceased children).

## DISCUSSION

The results revealed a gradual decrease in the incidence of orthopedic morbidity in children in the Russian Federation over time [19]. Among other regions in Russia, St. Petersburg still records a higher number of pediatric patients with MSSDs among all childhood morbidities. This pathology is second only to respiratory diseases. This finding is attributed to the high level of diagnostics and timely detection of MSSDs in children in this region. Since 2019, MSSDs in St. Petersburg accounted for 7% of the total number of diseases registered in children. Our data are close to the values given in a study on MSSDs in Dutch children, that is, 7.5% of the total number of diseases [20].

Among conditions under MSSDs, arthropathies rank first, which accounts for up to 40%–43% of the total number of diseases, dorsopathies rank second (24%–28%), and osteopathies and chondropathies rank third (3%). These results are consistent with information obtained from a study conducted in Australia, where the predominance of upper and lower extremity disorders, followed by spinal disorders, was noted in children who sought medical help for MSSDs [21].

The rates of MSSD-related disability in children increased steadily; however, the increase in the number was mainly due to the high disability rates in girls, which may be caused by the worsening course of juvenile arthritis and requires more detailed study. Despite the increase in MSSD-related disability in children, in our region, 5.4 per 10,000 children have disability, which is much less than the national average index of 8.4 per 10,000 children of the corresponding age. This fact may be associated with timely and accurate diagnostics and adequate options for modern conservative and surgical treatment [22].

Physical inactivity and increased static load on muscles due to current social and hygienic features in children are among the probable causes of the increased incidence of MSSDs [6, 7]. The above changes, specifically in children, result in the deterioration of the quality of life at an older age. Research supports the relationship between physical activity and bone health in children and adults [23–26].

## CONCLUSION

The results of this study revealed an increase in the incidence of MSSDs in children in St. Petersburg, which was attributed to the increase in the number of patients with newly diagnosed MSSDs. Moreover, a negative trend was observed in the incidence of MSSD-related disability in children. The main task of the traumatology and orthopedic service is to diagnose diseases early, provide timely and adequate treatment using high medical technologies, and offer comprehensive rehabilitation of patients with subsequent dispensary follow-up. A set of measures aimed at preventing pathological disorders and focusing on a healthy lifestyle presents the basis for reducing MSSDs and disability rates.

## ADDITIONAL INFORMATION

**Funding source.** The study had no external funding.

**Competing interests.** The authors declare that they have no competing interests.

**Author contributions.** A.G. Baidurashvili and S.V. Vissarionov conceived the study and edited the text of the article; A.V. Zaletina, Yu.A. Lapkin, and E.N. Shchepina analyzed the material, studied the literary sources, and wrote the article.

All authors made significant contributions to the study and preparation of the article; they read and approved the final version before its publication.

