ASSESSMENT OF CONSEQUENCES OF COVID-19 IN ADOLESCENTS BY THE METHOD OF QUESTIONNAIRE

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ABSTRACT

Background. *In Russia, of all detected cases of COVID-19, 18 % were in the pediatric population. According to a number of studies, adolescents develop long-term clinical and psychological consequences after an illness. Therefore, at present, the most relevant is a thorough study of the structure and severity of consequences of COVID-19 in adolescents.*

The aim of the study. *To assess the severity of consequences of COVID-19 in adolescents depending on the time after the disease.*

Materials and methods. *The sample included 96 people aged 11–16 years: 48 adolescents who have undergone COVID-19 (main group); 48 adolescents who did not have COVID-19 (control group). The main group was divided into six subgroups, depending on the period after COVID-19. The following research methods were used: clinical history using a standardized interview method; "Correction test" method by B. Bourdon; Beck's Depression Inventory (BDI-1A); Adolescent's Form of Manifest Anxiety Scale by A.M. Prikhozhan.*

Results. *Clinical symptoms of COVID-19 during the acute phase of the disease were considered in adolescents. It has been established that the most common symptoms include fever, runny nose, cough, sore throat, severe fatigue, impaired sense of smell, impaired taste, headache (most often localized in the frontal region). Clinical and psychological symptoms characteristic of post-COVID syndrome were considered as consequences of COVID-19 in adolescents. The majority of the examined adolescents showed the following clinical symptoms of COVID-19 after discharge: asthenia, disturbances of smell and taste; lasting from 2 to 64 weeks. As psychological symptoms, adolescents were characterized by reduced attention span, reduced speed of information processing and concentration, as well as the presence of symptoms of severe depression and high anxiety. The most unfavorable emotional state was revealed in adolescents during the second month after COVID-19.*

Conclusion. *The data obtained made it possible to determine that post-COVID syndrome in adolescents is characterized by the presence of an asthenic condition, impaired attention, high anxiety, severe depressive symptoms.*

Key words: *COVID-19, long-COVID, post-COVID, adolescents*

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ОЦЕНКА ПОСЛЕДСТВИЙ COVID-19 У ПОДРОСТКОВ МЕТОДОМ АНКЕТИРОВАНИЯ

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РЕЗЮМЕ

Обоснование. *В России из всех выявленных случаев COVID-19 18 % приходятся на население детского возраста. По данным ряда исследований, у подростков формируются долгосрочные клинические и психологические последствия после перенесённого заболевания. Следовательно, в настоящее время наиболее актуальным является тщательное изучение структуры и степени выраженности последствий COVID-19 у подростков.*

Цель исследования. *Оценить степень выраженности последствий COVID-19 у подростков в зависимости от временного периода после перенесённого заболевания.*

Методы. *Выборка включала 96 человек в возрасте 11–16 лет: 48 подростков, перенёсших COVID-19 (основная группа); 48 подростков, не болевших COVID-19 (контрольная группа). Основная группа разделена на 6 подгрупп в зависимости от временного периода после COVID-19. В качестве методов исследования использовались: клинический анамнез с использованием метода стандартизированного интервью; методика «Корректурная проба» Б. Бурдона; шкала депрессии А. Бека (BDI-1A); шкала явной тревожности для подростков А.М. Прихожан.*

Результаты. *Рассмотрены клинические симптомы COVID-19 во время острой фазы течения заболевания. Установлено, что к наиболее распространённым симптомам относятся: повышенная температура тела, насморк, кашель, боль в горле, сильная усталость, нарушения обоняния, нарушения вкуса, головная боль (наиболее часто локализованная в лобной области). В качестве последствий COVID-19 у подростков рассмотрены клинические и психологические симптомы, характерные для постковидного синдрома. У большинства обследованных подростков выявлены следующие клинические симптомы COVID-19 после выписки: астения, нарушения обоняния и вкуса продолжительностью от 2 до 64 недель. В качестве психологических симптомов, для подростков характерны: сниженный объём внимания, пониженный уровень скорости переработки информации и концентрации внимания, а также наличие симптомов выраженной депрессии и высокой тревожности. В период второго месяца после COVID-19 выявлено наиболее неблагоприятное эмоциональное состояние.*

Заключение. *Полученные данные показали, что для постковидного синдрома у подростков характерно наличие астенического состояния, нарушения внимания, высокой тревожности, симптомов выраженной депрессии.*

