

## PEDIATRICS / ПЕДІАТРІЯ

UDC: 616.98:578.834COVID-19]-036.8-071-053.5/.6  
[https://doi.org/10.32345/USMYJ.4\(142\).2023.112-120](https://doi.org/10.32345/USMYJ.4(142).2023.112-120)

Received: June 21, 2023

Accepted: October 24, 2023

## Post-COVID-19 and other changes in the health status of children and adolescents associated with the transmission of COVID-19

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**Abstract:** determining the state of physical and psycho-emotional health of children and adolescents who have suffered from COVID-19 is an urgent diagnostic problem, the solution of which will provide an opportunity for early detection of long-term and distant consequences of the coronavirus disease. The aim is to analyze the frequency, duration, and clinical manifestations of post-COVID-19 in children and adolescents, as well as other changes in health status associated with having experienced COVID-19. Materials and methods: 155 children aged 6 to 18 took part in the study. Among them, 120 children with a confirmed diagnosis of COVID-19 in the anamnesis and a period after COVID-19 of more than 12 weeks (the main group) and 35 somatically healthy children of the same age who did not suffer from COVID-19 and formed the control group. The distribution of children in the main group took place taking into account the severity of COVID-19. Children who contracted mild COVID-19 formed the first group (n=49). Group II included children who suffered from COVID-19 of moderate severity (n=40). Group III included children who contracted COVID-19 with a severe course (n=31). General clinical (analysis of anamnesis data, objective examination, assessment of complaints and identification of post-covid symptoms), survey (assessment of the general state of health of children before and after COVID-19, assessment of the level of fatigue), statistical research methods (MedStat statistical packages, EZR). Results: post-COVID-19 was detected in 46 children (38.3%) of the main group. Among the children of the I group, the post-COVID-19 condition was determined in 10 children (20.4%), in the II group – in 14 (35.0%) children, and the III group – in 22 (71.0%) children. The median duration of the post-COVID-19 in the children of the I group was 3.5 months [3; 4], in the II group – 5 months, in the III group – 7 months ( $p < 0.05$  between groups when performing multiple comparisons according to Dunn's test). The median duration of post-COVID-19 symptoms in children of the main group was 5 months. The average value ( $\bar{X}$ ) and standard deviation ( $\pm SD$ ) of the number of symptoms of post-COVID-19 in children of the main group were  $5.17 \pm 2.7$  symptoms: in children of the I group –  $1.70 \pm 0.82$  symptoms, in the II group –  $4.29 \pm 1.38$  symptoms, in the III group –  $7.32 \pm 1.76$  symptoms. The most frequently recorded post-COVID-19 symptoms were anxiety (15; 95% CI 9.1-22.0), increased fatigue (13.3; 95% CI 7.8-20.0), sleep disturbances (12.5; 95% CI 7.2-19.1), depressive disorders (11.7; 95% CI 6.5-18.1), impaired concentration of attention (10.8; 95% CI 5.9-17.1). Analysis of survey data on changes in physical and psychological/emotional health status revealed a worsening of outcomes after COVID-19 compared to the period before coronavirus disease. The median score on the Chalder fatigue scale in the children of the main group was

12, in the control group – 7 ( $p < 0.001$  by the Wilcoxon  $W$ -test for two independent samples). Conclusions: Acute COVID-19 harms the health of children and adolescents, which can be manifested by the development of a post-COVID-19. The risk of developing post-COVID-19 depends on the degree of severity of the transferred coronavirus disease. The post-COVID-19 condition was detected in 71% of children who suffered from severe COVID-19, which is significantly higher compared to children who suffered from COVID-19 of mild and moderate severity. Children with COVID-19 scored worse on the Chalder Fatigue Scale than healthy children. There was also a tendency to worsen the assessment of the health status of children in a comparative analysis of the physical and psychological/emotional components before and after COVID-19.

