

UDC 616.053.2+578.834.1+616-036.21+574.23+616-082+614.2/.4
DOI: 10.56871/MHCO.2024.78.73.002

COMPARATIVE ANALYSIS OF THE STRUCTURE OF URGENT HOSPITALIZATION OF CHILDREN DURING THE COVID-19 PANDEMIC

© Anna V. Emeljanova, Larisa V. Sakhno, Inna V. Koltuntseva, Irina M. Gaiduk, Olga L. Ezhova, Ksana V. Shternlikht, Svetlana V. Bairova, Maria O. Revnova

Saint Petersburg State Pediatric Medical University. 2 Lithuania, Saint Petersburg 194100 Russian Federation

Contact information: Anna V. Emeljanova — Candidate of Medical Sciences, Associate Professor of the Department of Pediatrics named after acad. A.F. Tur. E-mail: emeljanova.nura@yandex.ru ORCID: <https://orcid.org/0000-0001-6123-8168> SPIN: 1918-2737

For citation: Emeljanova AV, Sakhno LV, Koltuntseva IV, Gaiduk IM, Ezhova OL, Shternlikht KV, Bairova SV, Revnova MO. Comparative analysis of the structure of urgent hospitalization of children during the COVID-19 pandemic. *Medicine and Health Care Organization*. 2024;9(1):25–35. DOI: <https://doi.org/10.56871/MHCO.2024.78.73.002>

Received: 15.01.2024

Revised: 13.02.2024

Accepted: 14.03.2024

ABSTRACT. The analysis of the structure of emergency hospitalization cases in a multidisciplinary children's hospital for children aged 0 to 17 years during the COVID-19 pandemic (2020, 2021, 2022) revealed significant differences compared to the period before (2019). During the pandemic children under the age of 3 most often needed emergency hospitalization due to acute respiratory pathology, which indicates a high vulnerability in susceptibility to infectious factors, despite restrictive measures. During pandemic, there was a decrease in cases of emergency hospitalization of children with acute digestive pathology in the age group under 3 years and in the group of children from 4 to 7 years of age from all cases of hospitalization per year, compared with the period before the pandemic. In the group of elder children, aged 8 years and older, on the contrary, an increase in the number of hospitalized with digestive diseases patients was revealed compared with the period before the pandemic. These features may be related to the restriction of nutrition of children of early and preschool age outside home, greater alertness of parents to children's complaints and earlier seeking for medical help. In school-age children, a certain increase of acute pathology of the digestive organs is presumably due to the possessing chronic pathology, periods of exacerbation, influence of lower dietary control by adult members. The main causes of emergency hospitalization in the group of adolescents aged 12–17 years during the pandemic were associated with injuries and infectious diseases, which is probably due to children's behavior and violation of self-isolation. In the period after the end of restrictions in the time of pandemic, an increase in the number of emergency hospitalizations in children with acute appendicitis was revealed, which may be the result of expanding children's access to food in public catering establishments, and presumably by a consequence of the influence of a new coronavirus infection, which requires further study.

KEYWORDS: children 0–17 years old, structure of emergency hospitalization, new coronavirus infection

СРАВНИТЕЛЬНЫЙ АНАЛИЗ СТРУКТУРЫ УРГЕНТНОЙ ГОСПИТАЛИЗАЦИИ ДЕТЕЙ В ПЕРИОД ПАНДЕМИИ COVID-19

© Анна Владимировна Емельянова, Лариса Викторовна Сахно, Инна Викторовна Колтунцева, Ирина Михайловна Гайдук, Ольга Леонидовна Ежова, Ксана Викторовна Штернлихт, Светлана Вадимовна Баирова, Мария Олеговна Ревнова

Санкт-Петербургский государственный педиатрический медицинский университет. 194100, г. Санкт-Петербург, ул. Литовская, д. 2

Контактная информация: Анна Владимировна Емельянова — к.м.н., доцент кафедры педиатрии им. акад. А.Ф. Тура. E-mail: emeljanova.nura@yandex.ru ORCID: <https://orcid.org/0000-0001-6123-8168> SPIN: 1918-2737

Для цитирования: Емельянова А.В., Сахно Л.В., Колтунцева И.В., Гайдук И.М., Ежова О.Л., Штернлихт К.В., Баирова С.В., Ревнова М.О. Сравнительный анализ структуры ургентной госпитализации детей в период пандемии COVID-19 // Медицина и организация здравоохранения. 2024. Т. 9. № 1. С. 25–35. DOI: <https://doi.org/10.56871/MHCO.2024.78.73.002>

Поступила: 15.01.2024

Одобрена: 13.02.2024

Принята к печати: 14.03.2024

РЕЗЮМЕ. Анализ структуры случаев экстренной госпитализации в многопрофильном детском стационаре детей в возрасте от 0 до 17 лет в период пандемии COVID-19 (2020, 2021, 2022 гг.) выявил значительные отличия по сравнению с периодом до пандемии (2019 г.). В период пандемии наиболее часто нуждались в экстренной госпитализации дети в возрасте до 3 лет по причине острой патологии органов дыхания, что свидетельствует о высокой уязвимости по восприимчивости к инфекционным факторам, несмотря на ограничительные меры. Во время пандемии отмечено снижение случаев экстренной госпитализации детей с острой патологией органов пищеварения в возрастной группе до 3 лет и в группе детей от 4 до 7 лет из всех случаев госпитализации за год, по сравнению с периодом до пандемии. В группе детей более старшего возраста, от 8 лет и старше, напротив, выявлен рост числа госпитализированных с болезнями органов пищеварения по сравнению с периодом до пандемии. Возможно, данные особенности связаны с ограничением питания детей раннего и дошкольного возраста вне дома, большей настороженностью родителей к жалобам детей и более ранним обращением за медицинской помощью. У детей школьного возраста рост острой патологии органов пищеварения предположительно обусловлен имеющейся хронической патологией, с периодами обострения, влиянием более низкого контроля за питанием со стороны взрослых. Основными причинами экстренной госпитализации в группе подростков 12–17 лет в период пандемии явились травмы и инфекционные заболевания, что, вероятно, обусловлено поведением детей и нарушением самоизоляции. После окончания ограничений в пандемию выявлен рост количества экстренной госпитализации у детей с острым аппендицитом, что, вероятно, является результатом расширения возможностей доступности детей к заведениям общественного питания и, предположительно, последствием влияния новой коронавирусной инфекции, что требует дальнейшего изучения.