Ключевые слова: *COVID-19, продолженный COVID, постковид, подростки*

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INTRODUCTION

In Russia, cases of COVID-19 infection among the population have been recorded from 2020 onwards. Thus, according to official statistics, more than 18 million cases of COVID-19 infection have been detected in Russia since the beginning of the pandemic. At the same time, 18 % of diagnosed cases of COVID-19 infection are in the pediatric population, of which 6 % are pre-school children and 12 % are school-aged children. It is important to note that COVID-19 prevalence in the population is currently declining, which has allowed the removal of earlier restrictive measures (e. g., wearing masks). Nevertheless, at the same time, the effects of the disease in the population are still being felt. This is associated with the fact that COVID-19, in contrast to "classical" acute respiratory viral infections, is characterised by peculiarities of course and complications that can affect almost all human organs and systems [1–3]. In particular, the National Institute for Health and Care Excellence (NICE) has proposed a classification of COVID-19 course periods, according to which they differentiate: (1) acute period, when signs and symptoms of the disease persist for no more than 4 weeks (the diagnosis is removed when a negative PCR test for SARS-CoV-2 carriage is obtained); (2) long-COVID – persisting symptoms of the disease for 1–3 months; (3) post-COVID – when signs and symptoms that develop during and/or after the disease last for more than 3 months and are not explained by an alternative diagnosis [4]. These symptoms can change over time, disappear and reappear, affecting many body systems [5–7]. At the same time, it is noted that even those people who have experienced COVID-19 in a mild form are not immune to adverse effects [5, 8].

According to a number of studies, symptoms occurring during the acute period of COVID-19 course include fever, runny nose, cough, sore throat, gastrointestinal disorders, conjunctivitis, headache, severe fatigue, sleep disruption, smell and taste disorders [6, 9–11]. Various disorders of smell and taste were the most prominent symptoms of the acute period of COVID-19, and their prevalence reached 73–98 % [10–12]. The duration of these disorders, as a rule, is no more than 10–20 days, but cases of longer loss of sense of smell and taste – more than 60 days – are common [13], which are part of the structure of the so-called "long-COVID" and "post-COVID" [14].

A number of clinical and psychological symptoms characteristic of the long-COVID and post-COVID course of the disease are also distinguished. Currently, the symptomatology of these periods of the COVID-19 course is combined into a single nosology, post-COVID-19 syndrome. The diagnosis of post-COVID syndrome is listed in the International Classification of Diseases 10th Revision (ICD-10) under the code U09.9 "Condition after COVID-19 unspecified", which also includes post-COVID. In this case, post-COVID syndrome is defined as a complex of symptoms occurring during and/or after the disease, which persist for more than 3 months and are not explained by an alternative diagnosis [15, 16]. According to a study conducted in the Volgograd region, the prevalence of post-COVID syndrome among re-infected adolescents is 25 %, with symptoms persisting for 5 or more months [17]. That said, the various symptoms of post-COVID manifest with a different frequency and can vary. Thus, the most common clinical and psychological symptoms of post-COVID in adolescents include headache (3–80 %), abdominal pain (1–76 %), taste and smell disorder (3–74 %), sleep disruption (2–63 %), fatigue (3–87 %), depressive state (43–87 %), high anxiety (41–84 %), reduced attention concentration (2–81 %) [8, 18]. At the same time, however, the duration of symptoms has an individual severity. Thus, according to N.R. Magson et al. [19], the following symptoms are observed in adolescents during 4 to 12 weeks after the acute phase of COVID-19: headache, fatigue, sleep disruption, and difficulty concentrating. Different results from the previous study were obtained in a study by Q. Han et al. [20]. According to the authors, 8591 patients had symptoms such as fatigue/weakness (28 %), dyspnoea (18 %), arthromyalgia (26 %), depression (23 %), anxiety (22 %), memory disorder (19 %), decreased concentration (18 %) and insomnia (12 %) for at least 1 year [20].

Despite the significant contributions of these authors, the problem of identifying and studying the effects of COVID-19 in adolescents remains unresolved. Therefore, **the aim of this study** was to evaluate the severity of the COVID-19 consequences in adolescents according to the follow-up intervals.