**Keywords:** [Child](#), [COVID-19](#), [Health Status](#), [Post-Acute COVID-19 Syndrome](#), [SARS-Cov-2](#)

### Introduction

It is known that the clinical picture of coronavirus disease in children is similar to adults, but is characterized by less pronounced symptoms and a small number of complications (Koloskova et al., 2021). The majority of authors agree that COVID-19 is a mild disease for children and adolescents while noting that the impact of COVID-19 on physical, and psycho-emotional health and quality of life are important and understudied aspects (Zimmerman et al., 2021; Gupta et al., 2022; Pellegrino et al., 2022).

There are three possible mechanisms for the termination of an acute episode of COVID-19, namely: complete recovery, the development of acute post-infectious complications such as multisystem inflammatory syndrome (MIS-C), neuro-psychiatric diseases, and the development of long-term COVID-19, or the so-called post-COVID-19 (Buonsenso et al., 2022). The consensus definition of post-COVID-19 in children and youth, proposed by the WHO, reads as follows: «is a post-COVID-19 condition occurring in young people with a confirmed history of SARS-CoV-2 infection, with at least one persistent physical symptom during a minimum of 12 weeks after initial testing that cannot be explained by an alternative diagnosis. Symptoms affect daily functioning, may develop after probable recovery from COVID-19, and change or recur over time» (Stephenson et al., 2022).

The pathogenesis of the development of the post-COVID state has not yet been fully understood (Morello et al., 2023). The main hypotheses of post-COVID-19 development and its long-term consequences are directly related to the features of the pathogenesis of the acute phase

of COVID-19. Also, other factors are assumed to play a key role in the pathogenesis of the post-covid state, namely: latent persistence of SARS-CoV-2 in body tissues, possible reactivation of herpes viruses, development of an imbalance of the immune response, intestinal dysbacteriosis, subcellular abnormalities in metabolic pathways (Morello et al., 2023; Marushko and Dmytryshyn, 2023).

The risk of developing a post-covid condition depends on many factors, namely, the severity of the transmitted COVID-19, the number of clinical manifestations during the acute episode of the coronavirus disease, the presence of concomitant diseases, and the premorbid background (Funk et al., 2022).

Clinical manifestations of post-COVID-19 are different and resemble manifestations of asthenic syndrome of other etiologies. Post-Covid-19 symptoms may include excessive weakness, anxiety, depressive disorders, headache, dizziness, incoordination, and others. In total, there are more than 70 symptoms associated with post-COVID-19 that can have a negative impact on the health of children and adolescents who have experienced the coronavirus disease. An urgent issue is the diagnosis and monitoring of such pathological changes (Morello et al., 2023).

The difficulties in diagnosing post-COVID-19 are related to the fact that no validated laboratory test in the clinical setting can definitively distinguish post-COVID-19 from conditions of other etiologies. At the same time, it is worth noting that changes in the state of health associated with COVID-19 can develop not only in children with post-covid manifestations. Given that the majority of post-COVID-19

symptoms are nonspecific and widespread in the pediatric population, most children may not even associate these symptoms with having experienced COVID-19 or may not notice them at all (Zimmerman et al., 2021). That is why determining the state of physical and psycho-emotional health of children and adolescents who have suffered from COVID-19 is, therefore, an urgent diagnostic problem, intending to study the biopsychosocial effect of COVID-19 and early detection of long-term and distant consequences of the coronavirus disease, as within the post-COVID-19 state. 19 and beyond (Sykes et al., 2021).

### **Aim**

The aim of the research is to analyze the frequency, duration, and clinical manifestations of post-COVID-19 in children and adolescents, as well as other changes in health status associated with having experienced COVID-19.

### **Materials and Methods**

155 children aged 6 to 18 took part in the study. Among them, 120 children with a confirmed diagnosis of COVID-19 in the anamnesis and a period after COVID-19 of more than 12 weeks (main group) and 35 somatically healthy children of the same age who did not suffer from COVID-19 and formed the control group. Also, the distribution of children in the main group took place taking into account the severity of the course of the coronavirus disease (following Order No. 762 dated 02.04.2020 «On the approval of the protocol «Providing medical assistance for the treatment of the coronavirus disease (COVID-19)»). Children who contracted mild COVID-19 formed the first group (n=49). Group II included children who suffered from COVID-19 of moderate severity (n=40). Group III included children who contracted COVID-19 with a severe course (n=31). The age and gender distribution of the groups was uniform.