КЛЮЧЕВЫЕ СЛОВА: дети 0–17 лет, структура экстренной госпитализации, новая коронавирусная инфекция

INTRODUCTION

The COVID-19 pandemic and associated stringent anti-epidemic measures had a significant impact on all aspects of public life. Strict isolation, banning the movement of people and restricting the operation of businesses were forced and necessary measures to prevent the spread of infection. The COVID-19 pandemic was a serious test for the entire Russian health care system and made significant adjustments in the work of medical organisations [2, 8, 11]. All efforts were directed to the identification and treatment of COVID-19 patients. At the same time, the diseases that children face in normal life have not lost their relevance during the pandemic [5, 7, 10]. The limitation of outpatient appointments, planned hospitalisation, and social activity could affect the prevalence, diagnosis and treatment of various diseases; therefore, the assessment of the structure of emergency hospitalisation of children during

the pandemic in a metropolitan multidisciplinary children's hospital is a relevant topic for research.

AIM

To assess the impact of restrictions in routine and preventive medical care and social restriction for minors during the COVID-19 pandemic on the age and nosological structure of acute pathology in children who required emergency hospitalisation.

MATERIALS AND METHODS

The medical histories of children from 0 to 17 years old admitted to the emergency department of the St. Petersburg State Pediatric Medical University (SPbSPMU) clinic in emergency, delivered by ambulance and emergency brigades in 2019, 2020, 2021, and 2022 were studied retrospectively.

All cases of emergency hospitalisation were divided into groups: the main group — emergency admissions to hospital in 2020 (n=7107) and 2021 (n=6397) — during the period of anti-epidemic restrictions during the COVID-19 pandemic, the 1st control group in 2019 — the period before the COVID-19 pandemic (n=8255), the 2nd control group in 2022 — the period after the existing restrictions during the COVID-19 pandemic were lifted (n=6353). All children in the main and control groups were free of COVID-19 infection at the time of hospitalisation according to laboratory test results. Restrictions of varying duration included: periods of isolation of organised children and their transfer to distance learning, prohibition of cultural and social activities, prohibition of preventive examinations and routine vaccination of children, and prohibition of routine hospitalisation in hospitals.

All children hospitalised on an emergency were divided into subgroups by age: 0 to 3 years, 4 to 7 years, 8 to 11 years, and 12 to 17 years.

By nosology, all patients were also divided into groups according to ICD-10 classification: I Certain infectious and parasitic diseases. II Neoplasms. IV Diseases of the endocrine system and nutritional and metabolic disorders. IX Diseases of the circulatory system. X Diseases of respira-

tory system. XI Diseases of the digestive system. XII Diseases of the skin and subcutaneous tissue. XIII Diseases of the musculoskeletal system and connective tissue. XIV Diseases of the genitourinary system. XIX Injuries, poisoning and certain other consequences of external causes.

RESULTS

We analysed the cases of emergency hospitalisation of children in the emergency department of the SPbSMU clinic during the period of anti-epidemic restrictions during the COVID-19 pandemic in 2020 and 2021, as well as for the period before the pandemic in 2019 and after the cancellation of some existing restrictions during the pandemic in 2022 by the nosological structure (Table 1).

In 2020 and 2021, emergency hospitalisation was the most frequent requirement for children in the age group 12 to 17 years, at 31.6% and 30.0%, respectively, among all hospitalisations for the year. Whereas in 2019, children in the age group of 4 to 7 years were the most frequently requiring emergency hospitalisation, in 29.5% among all cases for the period, and in 2022, children in the age group of 12 to 17 years, in 31.0% among all cases for the period (Fig. 1).

Table 1

Comparative characteristic of the nosological structure of cases of emergency hospitalization in the clinic of St. Petersburg State Medical University of children under 17 for 2019, 2021, 2021, 2022

Таблица 1

Сравнительная характеристика нозологической структуры случаев экстренной госпитализации детей в возрасте до 17 лет за 2019, 2020, 2021, 2022 гг. в клинику СПбГПМУ

Нозологические единицы / Nosological units	Количество случаев, n / Number of cases, n			
	2019	2020	2021	2022
I. Инфекционные заболевания / Infectious diseases	1639	1336	1653	1274
II. Новообразования / Neoplastic diseases	81	83	80	19
IV. Болезни эндокринной системы / Endocrine diseases	238	336	167	209
IX. Болезни системы кровообращения / Diseases of the circulatory system	22	48	56	27
X. Болезни органов дыхания / Respiratory diseases	1921	1042	1104	1106
XI. Болезни органов пищеварения / Digestive diseases	1410	957	929	1362
XII. Болезни кожи и подкожной клетчатки / Diseases of the skin and subcutaneous tissue	477	426	326	245
XIII. Болезни костно-мышечной системы / Diseases of the musculoskeletal system	59	28	29	14
XIV. Болезни мочеполовой системы / Genitourinary diseases	196	179	139	169
XIX. Травмы / Injuries	2212	2692	1914	1928
Всего случаев, n / Total of cases, n	8255	7107	6397	6353

It was found that the number of hospitalised children in 2020 in the under 3 years age group had a minimum value of 12.2%, while in 2019 it was 18.1% of cases. In the group of 4 to 7 years, among all emergency hospitalisations, the number was 26.6% in 2020, 25.6% in 2021, whereas in 2019 it was 29.5% of cases ($p \leq 0.05$). In the 12 to 17 years old group, the number of hospitalisations in 2020 was 31.6% among all emergency hospitalisations in a year, in 2021 it was 30.1%, whereas in 2019 it was only 27.5% of cases ($p \leq 0.05$) (Fig. 1).

In 2020 and 2021, 7107 and 6397 children were admitted to the emergency department of the clinic respectively. The predominant pathologies among all those requiring hospitalisation during the period of social restrictions were: in 2020 — injuries — 37.6% of cases, in 2021 — 29.9% of cases. Infectious diseases in 2020 accounted for 18.9%, in 2021 — 25.8%. Respiratory diseases in 2020 accounted for 14.7%, in 2021 — 17.3% of cases (Fig. 2).

In 2019, 8255 children were hospitalised as emergencies in the clinic of SPbSMU. The predominant reason for emergency hospitalisation in 2019 was: injuries — in 26.8%, respiratory diseases — in 23.3%, infectious diseases — in 19.9% of cases (Table 1, Fig. 2).

In 2022, 6353 patients were hospitalised as emergencies in the clinic of St. Petersburg State Medical University. The predominant reason for emergency hospitalisation was trauma — in 30.3% of cases, digestive diseases — in 21.4%, infectious diseases (excluding coronavirus infection) — in 20.0% of cases (Table 1, Fig. 2).

The number of hospitalisations of children with injuries in 2021 was 29.9% of cases, compared to 26.8% of all hospitalisations in 2019 ($p \leq 0.05$).