MATERIALS AND METHODS

The study, conducted between November 2021 and June 2023, included adolescents from among the patients of the Clinic of the Scientific Centre for Family Health and Human Reproduction Problems (Irkutsk) who met the inclusion criteria. Inclusion criteria: age 11–16 years; informed consent of the adolescent's legal representative to participate in the study. Exclusion criteria: failure to meet the inclusion criteria; presence of comorbid disease (asthma, arterial hypertension, etc.); presence of disorder of mental development (mental retardation, autism spectrum disorder, cerebral palsy, etc.); refusal of the adolescent or his/her legal representative to participate in the study.

The pilot study was a prospective, non-randomized, case-control study. The study sample consisted of 96 adolescents: 18 (18.7 %) boys and 78 (81.3 %) girls aged 11–16 years (mean age – 14.6 ± 1.6 years). All the study participants were divided into two groups – main and control. Inclusion criteria in the main group: a history of a positive PCR test for SARS-CoV-2 carriage and evidence of mild or moderate COVID-19. Inclusion criteria for the control group: no history of a positive PCR test for SARS-CoV-2 carriage and no evidence of mild or moderate COVID-19. In order to assess the severity of the COVID-19 consequences in adolescents according to the follow-up interval, the main group was divided into six subgroups: (1) one month after COVID-19; (2) two months after COVID-19; (3) three months after COVID-19; (4) four months after COVID-19; (5) six

months to one year after COVID-19; (6) more than one year after COVID-19. Table 1 summarizes the general characteristics of the study groups of adolescents. The main and control groups of the study were comparable in sex and age characteristics.

All respondents were surveyed using the following methods: clinical history using the standardised interview method; B. Bourdon's Test [21]; Beck Depression Inventory (BDI-1A) adapted by N.V. Tarabrina [22]; A.M. Prikhozhan's manifest anxiety scale for adolescents [23].

Clinical history using standardised interview method included collection of anamnestic information about respondents (sex, age, presence of COVID-19 cases in the family, features of the course of the acute phase of COVID-19, features of the condition after COVID-19 diagnosis removal, presence of stressful experiences at the time of examination).

To assess the properties of respondents' attention, the method of B. Bourdon's Test was used [21]. The survey was conducted using special forms with rows of letters arranged in random order. Each respondent viewed a series of letters and crossed out certain letters indicated in the instructions for 7 minutes. At the end of each minute, the respondent made a mark where he/she held the pencil/pen. The following indicators were determined based on the results of the method: attention span, attention concentration, accuracy and speed.

The "attention span" indicator corresponded to the total number of letters viewed by the respondent in 7 minutes.

To determine the "concentration of attention" indicator (P), the "concentration of attention in 1 minute" indicator was first calculated for each of the 7 minutes according to the formula:

$$P = K \times Q,$$

where: P – attention concentration in 1 minute; K – accuracy in 1 minute; Q – number of letters viewed in 1 minute.

Then the "concentration of attention" indicator (Pt) was calculated using the formula:

$$Pt = (P1 + P2 + P3 + P4 + P5 + P6 + P7) / 7,$$

where: $P(1–7)$ is the concentration for each individual minute.

To determine the "accuracy" indicator, the "accuracy in 1 minute" indicator (K) was first calculated for each of the 7 minutes according to the formula:

$$K = (n – x) / n,$$

where: n – number of letters to cross out in 1 minute; x – number of errors in 1 minute.

Then the "accuracy" indicator (Kp) was calculated using the formula:

$$Kp = (K1 + K2 + K3 + K4 + K5 + K6 + K7) / 7,$$

where: $K(1–7)$ is the accuracy for each individual minute.

To determine the "speed" indicator (S), the formula was used:

$$S = (0{,}5936 \times Qt – 2{,}807 \times xn) / t,$$

where: Qt is the total number of letters viewed in 7 minutes; xn – the total number of errors in 7 minutes; 0.5936 – the average volume per letter; 2.807 – the loss of information per missed letter; t – the total time of the technique (in seconds).

To assess the presence of symptoms of depression in adolescents, the Beck Depression Scale (BDI-1A) was used, developed by A. Beck in 1978 and adapted by N.V. Tarabrina in 2001 [22]. The scale contains 13 groups of statements corresponding to groups of depression symptoms. Each item on the scale is rated from 0 to 3 points according to increasing severity of symptoms. Thus, the final result of the method from 0 to 9 points indicates the absence of symptoms of depression; from 10 to 15 points – the presence of symptoms of mild depression (subdepression); from 16 to 19 points – the presence of symptoms of moderate depression; more than 20 points – the presence of symptoms of severe depression [23].