Criteria for involvement in the study – age 6-18 years; a confirmed diagnosis of COVID-19 (positive PCR of a nasopharyngeal sample or a rapid test for SARS-CoV-2 antigen) in the anamnesis and a period after COVID-19 of more than 12 weeks. Also, somatically healthy children of the same age who did not suffer from COVID-19 were included in the study. Informed consent of the

patients (children's parents or their guardians) was obtained for the research.

Criteria for not involving patients in the study – preschool age; acute and chronic diseases in the exacerbation stage; concomitant diseases (cardiovascular, digestive, urinary, nervous, endocrine systems) that were diagnosed before COVID-19 and burdened the premorbid background; lack of informed consent of the child or the child's parents/legal representatives to participate in the study.

In the course of the study, the following research methods were used: general clinical (analysis of anamnesis data, objective examination, assessment of complaints and detection of post-covid symptoms), questionnaire (assessment of the general state of health of children before and after COVID-19, assessment of the level of fatigue), statistical methods of information processing (statistical packages MedStat, EZR).

For patient questionnaires, a modified questionnaire for assessing the consequences of the transferred COVID-19 developed based on the «Long-COVID Pediatric Survey» and proposed by the International Severe Acute Respiratory and Emerging Infection Consortium (ISARICA), was used. According to the questions of the questionnaire, it was suggested to note the presence or absence of post-covid manifestations, to give answers to questions about comparing the state of physical and psychological/emotional health before and after the coronavirus disease. Interpretation of the results was carried out according to the standard method: absolute values, frequency of post-covid manifestations, and their duration were determined.

To compare the assessment of the health status of the children from the main group and the control group, a questionnaire was conducted according to the Chalder fatigue scale. The questionnaire includes 11 questions about problems related to feelings of fatigue, weakness, lack of energy, and memory impairment. The interpretation of the obtained results was carried out according to the method described by the author (Cella and Chalder., 2010).

Statistical processing of the research results was carried out using statistical packages «MedStat v5.2» and EZR v. 1.54 (graphical user interface for

R statistical software version 4.0.3, R Foundation for Statistical Computing, Vienna, Austria) (Kanda, 2013). The critical level of significance ( $p$ ) when comparing the studied groups is  $p < 0.05$ .

The research protocol, as well as the text of the informed consent for participation in the research for parents/guardians and children, was approved at the meeting of the Commission on Bioethical Expertise at the Bogomolets National Medical University.

### Results

Analysis of the frequency of detection of the post-COVID-19 condition in children showed that post-COVID-19 was detected in 46 children (38.3%) of the main group. Among the children of the I group, the post-covid state was determined in 10 children (20.4%), in the II group – in 14 (35.0%) children, and in the III group – in 22 (71.0%) children (statistically significant difference between the I and III ( $p < 0.001$ ) and II and III ( $p = 0.018$ ) groups according to the MLH procedure).

The median duration of the post-covid state in children of the I group was 3.5 months [3; 4], in children of the II group – 5 months [4; 6], in the III group – 7 months [5; 8] ( $p < 0.05$  between groups according to Dunn's test). In general, in the main group, the duration of post-COVID-19 symptoms was 5 months [4; 7]. Spearman's rank correlation index ( $r$ ) between the duration of the post-covid state and the degree of severity of the transferred COVID-19 was 0.726, which indicates a positive strong rank correlation between these characteristics ( $p < 0.001$ ).