Infectious diseases accounted for 14.7% of all emergency hospitalisations in 2020, excluding coronavirus infection, in 2020 and 25.8% of all emergency hospitalisations in 2021, whereas infectious diseases accounted for 19.9% in 2019 and 20.0% in 2022 ($p \leq 0.05$). In 2019, respiratory diseases led to emergency hospitalisation significantly more often in 23.3% ($p \leq 0.05$) compared to 2020 — 18.9% and 2021 — in 17.3% of cases, respectively.

Analysis of the age groups of children admitted to emergency hospitalisation with trauma in 2020 and 2021 was dominated by children aged 12 to 17 years, $n=1015$ and $n=767$ respectively.

In this age group, fractures were the most common injury with 62.3% of cases in 2020 and 55.7% of cases in 2021 (Fig. 3).

In the 12 to 17 year old group, injuries were the cause of hospitalisation in 38.0% and 40.4% of cases in 2020 and 2021 respectively, compared to 37.1% in 2019 ($p \leq 0.05$) (Fig. 3).

Among hospital admissions with injuries in 2019 ($n=2212$), fractures were more common (43.1%) ($n=953$), contusions were less common (18.3%) ($n=404$), and wounds were 18.2% ($n=403$). The highest number of injuries was observed in the age group from 12 to 17 years — in 37.1% of cases (Fig. 3).

When comparing the cases of injuries in the structure of emergency hospitalisation in 2020 and 2021, their significant increase in the group of children from 12 to 17 years old was revealed — in 43.8 and 40.4% of cases, respectively, compared to 2019, when their number was 37.1% of all emergency cases ($p \leq 0.05$).

Among hospitalised patients with injuries in 2022 ($n=1928$), fractures predominated in 49.2% ($n=948$) of cases, wounds in 20.0% ($n=385$), and contusions in 15.7% ($n=302$) of cases. Injuries were more frequent in the age group of children from 12 to 17 years old — 42.4% of cases among all those hospitalised with injuries.

A comparative characterisation of the number of cases of digestive diseases (Fig. 4) as a cause of emergency hospitalisation in 2019, 2020, 2021, 2022 revealed a significant increase in the number of hospitalisations in 2022 compared to the pre-pandemic period and during the period of anti-epidemic restrictions in the pandemic. It was found that the relative number of digestive diseases that were the cause of emergency hospitalisation increased in 2022 and accounted for 21.4% of all emergency hospitalisations in this time period, compared to only 13.4% in 2020, 14.5% in 2021, and 17.0% of cases in 2019 ($p \leq 0.05$) (Fig. 4).

Analysis by age group showed that in 2020 and 2021, a decrease in emergency hospitalisations of children with digestive diseases in the age group under 3 years was found in 2020 and 2021 — 7.3% and 8.4%, respectively, and 29.3% in 2019 ($p \leq 0.05$), of all hospitalisations for the year. The same trend in the decrease in the relative number of children with GI diseases was observed in the age group of 4 to 7 years — 21.8% in 2020 and 21.9% in 2021, compared to 29.3% of cases in 2019 ($p \leq 0.05$). In contrast, in the group of chil-

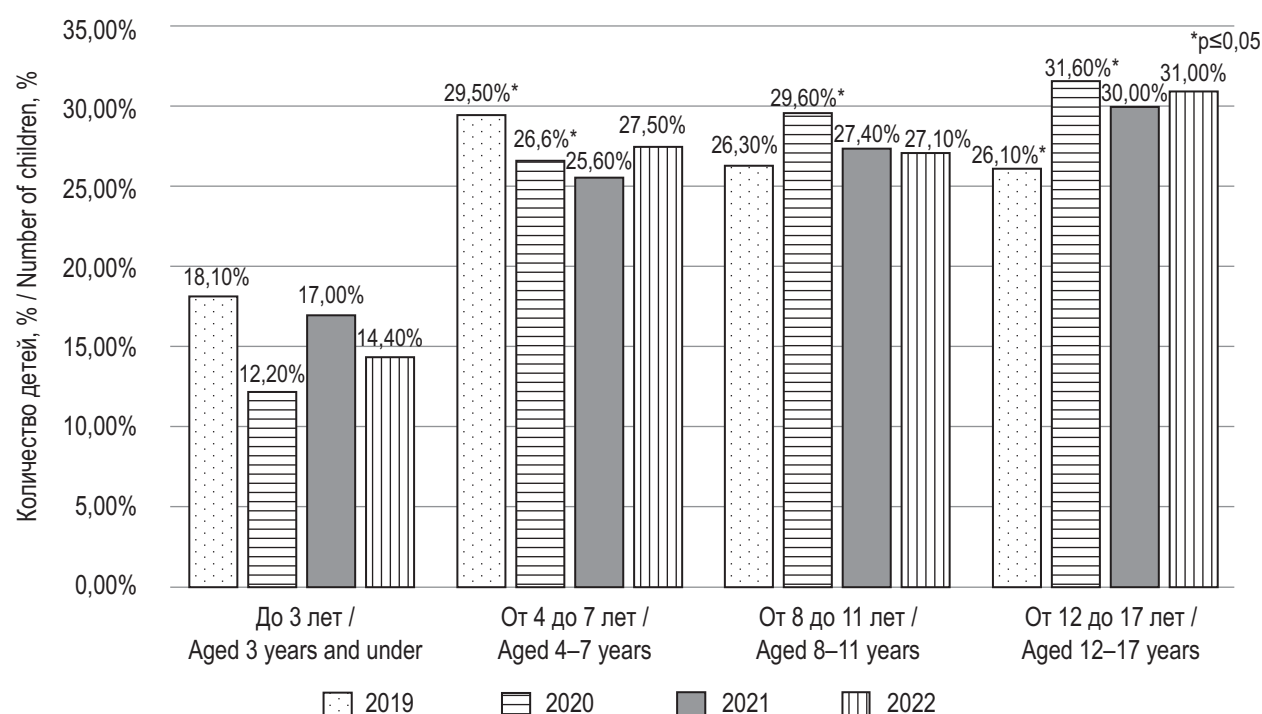


Fig. 1. Age structure of cases of emergency hospitalization in the clinic of St. Petersburg State Pediatric Medical University for 2019–2022

Рис. 1. Возрастная структура случаев экстренной госпитализации в клинику СПбГПМУ за 2019–2022 гг.