A.M. Prikhozhan's manifest anxiety scale for adolescents [24] was used to identify anxiety as a relatively sta-

TABLE 1

GENERAL CHARACTERISTICS OF THE STUDIED GROUPS OF ADOLESCENTS

Groups	Age (years), M ± SD	Sex, % (*n*)		Total, % (*n*)
		boys	girls	
Main group	14.6 ± 1.6	18.7 (*n* = 9)	81.3 (*n* = 39)	100.0 (*n* = 48)
Subgroup 1	14.7 ± 0.1	14.3 (*n* = 1)	85.7 (*n* = 6)	14.6 (*n* = 7)
Subgroup 2	15.2 ± 0.6	20.0 (*n* = 1)	80.0 (*n* = 4)	10.4 (*n* = 5)
Subgroup 3	14.7 ± 0.3	14.3 (*n* = 1)	85.7 (*n* = 6)	14.6 (*n* = 7)
Subgroup 4	14.4 ± 0.1	37.5 (*n* = 3)	62.5 (*n* = 5)	16.7 (*n* = 8)
Subgroup 5	14.5 ± 0.3	8.4 (*n* = 1)	91.6 (*n* = 11)	25.0 (*n* = 12)
Subgroup 6	14.4 ± 0.4	22.2 (*n* = 2)	77.8 (*n* = 7)	18.7 (*n* = 9)
Control group	14.6 ± 1.6	18.7 (*n* = 9)	81.3 (*n* = 39)	100.0 (*n* = 48)
Total	14.6 ± 1.6	18.7 (*n* = 18)	81.3 (*n* = 78)	100.0 (*n* = 96)

ble personality formation in adolescents. The scale developed by A.M. Prikhozhan on the basis of adult and child versions of the manifest anxiety scale (J. Taylor, 1951, 1953; A. Castenada, B.R. McCandless, D.S. Palermo, 1956) contains 65 items. Analyzing the respondent's answers allows us to calculate "raw" scores on the anxiety scale. "Raw" scores are then converted to scale scores (walls) by comparing the examinee's data with normative scores of a group of adolescents of the appropriate age and gender. Based on the obtained scale score, the level of anxiety expression of the respondent was determined. Thus, 1–2 walls indicate the presence of a low level of anxiety; 3–6 walls indicate a normal level of anxiety; 7–8 walls indicate somewhat elevated anxiety; 9 walls indicate high anxiety; 10 walls indicate very high anxiety.

The study protocol was designed in accordance with the World Medical Association Declaration of Helsinki "Ethical Principles for the Conduct of Scientific Medical Research Involving Human Subjects" as amended in 2013.

Statistical processing of the study results was performed using Statistica 8 application software package (StatSoft Inc., USA). The sample size has not been precalculated. The Shapiro – Wilk test was used to check the normality of the distribution of the studied indicators. Arithmetic mean and standard deviation in M ± SD format were used to describe quantitative data. The Mann – Whitney U-criterion was used to analyze intergroup differences. Differences in percentage or relative values were assessed using Pearson's χ^2 criterion. The critical value of the level of statistical significance was considered to be $p \leq 0.05$.

RESULTS

The frequency and duration of clinical symptoms of COVID-19 in adolescents during the course of the acute period of the disease were determined based on the re-

TABLE 2

FREQUENCY AND DURATION OF CLINICAL SYMPTOMS OF COVID-19 IN ADOLESCENTS

Clinical symptoms	Detection frequency, *n* (%)	Duration from disease onset (days), M ± SD	Duration (day), min–max
Elevated body temperature	41 (85 %)	8.7 ± 4.7	1–21
Severe fatigue	34 (71 %)	19 ± 6.9	7–38
Runny nose	32 (67 %)	6 ± 4.3	1–21
Olfactory disorders	28 (58 %)	19 ± 6.9	7–38
Headaches, of which:	29 (60 %)		
temporal region	3 (10 %)		
occipital region	3 (10 %)		
frontal region	12 (42 %)	19 ± 6.9	7–38
frontal and parietal region	2 (7 %)		
frontal and temporal region	2 (7 %)		
whole head	7 (24 %)		
Cough	27 (56 %)	6 ± 4.3	1–21
Abnormal taste	26 (54 %)	19 ± 6.9	7–38
Sore throat	27 (56 %)	6 ± 4.3	1–21
Sleep disruptions:	14 (29 %)		
hard to sleep	10 (21 %)		
nocturnal awakening	7 (15 %)	19 ± 6.9	7–38
nightmares	3 (6 %)		
hard to wake up	6 (13 %)		
Gastrointestinal disorders	7 (15 %)	6 ± 4.3	1–21
Conjunctivitis	4 (8 %)	6 ± 4.3	1–21
Total period of illness	48 (100 %)	17 ± 8.3	1–38