## REFERENCES

1. Mirskaya NB, Kolomenskaya AN, Sinyakina AD. Prevalence and medical and social importance of disorders and diseases of the musculoskeletal systems in children and adolescents (review of literature). *Hygiene and Sanitation*. 2015;94(1):97–104. EDN: TSBQOV
2. Mirskaya NB. *Innovative technologies for implementing a conceptual model for the prevention and correction of disorders and diseases of the musculoskeletal system in schoolchildren [dissertation abstract]*. Moscow; 2010. (In Russ.) EDN: QGVPOH
3. Bogormistrova VA, Svoboda PN, Shestakova VN, et al. The structure of lesions of the musculoskeletal system in adolescent children, considering the somatic pathology and living environment. *Pediatric Traumatology, Orthopaedics and Reconstructive Surgery*. 2022;10(1):5–12. EDN: ORERAQ doi: 10.17816/PTORS96525
4. Alikova ZR, Remizov OV, Enaldieva SS, et al. The estimation of quality of life of children with diseases of musculoskeletal system. *Problems of social hygiene, public health and history of medicine*. 2022;30(4):569–573. EDN: WJFQSX doi: 10.32687/0869-866X-2022-30-4-569-573
5. Orel VI, Kim AV, Guryeva NA, et al. Features of the health status of pre-conscripts depending on their physical development. *Children's Medicine of the North-West*. 2021;9(1):272–273. (In Russ.) EDN: TZYHGY
6. Mansurova GSh, Ryabchikov IV, Maltsev SV, et al. Violations of the musculoskeletal system in school-age children. *Russian Bulletin of Perinatology and Pediatrics*. 2017;62(5):187–191. EDN: ZRPYUN doi: 10.21508/1027-4065-2017-62-5-187-191
7. Belova OA. Diagnosis and prevention of disorders of musculoskeletal systems in the primary school years. *Health and education in the 21st century*. 2012;14(1):9–17. EDN: QAJXLZ
8. Antonova AA, Yamanova GA, Serdyukov VG, et al. Dynamics of locomotor apparatus state in children and adolescents. *International Research Journal*. 2020;7–2(97):53–56. EDN: INBZTH doi: 10.23670/IRJ.2020.97.044
9. Schwend RM. The Burden of pediatric musculoskeletal diseases worldwide. *Orthop Clin North Am*. 2020;51(2):207–217. doi: 10.1016/j.jocl.2019.11.005
10. Vissarionov SV, Zaletina AV, Shchepina EN. Idiopathic scoliosis in children of St. Petersburg in the structure of diseases of the musculoskeletal system. In: *Complex treatment of children with spinal deformities: proceedings of a scientific symposium, St. Petersburg, September 22–23, 2022*. Saint Petersburg: Science-Intensive Technologies; 2022. P. 19–21. EDN: QSMORV
11. Gorbach AP, Sergeenko OM, Shchurova EN. Idiopathic scoliosis as a multifactorial disease: systematic review of current literature. *Russian Journal of Spine Surgery*. 2022;19(2):19–32. EDN: PUDHGI doi: 10.14531/ss2022.2.19-32
12. Hannink E, Toye F, Newman M, et al. The experience of living with adolescent idiopathic scoliosis: a qualitative evidence synthesis using meta-ethnography. *BMC Pediatr*. 2023;23(1):373. doi: 10.1186/s12887-023-04183-y
13. Chernyshova OE, Konyushevskaya AA, Vaiser NV, et al. Juvenile arthritis: etiology, pathogenesis, modern aspects (review of the literature). *Injury*. 2018;19(2):99–105. EDN: XPPFAT doi: 10.22141/1608-1706.2.19.2018.130662
14. Ogbu EA, Brunner HI. Treatment guidelines in pediatric rheumatic diseases. *Rheum Dis Clin North Am*. 2022;48(3):725–746. doi: 10.1016/j.rdc.2022.03.007
15. Baranov AA, Albitsky VYu. State of health of children in Russia, priorities of its preservation and improving. *Kazan medical journal*. 2018;99(4):698–705. EDN: XUGHOX doi: 10.17816/KMJ2018-698
16. Makarov VYu, Shilnikova NF, Gromov PV. Analysis of morbidity of musculoskeletal system diseases (diseases of the bone-muscular system and connective tissue) as the basis of medical rehabilitation planning in a subject of the Russian Federation. *Bulletin of Semashko National Research Institute of Public Health*. 2019;(3–4):48–56. EDN: QSGYGY doi: 10.25742/NRIPH.2019.03.006
17. Sebbag E, Felten R, Sagez F, et al. The world-wide burden of musculoskeletal diseases: a systematic analysis of the World Health Organization Burden of Diseases Database. *Ann Rheum Dis*. 2019;78(6):844–848. doi: 10.1136/annrheumdis-2019-215142
18. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1789–1858. doi: 10.1016/S0140-6736(18)32279-7
19. Mironov SP. State of orthopaedic-traumatologic service in Russian Federation and perspectives for introduction of innovative technologies in traumatology and orthopaedics. *N.N. Priorov Journal of Traumatology and Orthopaedics*. 2010;(4):10–13. (In Russ.) EDN: NBRIYV
20. Vijlbrief AS, Bruijnzeels MA, van der Wouden JC, et al. Musculoskeletal disorders in children: a study in Dutch general practice. *Scand J Prim Health Care*. 1995;13(2):105–111. doi: 10.3109/02813439508996745
21. Henschke N, Harrison C, McKay D, et al. Musculoskeletal conditions in children and adolescents managed in Australian primary care. *BMC Musculoskelet Disord*. 2014;15:164. doi: 10.1186/1471-2474-15-164
22. Mironov SP, editor. *Traumatism, orthopedic morbidity, organization of traumatological and orthopedic care in the Russian Federation in 2020: collection*. Moscow: NMITSTO named after. N.N. Priorov; 2022. EDN: NBRIZF
23. Silkin YuR, Chekalova NG, Matveeva NA, et al. The peculiarities of the health indices of schoolchildren with musculoskeletal system pathology. *Medical Almanac*. 2013;2(26):135–138. EDN: QAXDMZ
24. Bezrukh MM. Health of schoolchildren, problems, solutions. *Siberian Pedagogical Journal*. 2012;(9):11–16. (In Russ.) EDN: PONYUN
25. Proia P, Amato A, Drid P, et al. The impact of diet and physical activity on bone health in children and adolescents. *Front Endocrinol (Lausanne)*. 2021;12. doi: 10.3389/fendo.2021.704647
26. Loud KJ, Gordon CM. Adolescent bone health. *Arch Pediatr Adolesc Med*. 2006;160(10):1026–1032. doi: 10.1001/archpedi.160.10.1026