The average value ( $\bar{X}$ ) and standard deviation ( $\pm SD$ ) of the number of symptoms of the post-COVID-19 condition in the children of the main group was  $5.17 \pm 2.7$  symptoms. In children of the I group, this indicator was  $1.70 \pm 0.82$  symptoms, in the II group –  $4.29 \pm 1.38$  symptoms, in the III group –  $7.32 \pm 1.76$  symptoms ( $p < 0.01$  between groups according to Scheffe's method of multiple comparisons). Correlation analysis of the relationship between the number of clinical manifestations of the post-covid state and the degree of severity of COVID-19 revealed a positive strong rank correlation relationship (Spearman's rank correlation coefficient  $r = 0.851$ ,  $p < 0.001$ ). The table presents the frequency of clinical mani-

**Table 1.** Frequency of clinical manifestations post-COVID-19 in children of the main group (abs., %, 95% CI)

№	Symptom/sign	Absolute number (abs.)	Relative number (%, 95% CI)
<i>I. Psychoneurological changes</i>			
1.	Fatigue	16	13,3 (7,8-20,0)
2.	Angry	12	10,0 (5,3-16,0)
3.	Anxiety	18	15,0 (9,1-22,0)
4.	Depressive disorders	14	11,7 (6,5-18,1)
5.	Sleep disturbance	15	12,5 (7,2-19,1)
6.	Headache	10	8,3 (4,0-14,0)
7.	Dizziness	12	10,0 (5,3-16,0)
8.	Memory loss	7	5,8 (2,3-10,8)
9.	Impaired concentration of attention	13	10,8 (5,9-17,1)
10.	Pins and needles, numbness	3	2,5 (0,5-6,1)
11.	Movement coordination disorders	1	0,8 (0,0-0,3)
12.	Episodes of loss of consciousness	2	1,7 (0,2-4,8)
<i>II. Cardiovascular manifestations</i>			
13.	Chest pain	8	6,7 (2,9-11,9)
14.	Palpitations	6	5,0 (1,8-9,7)
15.	Variations in heart rate	4	3,3 (0,9-7,3)
<i>III. Respiratory signs</i>			
16.	Nasal congestion	4	3,3 (0,9-7,3)
17.	Sore throat	4	3,3 (0,9-7,3)
18.	Dyspnea	11	9,2 (4,6-15,0)
19.	Cough	6	5,0 (1,8-9,7)
<i>IV. Gastrointestinal manifestations</i>			
20.	Abdominal pain	5	4,2 (1,3-8,5)
21.	Nausea/vomiting	4	3,3 (0,9-7,3)
22.	Diarrhea	1	0,8 (0,0-0,3)
23.	Constipation	2	1,7 (0,2-4,8)
<i>V. Sensory disorders</i>			
24.	Altered smell/taste	12	10,0 (5,3-16,0)
25.	Loss of appetite	8	6,7 (2,9-11,9)

**Table 1.** (continued).

№	Symptom/sign	Absolute number (abs.)	Relative number (%; 95% CI)
26.	Ophthalmologic (blurred vision, photophobia, «dry eye syndrome»)	4	3,3 (0,9-7,3)
27.	Tinnitus, earache or vertigo	5	4,2 (1,3-8,5)
<i>VI. Skin signs</i>			
28.	Hyperhidrosis	7	5,8 (2,3-10,8)
29.	Rashes	1	0,8 (0,0-0,3)
30.	Hair loss	4	3,3 (0,9-7,3)
<i>VII. Others</i>			
31.	Myalgia/arthritis	10	8,3 (4,0-14,0)
32.	Fever	2	1,7 (0,2-4,8)
33.	A feeling of chills	7	5,8 (2,3-10,8)

festations of post-COVID-19 in children of the main group (n=120).

As can be seen from Table 1, the most frequently reported post-COVID-19 symptoms were anxiety (15%), fatigue (13.3%), sleep disturbances (12.5%), depressive disorders (11.7%), and impaired concentration of attention (10.8%). With a frequency of 10% – altered smell/taste, dizziness, and angry feelings were detected. The frequency of other symptoms was less than 10%. The most rarely recorded manifestations were movement coordination disorders (0.8%), episodes of loss of consciousness (1.7%), diarrhea (0.8%), constipation (1.7%), the appearance of a rash (0.8%), and fever (1.7%).