sults of the clinical history of the disease (Table 2). Specifically, the acute period of the course of COVID-19 in adolescents averaged 17 ± 8.3 days (1 to 38 days).

Table 2 summarizes that more than half of the respondents reported the following clinical symptoms: fever (85 %), runny nose (67 %), cough (56 %), sore throat (56 %), severe fatigue (71 %), olfactory disorder (58 %), taste disorder (54 %), headache (60 %) (most often localised in the frontal area). The following COVID-19 clinical symptoms were less frequent: gastrointestinal disorders (15 %), conjunctivitis (8 %), and sleep disruptions (29 %) (most commonly associated with difficulty falling asleep).

Based on the results of the clinical history of the disease, the frequency and duration of COVID-19 clinical symptoms in adolescents after the diagnosis was removed (during the course of the post-COVID syndrome) were determined (Table 3). Specifically, 77 % of adolescents showed COVID-19 clinical symptomatology after the diagnosis was removed for a duration ranging from 0.5 to 64 weeks (mean – 10.1 ± 14.6 weeks).

The most common clinical symptoms of COVID-19 after the diagnosis has been removed are: asthenia, smell and taste disorders, as can be summarised in Table 3. Symptoms such as headache, joint pain, runny nose, cough, ele-

TABLE 3

FREQUENCY AND DURATION OF COVID-19 CLINICAL SYMPTOMS IN ADOLESCENTS AFTER THE DIAGNOSIS HAS BEEN REMOVED

Clinical symptoms	Detection frequency, *n* (%)	Duration after discharge (weeks), M ± SD	Duration (weeks), min–max
Joint ache	2 (4 %)	1.8 ± 0.4	1.5–2.0
Runny nose	1 (2 %)	0.5 ± 0.0	0.5–0.5
Elevated body temperature (37 °C)	3 (6 %)	13.8 ± 13.3	1.5–28.0
Cough	1 (2 %)	1.0 ± 0.0	1.0–1.0
Diarrhea	1 (2 %)	1.0 ± 0.0	1.0–1.0
Severe chest pain	1 (2 %)	1.0 ± 0.0	1.0–1.0
Reduced appetite	2 (4 %)	26.0 ± 2.8	24.0–28.0
Nausea	2 (4 %)	2.5 ± 1.3	1.0–4.0
Dizziness	3 (6 %)	5.0 ± 4.6	2.0–12.0
Headache	2 (4 %)	5.0 ± 4.8	1.0–12.0
Asthenia	15 (31 %)	14.0 ± 12.1	3.0–64.0
Abnormal taste	16 (33 %)	11.7 ± 10.5	2.0–56.0
Olfactory disorders	17 (36 %)	14.6 ± 10.3	2.0–64.0
General post-COVID period	37 (77 %)	10.1 ± 14.6	0.5–64.0