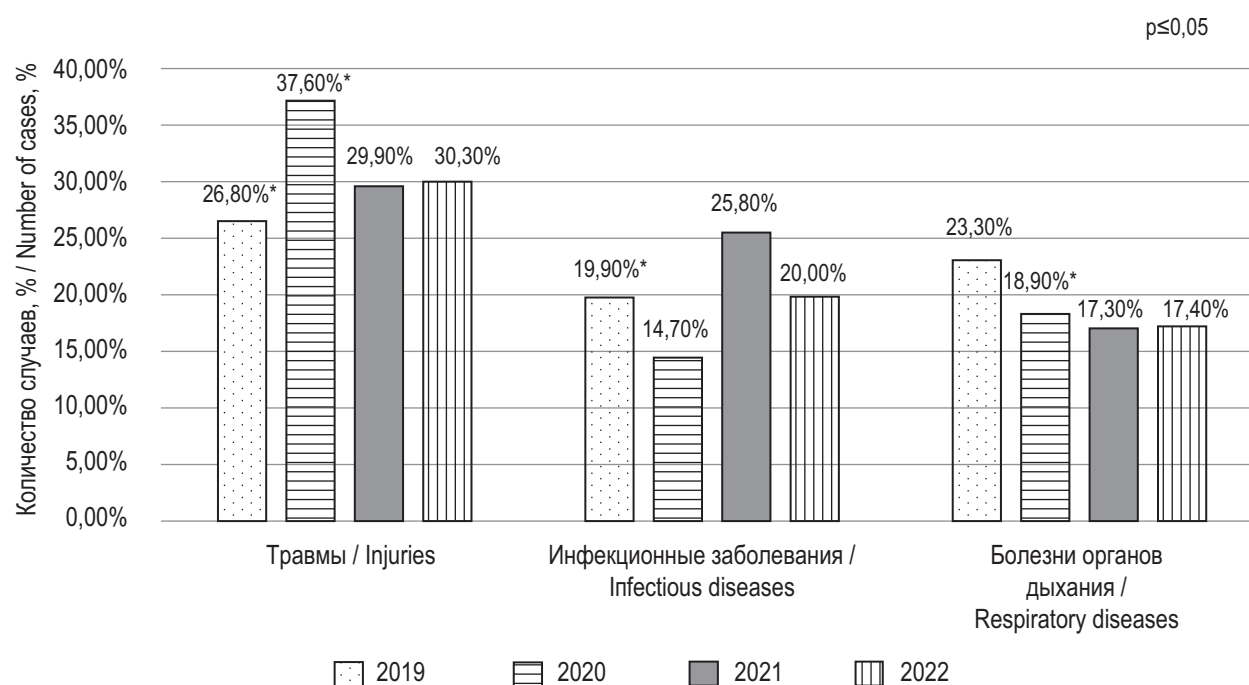


Fig. 2. The most common causes of emergency hospitalization of children during the study period (2019–2022)

Рис. 2. Наиболее частые причины экстренной госпитализации детей за исследуемый период (2019–2022)

dren 8 to 11 years old, an increase in the relative number of children hospitalised with diseases of the digestive organs was found in 2020 and 2021 compared with 2019: in 2020 — 39.8%, in 2021 — 39.3% and in 2019 — 36.5% of cases, while in 2022 this figure was 37.7% of cases

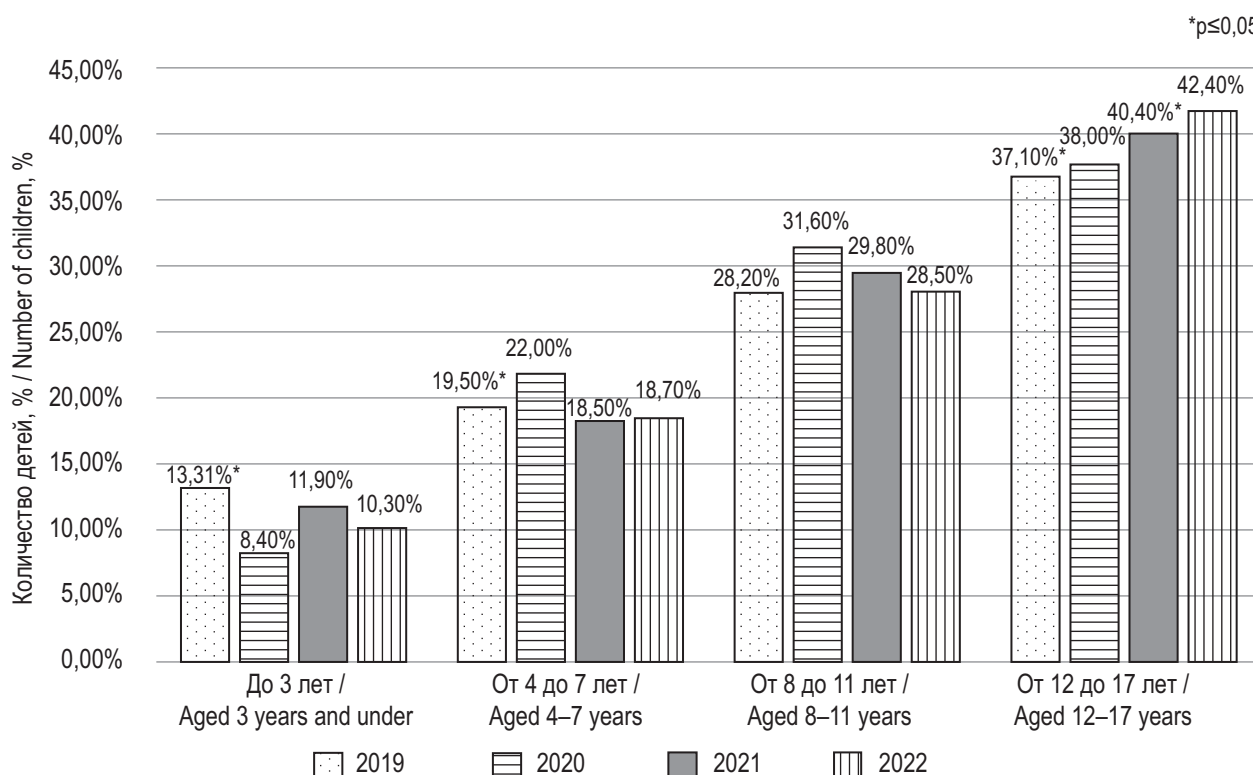


Fig. 3. Injuries as causes of emergency hospitalization in children during the study period (2019–2022)

Рис. 3. Травмы как причины экстренной госпитализации у детей за исследуемый период (2019–2022)