For comparative analysis of the health status of children who contracted COVID-19, a survey was conducted based on the above-mentioned modified questionnaire for assessing the consequences of having experienced COVID-19. The questionnaire included blocks of questions asking respondents to answer and compare their physical and psychological/emotional health status before and after COVID-19. The evaluation scale included 5 points: «very poor», «poor», «Ok», «good», and «very good».

The results of comparing the state of physical health before and after COVID-19 in the children

of the main group were as follows. It was found that before the acute illness of COVID-19, children considered their state of health mainly as «Ok» (30 children, 25%, 95% CI 17.6-33.2), «good» (68 children, 56.7%, 95% CI 47.6-65.5) and «very good» (22 children, 18.3%, 95% CI 11.9-25.8). After the coronavirus disease, none of the interviewed patients defined the state of their physical health as «good» or «very good». Instead, the majority of children rated it as «poor» (84 children, 70%, 95% CI 61.4-77.9), «very poor» (19 children, 15.8%, 95% CI 9.8-23.0) and «Ok» (17 children, 14.2%, 95% CI 8.5-21.0). To the question «Have you recovered your health after COVID-19?» only 15 (12.5%) children answered affirmatively.

The results of a comparative analysis of the state of psychological/emotional health before and after COVID-19 in children of the main group showed that before COVID-19 15 children (12.5%, 95% CI 7.2-19.1) assessed their state health as «very good», 91 children (75.8%, 95% CI 67.7-83.1) as «good» and 14 children (11.7%, 95% CI 6.5-18.1), as «Ok». After suffering from COVID-19, the proportion of children who rated their psychological health as «very good» (0 children) and «good» (8 children, 6.7%, 95% CI 2.9-11.9) decreased. The largest number of children (79 children, 65.8%, 95% CI 57.0-74.1) rated the psychological/emotional component of health as «Ok». There was a group of children who defined the state of psychological health as «poor» (27 children, 22.5%, 95% CI 15.4-30.5) and «very poor» (6 children, 5.0%, 95% CI 1.8-9.7), which was not detected before the acute episode of COVID-19. Thus, analysis of survey data on changes in physical and psychological/emotional health status revealed a worsening of outcomes after COVID-19 compared to pre-coronavirus disease.

We also assessed the state of health of children who suffered from COVID-19 according to the Chalder fatigue scale. The median score on this scale in the children of the main group was 12 [10; 16], in the control group – 7 [6; 8] ( $p < 0.001$  by the Wilcoxon W-test for two independent samples). In the I group, this indicator was 10 points [8; 12], in the II group – 14 points [11; 16], in the III group – 16 [15; 17] ( $p < 0.05$  between groups according to Dunn's test). The obtained data indicate worse

health characteristics of children who suffered from COVID-19, compared to children who did not suffer from SARS-CoV-2 infection. Correlation analysis of the relationship between the results of the Chalder fatigue scale and the degree of severity of the experienced COVID-19 revealed a strong positive rank correlation relationship (Spearman's rank correlation coefficient  $r=0.777$ ,  $p<0.05$ ).

### Discussion

Our results of the frequency of post-covid conditions in children are consistent with the results of studies conducted by other scientists. From a review of the literature, it is known that the prevalence of post-COVID-19 in children is very different according to the data of different authors. For example, data from a meta-analysis that included 17 studies ( $n=23,141$ ) with a mean follow-up period of 125 days reported that the prevalence of post-covid status among children varied from 15%–47% (Behnood et al., 2022). Another meta-analysis determined the prevalence of the post-covid condition to be between 4% and 66% (Zimmerman et al., 2021). Data from a systematic review that included 21 studies with the participation of 80,071 children reported a post-COVID-19 prevalence rate of 25.2% (95% CI 18.2% to 33.0%). It is also indicated that the severe form of the experienced COVID-19 increases the risk of developing a post-covid condition, and the prevalence of symptoms depends to a large extent on how much time has passed since the acute illness of COVID-19 (Lopez-Leon et al., 2022). Data from a review of studies examining the duration of the post-COVID-19 state in children showed that in most children post-COVID-19 symptoms disappear within 1–5 months (Borch et al., 2022). However, it is noted that some symptoms may persist a year after the diagnosis of COVID-19 (Lopez-Leon et al., 2022).