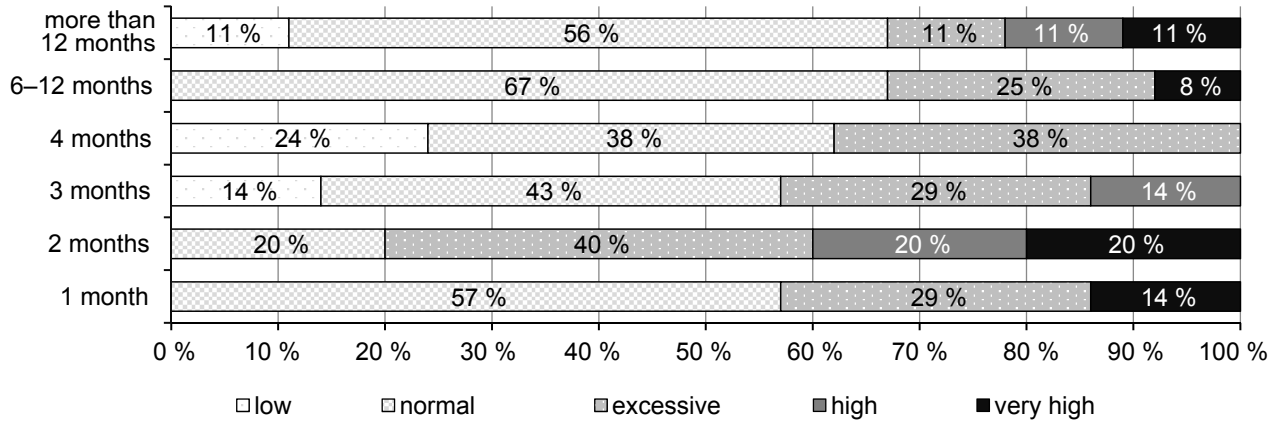

FIG. 1.

Anxiety levels in adolescents at different periods after COVID-19

vated body temperature, dizziness, nausea, diarrhoea, severe chest pain, and decreased appetite, were however rare and ranged from 0.5 to 28 weeks after COVID-19.

An analysis of adolescents' anxiety severity as a function of time after COVID-19 is summarised in Figure 1.

High anxiety (high and very high levels) was observed in adolescents between 1 and 3 months and six months and more than 12 months after COVID-19, as can be found in Figure 1. The majority of adolescents were characterised by high anxiety in the second month after the disease. Along with this, the detected differences in the values of respondents' anxiety severity indices in correlation with the time period after COVID-19 were not statistically significant ($p > 0.05$; χ^2 Pearson).

An analysis of depression symptom severity in adolescents after COVID-19 is summarised in Figure 2.

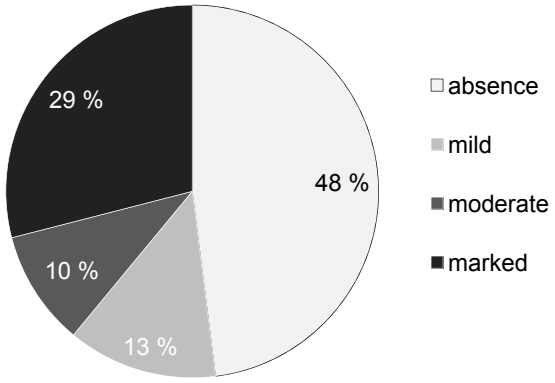

FIG. 2.
The severity of depressive symptoms in adolescents after COVID-19

Figure 2 indicates that the majority of adolescents (52 %) were diagnosed with symptoms of depression after undergoing COVID-19. For instance, 29 % of surveyed adolescents were diagnosed with symptoms of marked depression, 10 % with symptoms of moderate depression, and 13 % with symptoms of mild depression.

The analysis of depression symptom severity in adolescents as a function of time after COVID-19 is summarized in Figure 3.

Figure 3 reveals that the majority of adolescents (60 %) had symptoms of severe depression at 2 months after COVID-19. Symptoms of moderate depression were diagnosed in 29 % of adolescents in the first month after COVID-19; in 12 % of adolescents in 4 months after COVID-19; in 8 % of adolescents in 6 months to 1 year after COVID-19; and in 11 % of adolescents in 1 year or more after COVID-19. Mild depression symptoms were diagnosed in 14 % of adolescents at 1 month after COVID-19; in 40 % of adolescents at 2 months after COVID-19; in 12 % of adolescents at 4 months after COVID-19; and in 17 % of adolescents at 6 months to 1 year after COVID-19. The differences found are not statistically significant ($p > 0.05$; Pearson's χ^2).

In order to reveal the features of the COVID-19 consequences in adolescents, the properties of attention, the presence of symptoms of depression and the level of anxiety in adolescents of the main and control groups were analysed. Characteristics of attention properties in adolescents of the main and control groups are summarised in Table 4.

Table 4 reveals that adolescents who had undergone COVID-19 (main group) showed reduced attention span, reduced information processing speed and concentration. Statistically significant differences were revealed between the respondents of both groups based on the level of attention span, attention concentration and speed of information processing ($p \leq 0.05$).

Figure 4 illustrates the mean values of depression and anxiety symptom severity in adolescents of the main and control groups.