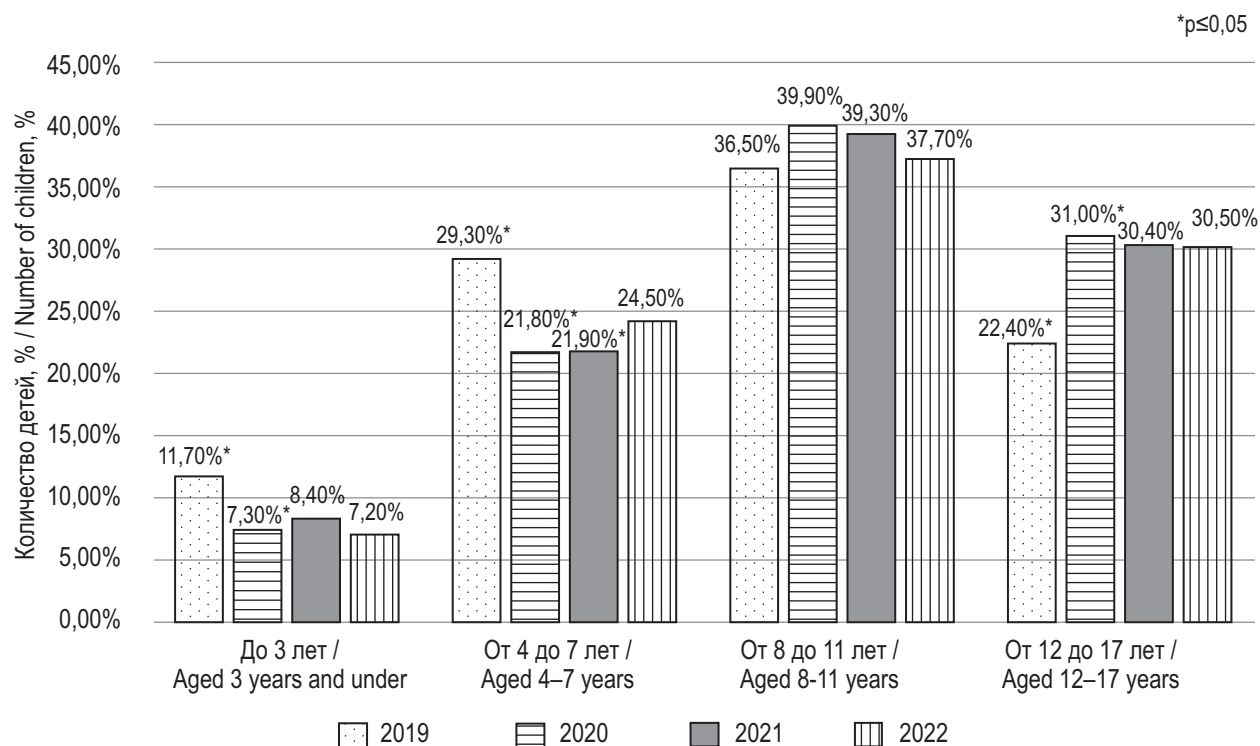


Fig. 4. Dynamics of the number of cases of emergency hospitalization caused by digestive diseases during the study periods (2019–2022)

Рис. 4. Динамика количества случаев экстренной госпитализации болезней органов пищеварения за исследуемые периоды (2019–2022)

($p > 0.05$). An increase in the number of hospitalisations with digestive diseases was found in the group of children between 12 and 17 years of age: in 2020 — 31.0% of cases, in 2021 — 30.4% of cases, and in 2022 — 30.5% of cases compared to 2019 — 22.4% of cases ($p \leq 0.05$). Among the total number of emergency hospitalisations with digestive diseases, children with bowel diseases were 40.1% in 2020 and 38.3% in 2021, up significantly from 31.0% in 2022 ($p \leq 0.05$). The number of cases of acute appendicitis had a minimum value of 16.0% in 2019, increasing to 30.2% in 2020, 27.8% in 2021 and 48.3% in 2022 ($p \leq 0.05$) (Fig. 4).

An analysis of the age composition of cases of emergency hospitalisation with infectious diseases for 2019–2022 revealed an increase in the incidence in the group of children from 12 to 17 years of age: in 2020 — 22.7% and in 2021 — 22.5%, compared to 2019 (16.2%) and 2022 (16.7%), $p \leq 0.05$. At the same time, in the age group of children between 4 and 7 years, there was a decrease in the number of emergency hospitalisations for infectious pathology compared to the number of cases in 2019 — 38.1% and in 2022 — 40.9% of cases ($p \leq 0.05$) (Fig. 5).

Infectious diseases as a cause of emergency hospitalisation in 2022 ($n=1274$) were represented by: acute respiratory viral infections (ARVI) in 41.3% ($n=527$) of cases, infectious mononucleosis in 40.4% ($n=515$) of cases, and acute intestinal infections in 11.3% ($n=144$) of cases.

Among infectious pathologies (excluding coronavirus infection) in children hospitalised in 2020 ($n=1336$) and 2021 ($n=1653$) as emergencies, the most frequent were: acute respiratory viral infections in 53.3% and 55.5% of cases respectively, infectious mononucleosis in 31.1% in 2020 and 27.1% in 2021, and acute intestinal infections in 15.5% in 2020 and 13.2% in 2021.

In the age group of children from 4 to 7 years old, the incidence of infectious pathology was 37.2% in 2020, decreased to 32.7% of all emergency hospitalisations in 2021, while in 2019 it was 38.1% of cases ($p \leq 0.05$).

In the group of children 12 to 17 years old infectious pathology led to emergency hospitalisation in 22.7% of cases in 2020, 22.5% of cases in 2021, compared to 16.2% of cases in 2019 ($p \leq 0.05$).

Among respiratory diseases, acute tonsillopharyngitis was diagnosed more frequently in emergency hospitalisations in 2020 and 2021, in

67.3% ($n=702$) and 79.8% ($n=881$) of cases respectively, acute out-of-hospital pneumonia was much less frequent, in 2020 9.9% ($n=104$) and 6.8% ($n=75$) of cases in 2021, and bronchitis — in 2020. 8.2% ($n=86$), and 6.0% ($n=67$) of cases in 2021. Acute tonsillopharyngitis was predominant in the age group of 4 to 7 years in 2020 in 74.1% ($n=255$) of cases, in 2021 — in 82.7% ($n=304$).

The causes of an emergency hospitalisation in children with respiratory diseases in 2019 ($n=1921$) were: acute tonsillopharyngitis in 67.6% ($n=1299$), acute out-of-hospital pneumonia in 10.7% ($n=206$), bronchial asthma in 5.7% ($n=109$) of cases. Acute tonsillopharyngitis was predominant in the age group of 4 to 7 years in 73.0% ($n=479$) and in the group of children under 3 years in 74.4% ($n=384$) of cases. Acute out-of-hospital pneumonia prevailed in the age group of children from 4 to 7 years in 9.5% ($n=64$) and in the group of children under 3 years in 10.3% ($n=53$) of cases.