## СПИСОК ЛИТЕРАТУРЫ

1. Мирская Н.Б., Коломенская А.Н., Синякина А.Д. Медико-социальная значимость нарушений и заболеваний костно-мышечной системы детей и подростков // Гигиена и санитария. 2015. Т. 94, № 1. С. 97–104. EDN: TSBQOV
2. Мирская Н.Б. Инновационные технологии реализации концептуальной модели профилактики и коррекции нарушений и заболеваний костно-мышечной системы школьников: автореф. дис. ... д-ра мед. наук. Москва, 2010. EDN: QGVPOH
3. Богормистрова В.А., Свобода П.Н., Шестакова В.Н., и др. Структура поражений опорно-двигательного аппарата у детей подросткового возраста с учетом соматической патологии и среды проживания // Ортопедия, травматология и восстановительная хирургия детского возраста. 2022. Т. 10, № 1. С. 5–12. EDN: ORERAQ doi: 10.17816/PTORS96525
4. Аликова З.Р., Ремизов О.В., Еналдиева С.С., и др. Оценка качества жизни детей с болезнями костно-мышечной системы // Проблемы социальной гигиены, здравоохранения и истории медицины. 2022. Т. 30, № 4. С. 569–573. EDN: WJFQSX doi: 10.32687/0869-866X-2022-30-4-569-573
5. Орел В.И., Ким А.В., Гурьева Н.А., и др. Особенности состояния здоровья допризывников в зависимости от их физического развития // Children's Medicine of the North-West. 2021. Т. 9, № 1. С. 272–273. EDN: TZYHGY
6. Мансурова Г.Ш., Рябчиков И.В., Мальцев С.В., и др. Нарушения опорно-двигательного аппарата у детей школьного возраста // Российский вестник перинатологии и педиатрии. 2017. Т. 62, № 5. С. 187–191. EDN: ZRPYUN doi: 10.21508/1027-4065-2017-62-5-187-191
7. Белова О.А. Диагностика и профилактика нарушений опорно-двигательного аппарата у младших школьников // Здоровье и образование в XXI веке. Серия: Медицина. 2012. Т. 14, № 1. С. 9–17. EDN: QAJXLZ
8. Антонова А.А., Яманова Г.А., Сердюков В.Г., и др. Динамика состояния опорно-двигательного аппарата у детей и подростков // Международный научно-исследовательский журнал. 2020. № 7–2(97). С. 53–56. EDN: INBZTH doi: 10.23670/IRJ.2020.97.7.044
9. Schwend R.M. The burden of pediatric musculoskeletal diseases worldwide // Orthop Clin North Am. 2020. Vol. 51, N. 2. P. 207–217. doi: 10.1016/j.jocl.2019.11.005
10. Виссарионов С.В., Залетина А.В., Щепина Е.Н. Идиопатический сколиоз у детей Санкт-Петербурга в структуре болезней костно-мышечной системы. В кн.: Комплексное лечение детей с деформациями позвоночника: материалы научного симпозиума, Санкт-Петербург, 22–23 сентября 2022 года. Санкт-Петербург: Научно-технологические технологии, 2022. С. 19–21. EDN: QSMORV
11. Горбач А.П., Сергеев О.М., Щурова Е.Н. Идиопатический сколиоз как мультифакторное заболевание: систематизированный обзор современной литературы // Хирургия позвоночника. 2022. Т. 19, № 2. С. 19–32. EDN: PUDHGI doi: 10.14531/ss2022.2.19-32
12. Hannink E., Toye F., Newman M., et al. The experience of living with adolescent idiopathic scoliosis: a qualitative evidence synthesis using meta-ethnography // BMC Pediatr. 2023. Vol. 23, N. 1. P. 373. doi: 10.1186/s12887-023-04183-y