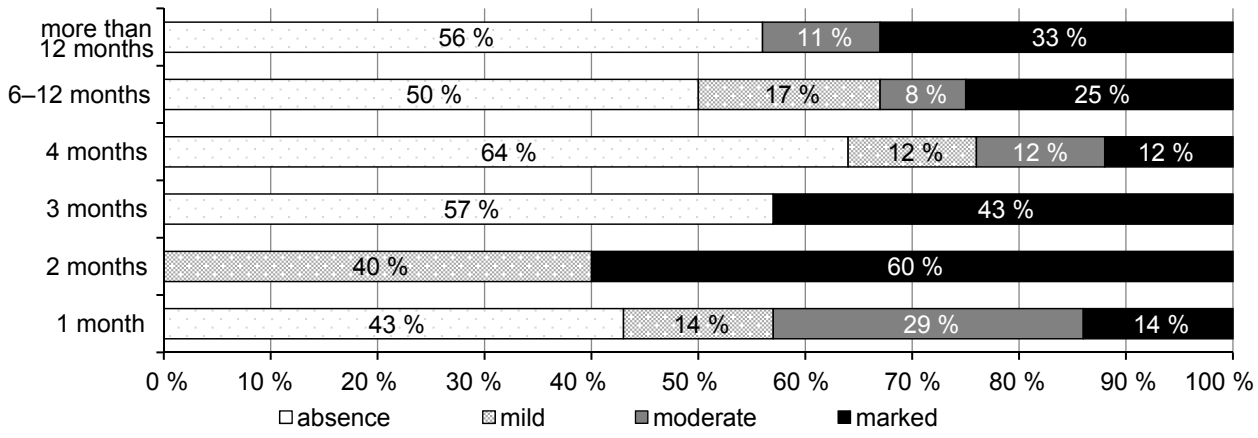

FIG. 3.
Depression symptom severity in adolescents at different periods after COVID-19

TABLE 4

ATTENTION FEATURES OF ADOLESCENTS IN THE MAIN AND CONTROL GROUPS

Indicator	Main group, M ± SD	Control group, M ± SD	Statistical significance level, *p*
Attention span	1060.40 ± 240.27	1311.90 ± 354.73	0.026*
Concentration (attentiveness)	138.28 ± 29.73	164.90 ± 41.84	0.042*
Accuracy	0.92 ± 0.07	0.87 ± 0.08	0.117
Speed/velocity	1.34 ± 0.29	1.63 ± 0.43	0.038*

Note. * – differences are statistically significant by Mann – Whitney U-criterion.

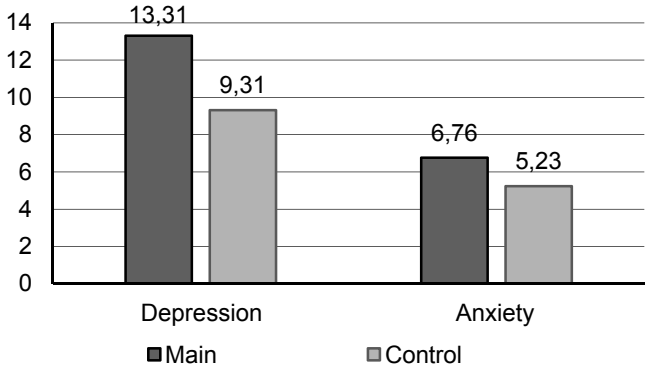

FIG. 4.

Depression and anxiety symptoms in adolescents of the main and control groups

In assessing the depression and anxiety symptom severity, higher levels of depression ($p = 0.002$) and anxiety ($p = 0.033$) were revealed in the group of respondents who had undergone COVID-19 (Fig. 4).

DISCUSSION

The results obtained in this study allow the authors to conclude that the clinical symptoms of COVID-19 characteristic of adolescents during the acute period of the disease include the following: fever (85 %), runny nose (67 %), cough (56 %), sore throat (56 %), severe fatigue (71 %), olfactory disorder (58 %), taste disorder (54 %), headache (60 %) (most often localised in the frontal area). These findings correlate with the results of a study by A. Nalbandian et al. who found a similar incidence of COVID-19 clinical symptomatology in adolescents during the course of the acute period of the disease [9].

Compared to the data of a study conducted in the Volgograd region [17], the prevalence and duration of clinical symptoms of COVID-19 after the diagnosis was removed were found to be higher. The incidence of these symptoms among overexposed adolescents, according to the results of our study, is 77 %, and their duration varies from 2 to 64 weeks. It is our hypothesis that this may be associated, firstly, with regional peculiarities of PCR testing coverage for SARS-CoV-2 carriage; secondly, with the fact that this study did not retrospectively analyze data from patients' ambulatory records and medical histories, but used information about clinical symptoms COVID-19 during the illness and after discharge, provided by the respondents themselves during the oral interview.