The most common post-COVID-19 manifestations in children were psychoneurological changes, including general weakness, mood changes, and increased fatigue. The prevalence of fatigue among children with post-convulsive conditions ranged from 0.7 to 84.4% (Funk et al., 2022; Lopez-Leon et al., 2022; Radtke et al., 2021; Stephenson et al., 2021). Headache and cognitive problems were found in 35% and 26%

of children, respectively (Kumar and Jat, 2023). Sleep disturbances were reported in 2–63% of children (Zimmerman et al., 2021; Lopez-Leon et al., 2022; Kumar and Jat, 2023). Data from a 2022 systematic review indicated that the most common clinical manifestations of post-traumatic stress disorder were sadness, tension, anger, depression, and anxiety (16.50%) (Lopez-Leon et al., 2022).

The data we obtained are consistent with the findings of other studies, which also revealed deterioration of physical and psychological health in children and young people after acute COVID-19 (Pereira et al., 2023).

Thus, according to the results of our study, the presence of the influence of the transferred coronavirus disease on the health of children and adolescents was established. These changes were characterized by the development of a post-covid state, worsening of the results of comparing the state of physical, psychological/emotional health before and after COVID-19, and worse results on the Chalder fatigue scale, compared to children who did not suffer from COVID-19. The obtained data must be taken into account when prescribing medical and rehabilitation measures for children who have contracted COVID-19 and also have clinical manifestations of a post-covid condition. The prospect of further study of the topic consists of finding methods for correcting the health status of children after COVID-19 and studying their effectiveness.

### Conclusions

1. Acute COVID-19 has a negative impact on the health of children and adolescents, which can be manifested by the development of a post-COVID-19 condition. Among children who experienced COVID-19, 38.3% of children were found to have post-COVID-19, with a median duration of clinical manifestations of 5 months and a mean number of symptoms of  $5.17\pm 2.7$ . The most frequently recorded symptoms of post-COVID-19 among the children who have had COVID-19, were anxiety (15%), fatigue (13.3%), sleep disturbances (12.5%), depressive disorders (11.7%), and impaired concentration of attention (10, 8%).

2. The risk of post-COVID-19 development depends on the degree of severity of the transferred

coronavirus disease. The post-COVID-19 condition was detected in 71% of children who suffered from severe COVID-19, which is significantly higher compared to children who suffered from COVID-19 of mild and moderate severity. A positive strong rank correlation was determined between the duration of symptoms, the number of clinical manifestations of the post-covid state, and the degree of severity of COVID-19.

3. Children with COVID-19 scored worse on the Chalder fatigue scale than healthy children. There was also a tendency to worsen the assessment of the health status of children in a comparative analysis of the physical and psychological/emotional components before and after COVID-19. Before the coronavirus disease, children rated their physical health status mainly as «normal», «good» and «very good». After the coronavirus disease, the majority of children (85.8%) rated it as «poor» and «very poor». After

acute COVID-19, the proportion of children who rated their psychological health as «very good» and «good» decreased. There was a group of children who defined their state of psychological health as «poor» and «very poor», which was not detected before COVID-19.

#### **Financing**

This study did not receive funding.

#### **Conflict of interests**

The authors declare no conflict of interest.

#### **Consent to publication**

Consent was obtained from participants included in the study.