Among infectious pathology in children hospitalised in 2019 ($n=1639$) as an emergency, the most frequent causes were: infectious mononucleosis — in 38.6% ($n=633$), acute respiratory viral infections — in 36.4% ($n=596$), acute intestinal infections — in 20.8% ($n=341$) of cases. Infectious pathology requiring emergency hospitalisation was most frequently detected in the group of children aged 4 to 7 years — in 38.1% ($n=625$) and in the group aged 8 to 11 years — in 23.7% ($n=388$) of cases (Fig. 5).

When analysing the dynamics of the number of cases of emergency hospitalisation for respiratory diseases in children during the COVID-19 pandemic before the removal of anti-epidemic restrictions, a significant increase in the number of cases in 2021 was found in the group of children under 3 years of age — 29.9% of cases, whereas in 2020 they were 24.0%, in 2019 — 26.8%, and in 2022 — 25.5% of cases ($p \leq 0.05$).

In the group of children 4 to 7 years and 8 to 11 years, the number of emergency hospitalisations for respiratory diseases in 2021 had a slight decrease of 33.3% and 15.3%, respectively, compared to 34.1% and 18.2% of cases, respectively, before the pandemic in 2019 ($p > 0.05$).

DISCUSSION

The most common causes of emergency hospitalisation in 2020 and 2021 were: injuries

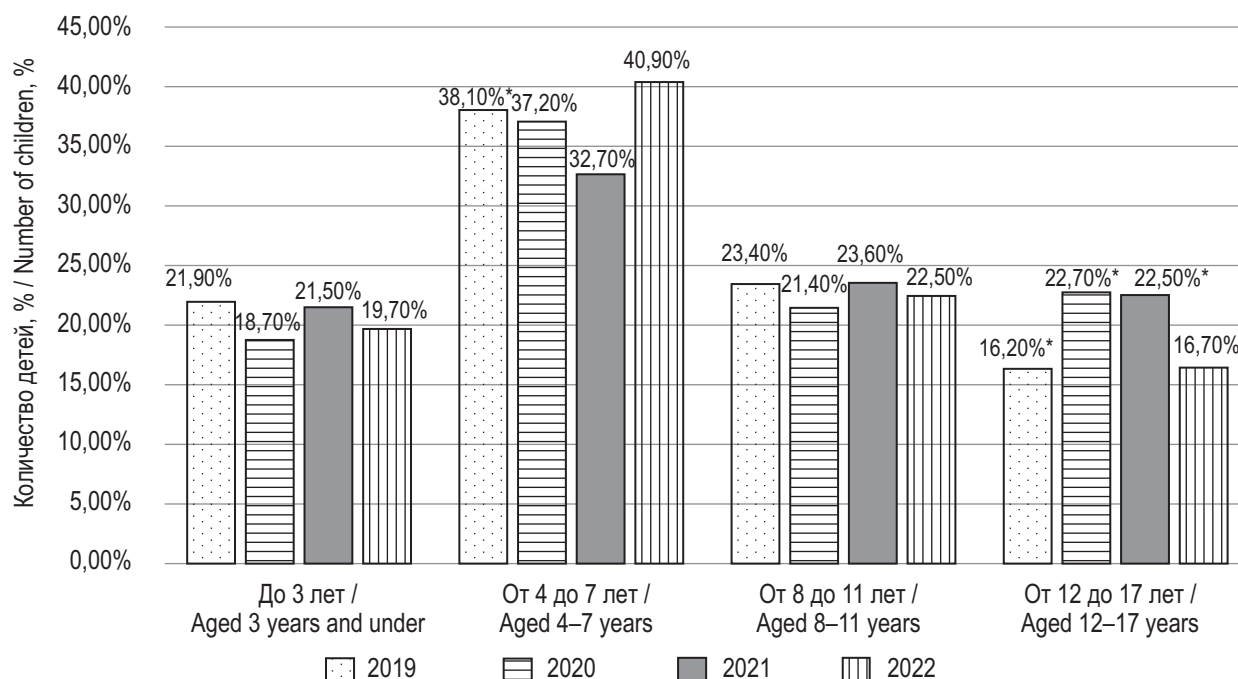
* $p \leq 0,05$ 

Fig. 5. Dynamics of the number of cases of emergency hospitalization caused by infectious diseases during the study periods (2019–2022)

Рис. 5. Динамика количества случаев экстренной госпитализации инфекционных заболеваний за исследуемые периоды (2019–2022)

(34.1% of cases), infectious diseases (22.1%) and respiratory diseases (15.9% of cases). And while the number of children with injuries and infectious diseases was significantly higher during the pandemic period, the number of children with respiratory diseases was significantly lower compared to 2019.

During the COVID-19 pandemic restriction period in 2020 and 2021, children aged 12 to 17 years were the most likely to require emergency hospitalisation. It was this age period that accounted for the highest number of injuries as a cause of emergency hospitalisation. The proportion of adolescents with injuries was 39.8% of all emergency hospitalisations for 2020–2021, compared to 37.1% in 2019. According to the international Health behaviour in school-aged children (HBSC) study, the highest rate of injuries occurs during adolescence [6]. It is possible that the increase in injury rates among adolescents during the pandemic is related to the impact of restrictive measures on access to public places and increased physical activity in environments not suited for this type of activity [9].

The structure of hospitalisations due to infectious pathology (except for coronavirus infection)

during the period of anti-epidemic restrictions during the pandemic also had age-specific characteristics. In the group of children under 3 years old, as well as from 4 to 7 years old, the number of cases of infectious diseases as a cause of emergency hospitalisation significantly decreased, while in the group of children from 12 to 17 years old this indicator in 2020 was significantly higher compared to 2019 and 2022. The analysis of literature data showed that in St. Petersburg, as well as worldwide, during the COVID-19 pandemic, the incidence of seasonal acute respiratory and intestinal infections in children decreased against the background of anti-epidemic measures [1, 12–14], changes in the age composition were noted only in acute respiratory infections — most of the sick belonged to the group of children 7–14 years old [12]. In our opinion, the increase in the number of hospital admissions with infectious diseases among adolescents is due to active behaviour and increased social activity of children of this age during the period of relaxation of restrictive measures in 2020 and 2021. In addition, adolescents do not always present active complaints and parents may underestimate their condition, which contributes to the higher inci-

dence of deterioration requiring hospitalisation in this group of children.