13. Чернышова О.Е., Коношевская А.А., Вайзер Н.В., и др. Ювенильный артрит: этиология, патогенез, современные аспекты (обзор литературы) // Травма. 2018. Т. 19, № 2. С. 99–105. EDN: XPPFAT doi: 10.22141/1608-1706.2.19.2018.130662
14. Ogbu E.A., Brunner H.I. Treatment guidelines in pediatric rheumatic diseases // Rheum Dis Clin North Am. 2022. Vol. 48, N. 3. P. 725–746. doi: 10.1016/j.rdc.2022.03.007
15. Баранов А.А., Альбицкий В.Ю. Состояние здоровья детей России, приоритеты его сохранения и укрепления // Казанский медицинский журнал. 2018. Т. 99, № 4. С. 698–705. EDN: XUGHOX doi: 10.17816/KMJ2018-698
16. Макаров В.Ю., Шильникова Н.Ф., Громов П.В. Анализ заболеваемости болезнями опорно-двигательного аппарата (болезни костно-мышечной системы и соединительной ткани) как основа планирования медицинской реабилитации в субъекте РФ // Бюллетень Национального научно-исследовательского института общественного здоровья имени Н.А. Семашко. 2019. № 3–4. С. 48–56. EDN: QSGYGY doi: 10.25742/NRIPH.2019.03.006
17. Sebbag E., Felten R., Sagez F., et al. The world-wide burden of musculoskeletal diseases: a systematic analysis of the World Health Organization Burden of Diseases Database // Ann Rheum Dis. 2019. Vol. 78, N. 6. P. 844–848. doi: 10.1136/annrheumdis-2019-215142
18. GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017 // Lancet. 2018. Vol. 392, N. 10159. P. 1789–1858. doi: 10.1016/S0140-6736(18)32279-7
19. Миронов С.П. Состояние ортопедо-травматологической службы в Российской Федерации и перспективы внедрения инновационных технологий в травматологии и ортопедии // Вестник травматологии и ортопедии им. Н.Н. Приорова. 2010. № 4. С. 10–13. EDN: NBRIYV
20. Vijlbrief A.S., Bruijnzeels M.A., van der Wouden J.C., et al. Musculoskeletal disorders in children: a study in Dutch general practice // Scand J Prim Health Care. 1995. Vol. 13, N. 2. P. 105–111. doi: 10.3109/02813439508996745
21. Henschke N., Harrison C., McKay D., et al. Musculoskeletal conditions in children and adolescents managed in Australian primary care // BMC Musculoskelet Disord. 2014. Vol. 15. P. 164. doi: 10.1186/1471-2474-15-164
22. Травматизм, ортопедическая заболеваемость, организация травматолого-ортопедической помощи в Российской Федерации в 2020 году: сборник / под ред. С.П. Миронова. Москва: НМИЦТО им. Н.Н. Приорова, 2022. EDN: NBRIZF
23. Силкин Ю.Р., Чекалова Н.Г., Матвеева Н.А. Особенности показателей здоровья учащихся с патологией костно-мышечной системы // Медицинский альманах. 2013. Т. 2, № 26. С. 135–138. EDN: QAXDMZ
24. Безруких М.М. Здоровье школьников, проблемы, пути решения // Сибирский педагогический журнал. 2012. № 9. С. 11–16. EDN: PONYUN
25. Proia P., Amato A., Drid P., et al. The impact of diet and physical activity on bone health in children and adolescents // Front Endocrinol (Lausanne). 2021. Vol. 12. doi: 10.3389/fendo.2021.704647
26. Loud K.J., Gordon C.M. Adolescent bone health // Arch Pediatr Adolesc Med. 2006. Vol. 160, N. 10. P. 1026–1032. doi: 10.1001/archpedi.160.10.1026