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A – Research concept and design, B – Collection and/or assembly of data, C – Data analysis and interpretation, D – Writing the article, E – Critical revision of the article, F – Final approval of article

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## Пост-COVID-19 та інші зміни стану здоров'я дітей і підлітків, асоційовані з перенесенням COVID-19

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**Анотація:** визначення стану фізичного та психоемоційного здоров'я дітей і підлітків, які перенесли COVID-19 є актуальною діагностичною проблемою, вирішення якої дасть можливість раннього виявлення довгострокових і віддалених наслідків коронавірусної хвороби. Мета – проаналізувати частоту, тривалість, клінічні прояви пост-COVID-19 у дітей та підлітків, а також інші зміни стану здоров'я, асоційовані з перенесенням COVID-19. Матеріали і методи: у дослідженні взяли участь 155 дітей віком від 6 до 18 років. Серед них 120 дітей з підтвердженим діагнозом COVID-19 в анамнезі та терміном після COVID-19 більше 12 тижнів (основна група) і 35 соматично здорових дітей того ж віку, які на COVID-19 не хворіли (група контролю). Було використано загальноклінічний (аналіз даних анамнезу, об'єктивного обстеження, оцінка скарг та виявлення симптомів постковіду), опитувальний (оцінка загального стану здоров'я дітей до і після COVID-19, оцінка рівня втомлюваності), статистичний методи дослідження (статистичні пакети MedStat, EZR). Результати: пост-COVID-19 було виявлено у 46 дітей (38,3%) основної групи. Серед дітей I групи постковідний стан визначався у 10 дітей (20,4%), в II групі – у 14 (35,0%) дітей та у III групі – у 22 (71,0%) дітей. Медіана тривалості постковідного стану у дітей I групи становила 3,5 місяців, у дітей II групи – 5 місяців [4; 6], у III групі – 7 місяців ( $p < 0,05$  між групами при проведенні множинних порівнянь за критерієм Данна). Медіана тривалості симптомів пост-COVID-19 у дітей основної групи становила 5 місяців. Середнє значення ( $\bar{X}$ ) та стандартне відхилення ( $\pm SD$ ) кількості симптомів постковідного стану у дітей основної групи складало  $5,17 \pm 2,7$  симптомів: у дітей I групи –  $1,70 \pm 0,82$  симптомів, у II групі –  $4,29 \pm 1,38$  симптомів, у III групі –  $7,32 \pm 1,76$  симптомів. Найчастіше реєструвалися такі симптоми пост-COVID-19, як тривожність (15; 95% ВІ 9,1-22,0), підвищена втомлюваність (13,3; 95% ВІ 7,8-20,0), порушення сну (12,5; 95% ВІ 7,2-19,1), депресивні розлади (11,7; 95% ВІ 6,5-18,1), порушення

концентрації уваги (10,8; 95% ВІ 5,9-17,1). Аналіз даних опитування щодо змін фізичного і психологічного/емоційного стану здоров'я виявив погіршення результатів після COVID-19 в порівнянні зі станом до коронавірусної хвороби. Медіана балів за шкалою втоми за Чалдер у дітей основної групи становила 12, у групі контролю – 7 ( $p < 0,001$  за  $W$ -критерієм Вілкоксона для двох незалежних вибірок). Висновки: гострий COVID-19 чинить негативний вплив на стан здоров'я дітей та підлітків, що може проявлятися розвитком постковідного стану. Ризик розвитку пост-COVID-19 залежить від ступеню тяжкості перенесеної коронавірусної хвороби. Постковідний стан виявлявся у 71% дітей, які перенесли COVID-19 з тяжким перебігом, що достовірно вище в порівнянні з дітьми, які перенесли легкий та середнього ступеня тяжкості COVID-19. У дітей, які перенесли COVID-19, відмічались гірші показники за шкалою втоми за Чалдер, ніж у здорових дітей. Також відмічалась тенденція до погіршення оцінки стану здоров'я дітей при порівняльному аналізі фізичної та психологічної/емоційної складової до та після COVID-19.

**Ключові слова:** діти, COVID-19, стан здоров'я, пост-COVID-19 синдром, SARS-CoV-2.



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