The decrease in the number of hospitalisations of children with infectious diseases in the age group up to 3 years and in the group from 4 to 7 years in 2020 and 2021 is obviously associated with restrictive measures on the attendance of pre-school institutions and public places. It should be noted that the proportion of all hospitalised children of this age in 2020 and 2021 was significantly lower compared to 2019 and 2022.

During the COVID-19 pandemic, during the period of anti-epidemic restrictions, a significant increase in the number of respiratory diseases as causes that required emergency hospitalisation was found in children under 3 years of age — in 28.4% of all hospitalisations for the year, while in 2019 the number of emergency hospitalisations with respiratory diseases was 26.9% and in 2022 — 25.5% of cases.

The increase in the number of hospitalisations in 2020 and 2021 among children under 3 years of age is mainly due to the incidence of tonsillopharyngitis and acute out-of-hospital pneumonia among all hospitalised patients with respiratory diseases in this age group. This trend is probably due to the reduced functional capacity of anti-infective immunity in young children due to immaturity of lymphoid tissue of the pharyngeal ring and reduced protective immune function of the tracheobronchial mucosa in conditions of increased viral load [3, 4].

Of particular interest are the data on the detected increase in digestive diseases manifested by urgent conditions requiring emergency hospitalisation. In 2022, the number of hospitalisations of patients with this pathology increased, accounting for 21.4% of all emergency hospitalisations compared to 2021 and 2019, the increase being due to an increase in the number of cases of acute appendicitis.

CONCLUSION

1. The most vulnerable age groups requiring more frequent hospitalisation due to the development of urgent conditions were adolescents from 12 to 17 years of age due to the increase in infectious diseases and injuries caused by increased social activity in this age group.

2. The COVID-19 pandemic influenced the growth of respiratory diseases in the age group of children up to 3 years old, which is caused by

anatomo-physiological peculiarities — immaturity of the immune system with low protective properties, as well as possibly related to the reduction of measures of non-specific (limitation of walks) and specific prophylaxis (vaccination) of respiratory infections, which once again proves the need for strict compliance with the National Calendar of preventive vaccinations, strict adherence to age-specific movement regimes, as well as the role of unconditional prevention of respiratory infections.

3. An increase in the number of cases of acute appendicitis in the period after the COVID-19 pandemic was revealed, which suggests the possible influence of viral infection with the subsequent development of inflammatory processes in the appendix and requires further research on this fact.

4. In the context of anti-epidemic measures in the pandemic of coronavirus infection, a decrease in the incidence of injuries and acute illnesses was expected. However, the main causes of emergency hospitalisation in the group of adolescents 12–17 years old during the pandemic were injuries and infectious diseases, which is probably due to children's behaviour and violation of self-isolation and lack of organised classes in educational institutions of secondary and additional education. Doctors and psychologists of the medical and social service of children's polyclinic departments and the department of medical care for children and adolescents in educational institutions should pay attention to health education and psycho-pedagogical work with parents and adolescents to involve schoolchildren in groups of additional education, including for the prevention of adolescent traumatism.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

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

Funding source. This study was not supported by any external sources of funding.

Consent for publication. Written consent was obtained from the patient for publication of

relevant medical information within the manuscript.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Информированное согласие на публикацию. Авторы получили письменное согласие пациентов на публикацию медицинских данных.

REFERENCES

1. Britkova T.A., Isaeva P.V., Nizamova G.F. Vliyanie rezhima samoizolyatsii na rasprostranennost' infektsionnykh zabolovaniy u detej, prozhivayushhih v gorodskoj i sel'skoj mestnosti. [The influence of the self-isolation regime on the prevalence of infectious diseases in children living in urban and rural areas]. *Detskije infektsii*. 2021; 20(3): 58–60. DOI: 10.22627/2072-8107-2021-20-3-58-60. (in Russian).
2. Vliyanie koronavirusa COVID-19 na situatsiyu v Rossijskom zdavookhraneni (analiticheskiy doklad). Red. V.I. Starodubov. [The impact of the COVID-19 coronavirus on the situation in Russian healthcare (analytical report)]. Available at: http://www.noav.ru/wpcontent/uploads/2020/05/doklad_cniioiz_po_COVID-19-2020_04_26.pdf (accessed: 05.02.2020). (in Russian).
3. Gayduk I.M., Bairova S.V., Polishchuk T.V. i dr. Organizatsiya mediko-social'noj pomoshhi podrostkam v sovremennykh usloviyakh. [Organization of medical and social assistance to adolescents in modern conditions]. *Medicine and healthcare organization*. 2021; 6(3): 84–95. (in Russian).
4. Gigiena detej shkol'nogo vozrasta. Pod red Puzyreva V.G., Revnovoy M.O. Uchebnoe posobie. [Hygiene of school-age children]. Sankt-Peterburg: SPbGPMU Publ.; 2021. (in Russian).
5. Emel'yanova A.V., Bairova S.V. Analiz struktury sluchaev ekstremnoy gositalizatsii u detej s travmaticheskimi povrezhdeniyami. [Analysis of the structure of emergency hospitalization cases in children with traumatic injuries]. *Children's medicine of the North-West*. 2023; 11(4): 65–71. (in Russian).
6. Issledovanie "Povedenie detej shkol'nogo vozrasta v ot-noshenii zdorov'ya" (HBSC): mezhdunarodnyy otchet po rezul'tatam issledovaniya 2013/2014 gg. [Research "Health behavior of school-age children" (HBSC): International report on the results of the 2013/2014 study]. Kopenhagen: Evropeiskii Regional'nyy Ofis; 2016. Available at: http://www.euro.who.int/_data/assets/pdf_file/0016/331711/HSBC-No.7-Growing-upunequal-Full-Report-ru.pdf?ua=1 (accessed: 05.02.2020). (in Russian).
7. Kapitonov V.F., Shurova O.A. Zabolevaemost' detej razlichnykh vozrastnykh grupp v doepidemicheskij COVID-19. [Morbidity of children of various age groups in pre-epidemic 2019 and the period of the COVID-19 coronavirus infection pandemic]. *Sotsial'nye aspekty zdorov'ya naseleniya*. 2021; 67(4): 4. Available at: <http://vestnik.mednet.ru/content/view/1283/30/lang.ru/> (accessed: 05.02.2020). (in Russian).
8. Kuchma V.R., Rapoport I.K., Sukhareva L.M. i dr. Zdorov'e detej i podrostkov v shkol'nom ontogeneze kak osnova sovershenstvovaniya sistemy medicinskogo obespecheniya i sanitarno-epidemiologicheskogo blagopoluchiya obuchayushchikhsya. [The health of children and adolescents in school ontogenesis as a basis for improving the system of medical support and sanitary-epidemiological well-being of students]. *Zdravookhranenie Rossijskoj Federatsii*. 2021; 65(4): 325–33. DOI: 10.47470/0044-197X-2021-65-4-325-333. (in Russian).
9. Levchenko O.V., Gerasimov A.N., Kuchma V.R. Vliyanie sotsial'no-ekonomicheskikh faktorov na zabollevaemost' detej i podrostkov sotsial'no znachimymi i osnovnymi klassami boleznej. [The influence of socioeconomic factors on the morbidity of children and adolescents with socially significant and major classes of diseases]. *Zdorov'e naseleniya i sreda obitaniya*. 2018; 8(305): 21–5. (in Russian).
10. Orel V.I., Zavrzhnov A.A., Emel'yanov O.V. i dr. Osobennosti organizatsii khirurgicheskoy pomoshhi v mnogoprofil'nom stacionare, pereprofilirovannom dlya okazaniya pomoshhi bol'ny'm COVID-19: struktura vkhodyashhego potoka i metodologiya khirurgicheskoy raboty v usloviyakh pandemii. [Features of the organization of surgical care in a multidisciplinary hospital repurposed to provide care to COVID-19 patients: the structure of the incoming flow and the methodology of surgical work in a pandemic]. *Medicine and healthcare organization*. 2022; 7(4): 40–56. DOI: 10.56871/MHCO.2022.91.85.005. (in Russian).
11. Rumyantseva E.E. Pandemiya COVID-19 v kontekste operativnoy zashchity zdorov'ya i zhizni naseleniya.