## AUTHOR INFORMATION

**Alexey G. Baidurashvili**, MD, PhD, Dr. Sci. (Med.), Professor,  
Member of RAS, Honored Doctor of the Russian Federation;  
ORCID: 0000-0001-8123-6944;  
eLibrary SPIN: 2153-9050;  
e-mail: turner011@mail.ru

**Sergei V. Vissarionov**, MD, PhD, Dr. Sci. (Med.), Professor,  
Corresponding Member of RAS;  
ORCID: 0000-0003-4235-5048;  
eLibrary SPIN: 7125-4930;  
e-mail: vissarionovs@gmail.com

\* **Anna V. Zaletina**, MD, PhD, Cand. Sci. (Med.);  
address: 64-68 Parkovaya str., Pushkin,  
Saint Petersburg, 196603, Russia;  
ORCID: 0000-0002-9838-2777;  
eLibrary SPIN: 4955-1830;  
e-mail: omoturner@mail.ru

**Yuri A. Lapkin**, MD, PhD, Cand. Sci. (Med.);  
ORCID: 0009-0007-9629-7601;  
eLibrary SPIN: 3283-8887;  
e-mail: lapkin1950@mail.ru

**Elena N. Schepina**, PhD, Cand. Sci. (Med.);  
ORCID: 0000-0003-1913-1118;  
eLibrary SPIN: 3934-0694;  
e-mail: ov-elena@mail.ru

## ОБ АВТОРАХ

**Алексей Георгиевич Баиндурашвили**, д-р мед. наук,  
профессор, академик РАН, заслуженный врач РФ;  
ORCID: 0000-0001-8123-6944;  
eLibrary SPIN: 2153-9050;  
e-mail: turner011@mail.ru

**Сергей Валентинович Виссарионов**, д-р мед. наук,  
профессор, чл.-корр. РАН;  
ORCID: 0000-0003-4235-5048;  
eLibrary SPIN: 7125-4930;  
e-mail: vissarionovs@gmail.com

\* **Анна Владимировна Залетина**, канд. мед. наук;  
адрес: Россия, 196603, Санкт-Петербург,  
Пушкин, ул. Парковая, д. 64-68;  
ORCID: 0000-0002-9838-2777;  
eLibrary SPIN: 4955-1830;  
e-mail: omoturner@mail.ru

**Юрий Алексеевич Лапкин**, канд. мед. наук;  
ORCID: 0009-0007-9629-7601;  
eLibrary SPIN: 3283-8887;  
e-mail: lapkin1950@mail.ru

**Елена Николаевна Щепина**, канд. мед. наук;  
ORCID: 0000-0003-1913-1118;  
eLibrary SPIN: 3934-0694;  
e-mail: ov-elena@mail.ru

\* Corresponding author / Автор, ответственный за переписку