It has been revealed that the most common clinical symptoms of COVID-19 after discharge include: asthenia (31 %), olfactory disorder (36 %) and abnormal taste (33 %). This is supported by the research data of K.I. Usov [8] and A.M. Bogariu et al. [18], according to the data of which, in adolescents in the post-COVID period are observed: from 3 to 87 % – fatigue; from 3 to 74 % – disorder of taste and smell. Meanwhile, according to the results of this study, the majority of respondents noted distortion of the taste to meat and dairy products ("rotten", "unpalatable"), which led to their complete exclusion from the diet until the relief of the symptom.

Analyses of anxiety and depression symptoms in adolescents based on the time period after COVID-19 revealed the following trends: 1) at least 15 % of the studied adolescents showed high anxiety in the periods from 1 to 3 months and from 1 year and more after COVID-19; 2) the majority of the studied adolescents (52 %) showed symptoms of depression after COVID-19; 3) symptoms of severe depression were revealed in adolescents in all the studied periods after COVID-19; 4) the most unfavourable emotional state in adolescents was revealed in the period of the second month after COVID-19. The statistical analysis of the detected differences in the values of anxiety and depression symptoms of the respondents of these groups did not show statistically significant differences. The reason for this may be that COVID-19 disease in adolescents may cause changes in the emotional sphere at a deeper level, affecting issues of self-image, perception of the world around and general stress tolerance, which leads to the appearance of symptoms of severe depression regardless of the time period after the disease.

The comparative analysis of attention properties, presence of depression symptoms and anxiety level in adolescents of the main and control groups allowed to reveal the peculiarities of the course of post-COVID syndrome

in adolescents. For instance, in the group of adolescents who underwent COVID-19, compared to the respondents of the control group, the following were revealed:

1. Reduced attention span, reduced level of information processing speed and attention concentration, which may be associated with the presence of a state of increased vigilance and tension in respondents who have undergone COVID-19.

2. Presence of symptoms of severe depression and high levels of anxiety. These conditions may be associated with the neurotropism of the SARS-CoV-2 virus; the social significance of the disease itself; social influence (news, being in quarantine and isolation, etc.); the emergence of feelings of guilt, feelings of failure and despair, negative attitudes towards oneself (in the case of infected relatives, older generation).

Study limitations

Despite the obtained statistically significant differences in the level of anxiety, depression symptoms and attention properties in adolescents depending on the presence or absence of a COVID-19 history, this study was a pilot study in this age group and has a number of limitations. These include the small sample size and the predominance of female adolescents in the sample. Also, this study utilized information about existing COVID-19 clinical symptoms during the illness and after discharge provided by the respondents themselves in an oral interview. This could have been one source of inaccuracy in the study. The presence of these limiting factors constrains the extension of the findings to the general population of adolescents and requires additional research.

CONCLUSION

The results of this study enabled assessment of the severity of the COVID-19 consequences in adolescents depending on the period after the disease. Clinical symptoms of COVID-19 in adolescents during the acute phase of the disease course are considered. It has been established that the most common symptoms include fever, runny nose, cough, sore throat, severe fatigue, impaired sense of smell, impaired taste, headache (most often localized in the frontal region).

It has been revealed that 77 % of adolescent post-COVID-19 cases exhibit post-COVID symptomatology lasting between 2 and 64 weeks. Meanwhile, the most common clinical symptoms of COVID-19 after discharge include: asthenia (31 %), olfactory disorder (36 %) and abnormal taste (33 %). The most common psychological symptoms characteristic of post-COVID syndrome include: reduced attention span, reduced information processing speed and concentration, as well as the presence of symptoms of marked depression and high anxiety. In summary, it can be said that the second month post COVID-19 revealed the most unfavourable emotional state in adolescents. The severity of depression and anxiety symptoms did not statistically significantly change depending on the time after COVID-19. Therefore, the next stage of this ongoing study is to increase the sample size in order to observe the socio-demographic, psychological and physiological determinants of health-related quality of life in children who have undergone COVID-19.

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Conflict of interest

The authors of this article declare no conflicts of interest.

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