- [The COVID-19 pandemic in the context of operational protection of public health and life]. *Zdravookhranenie Rossijskoj Federaczii*. 2021; 65(2): 89–95. (in Russian).
12. Chernova T.M., Ivanov D.O., Pavlova E.B. i dr. Vliyanie pandemii COVID-19 na infekcionnuyu zabolevaemost' u detei v usloviyakh megalopolisa. [The impact of the COVID-19 pandemic on infectious morbidity in children in a megalopolis]. *Detskie infekczii*. 2023; 22(2): 5–11. DOI: 10.22627/2072-8107-2023-22-2-5-11. (in Russian).
13. Bitar R.R., Alattas B., Azaz A. et al. Gastrointestinal manifestations in children with COVID-19 infection: Retrospective tertiary center experience. *Front Pediatr*. 2022; 10: 925520. DOI: 10.3389/fped.2022.925520.
14. Tanislav Ch., Kostev K. Fewer non-COVID-19 respiratory tract infections and gastrointestinal infections during the COVID-19 pandemic. *J Med Virol*. 2022; 94(1): 298–302. DOI: 10.1002/jmv.27321.
2016. Доступен по: http://www.euro.who.int/__data/assets/pdf_file/0016/331711/HSBC-No.7-Growing-upunequal-Full-Report-ru.pdf?ua=1 (дата обращения: 05.02.2020).
7. Капитонов В.Ф., Шурова О.А. Заболеваемость детей различных возрастных групп в доэпидемический 2019 г. и период пандемии коронавирусной инфекции COVID-19. Социальные аспекты здоровья населения. 2021; 67(4): 4. Доступен по: <http://vestnik.mednet.ru/content/view/1283/30/lang/ru/> (дата обращения: 05.02.2020).
8. Кучма В.Р., Рапопорт И.К., Сухарева Л.М. 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. DOI: 10.47470/0044-197X-2021-65-4-325-333.
9. Левченко О.В., Герасимов А.Н., Кучма В.Р. Влияние социально-экономических факторов на заболеваемость детей и подростков социально значимыми и основными классами болезней. *Здоровье населения и среда обитания*. 2018; 8(305): 21–5.
10. Орел В.И., Завражнов А.А., Емельянов О.В. и др. Особенности организации хирургической помощи в многопрофильном стационаре, перепрофилированном для оказания помощи больным COVID-19: структура входящего потока и методология хирургической работы в условиях пандемии. *Медицина и организация здравоохранения*. 2022; 7(4): 40–56. DOI: 10.56871/МНСО.2022.91.85.005.
11. Румянцева Е.Е. Пандемия COVID-19 в контексте оперативной защиты здоровья и жизни населения. *Здравоохранение Российской Федерации*. 2021; 65(2): 89–95.
12. Чернова Т.М., Иванов Д.О., Павлова Е.Б. и др. Влияние пандемии COVID-19 на инфекционную заболеваемость у детей в условиях мегаполиса. *Детские инфекции*. 2023; 22(2): 5–11. DOI: 10.22627/2072-8107-2023-22-2-5-11.
13. Bitar R.R., Alattas B., Azaz A. et al. Gastrointestinal manifestations in children with COVID-19 infection: Retrospective tertiary center experience. *Front Pediatr*. 2022; 10: 925520. DOI: 10.3389/fped.2022.925520.
14. Tanislav Ch., Kostev K. Fewer non-COVID-19 respiratory tract infections and gastrointestinal infections during the COVID-19 pandemic. *J Med Virol*. 2022; 94(1): 298–302. DOI: 10.1002/jmv.27321.

ЛИТЕРАТУРА

1. Бриткова Т.А., Исаева П.В., Низамова Г.Ф. Влияние режима самоизоляции на распространенность инфекционных заболеваний у детей, проживающих в городской и сельской местности. *Детские инфекции*. 2021; 20(3): 58–60. DOI: 10.22627/2072-8107-2021-20-3-58-60.
2. Влияние коронавируса COVID-19 на ситуацию в Российском здравоохранении (аналитический доклад). Ред. В.И. Стародубов. Доступен по: http://www.noav.ru/wpcontent/uploads/2020/05/doklad_cniiioiz_po_COVID-19-2020_04_26.pdf (дата обращения: 05.02.2020)
3. Гайдук И.М., Баирова С.В., Полищук Т.В., и др. Организация медико-социальной помощи подросткам в современных условиях. *Медицина и организация здравоохранения*. 2021; 6(3): 84–95.
4. Гигиена детей школьного возраста. Под ред. Пузырева В.Г., Ревновой М.О. Учебное пособие. СПб: СПбГПМУ; 2021.
5. Емельянова А.В., Баирова С.В. Анализ структуры случаев экстренной госпитализации у детей с травматическими повреждениями. *Children's medicine of the North-West*. 2023; 11(4): 65–71.
6. Исследование «Поведение детей школьного возраста в отношении здоровья» (HBSC): международный отчет по результатам исследования 2013/2014 гг. Копенгаген: Европейский Региональный Офис;