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MAIN FACTORS OF THE NEGATIVE IMPACT OF THE COVID-19 PANDEMIC ON MENTAL HEALTH OF CHILDREN

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Relevance. It is widely recognized that COVID-19 disease is significant problem for public health. The COVID-19 pandemic evolves, the long-term health impacts are continually increasing and children health is particular concern. The duration of exposure, heterogeneity and plurality of biopsychosocial factors have to unpredictable consequences on the mental health of vulnerable populations such as children and adolescents.

Objective. Determination the significant factors affecting the mental health of schoolchildren during the pandemic in order to further develop the health-saving measures.

Methods. During implementation of quarantine measures due to COVID-19 pandemic, we studied the peculiarities of schoolchildren's life and mental health in 2020-2021 (n=1393) from all regions of Ukraine. Q-RAPH, GPAQ, RCADS-P-25 questionnaires were used. Prior to the pandemic, MH survey of 500 schoolchildren was conducted using "Children's Neuroses Questionnaire" method. Descriptive statistics, Student's coefficients, univariate and multivariate analysis of variance, followed by a posteriori estimation of mean differences according to the Bonferroni test, conjugation tables, logistic and linear regression models were used.

Results. Constant stay in an apartment during quarantine leads to an increase in the chances of anxiety-depressive disorders on average by 2.5 times. During the pandemic for the observation period, both duration and frequency of walks were significantly lower for the children with mental disorders. The likelihood of pathological increases in anxiety and depression in school age children without interactive learning is 1.8 times greater. Pairwise comparisons of adjusted means using the Bonferroni test demonstrated that the higher is the BMI - the shorter is the sleep (β=-1.9; p=0.004), the longer is the sedentary behavior duration (β=3.4; p=0.001) - the shorter is MVPA (β =-1,4; p=0,005). It was established that depressive disorders are 2.4 times more common among the children with chronic diseases than among the healthy children (χ^2 =51.1; p<0.001). In the course of 3d linear modeling of normalized indicators we can see that a decrease in both light physical activity (LPA) and MVPA leads to deterioration in mental health indicators of the children.

Conclusions. Main factors of the negative impact on children's mental health during the COVID-19 pandemic are: permanent stay at home (OR=2.02; CI 1.39-2.93), frequency of walks less than 4 times a week and duration less than 220 minutes per week (OR=1.96; CI 1.12-3.45), non-interactive remote learning (OR=1.78; CI 1.17-2.69), overweight and obesity of schoolchildren (OR=1 .52; CI 1.11-2.08), presence of chronic diseases (OR=2.79; CI 1.99-3.91), anxiety disorders in parents (OR=3.67; CI 1.02-13,25) and their lack of higher education (OR=1,27; CI 1,03-1,56).

The obtained results must be taken into account when developing further preventive strategies and tactics for overcoming the pandemic consequences.

Keywords: COVID-19, children health, symptoms of depression and anxiety, lifestyle and physical activity.

Relevance. It is widely recognized that COVID-19 disease is significant problem for public health [1]. The COVID-19 pandemic evolves, the long-term health impacts are continually increasing and children health is particular concern [2, 3]. Therefore, a comprehensive study of the COVID-19 pandemic factors is still relevant.

First introduction of lockdown in Ukraine and transition of children to remote studies was a stressful factor that caused an increase in the level of anxiety and triggered a cascade of adaptive reactions [4, 5]. Introduction of further lockdowns with a periodic return to the normal way of life, but still under the conditions of a tense epidemic situation, became a chronic stress factor [6].

The duration of exposure, heterogeneity and plurality of biopsychosocial factors have to unpredictable consequences on the mental health of vulnerable populations such as children and adolescents [7]. Mental health is an indicator of the adaptive response of the body, since any adaptation process begins with the activation of genes that provoke an increase in the level of anxiety and thus, through a number of hormonal and biochemical mechanisms, trigger metabolic changes. With an excessive reaction to stress, depressive symptoms are added to anxiety symptoms. In case of the chronic effect of a stressful factor, depressive manifestations deepen and excessive stimulation of the pituitary-adrenal axis continues involving all organs and systems, which potentiates development of psychosomatic diseases.

Objective. An important task is to determine the significant factors affecting the mental health of schoolchildren during the pandemic in order to further develop the health-saving measures, which has become the **objective** of this study.

MATERIALS AND METHODS

During introduction of the quarantine measures due to the COVID-19 pandemic, we conducted a study of peculiarities of life and mental health of the schoolchildren from all regions of Ukraine in April 2020 and April 2021 (n=1393; 53.7% boys). Questionnaires Q-RAPH, GPAQ, RCADS-P-25 were used [8]. The questionnaire Q-RAPH had created by us specifically for this study and is copyrighted [9]. Assessment of the physical development of schoolchildren was carried out using z-scores of the body mass index (BMI) according to the WHO tables. Study of the mental health of the schoolchildren was conducted based on the anxiety and depression indicators assessment, as well as general well-being. We also assessed the lifestyle, motion activity (MA), its types, duration and frequency, presence of chronic diseases. Several questions were related to the psychological condition of the parents themselves using the GAD-2, PHQ-2 questionnaires. Before the pandemic, examination of the mental health of 500 schoolchildren (55.0% boys) was conducted according to the method "Children's Questionnaire of Neuroses" [10]. All survey participants signed informed consent statement. Statistical analysis was carried out using STATISTICA 8.0 and IBM SPSS STATISTICS 26 software. Descriptive statistics, Student's coefficients, univariate and multivariate analysis of variance, followed by a posteriori estimation of mean differences according to the Bonferroni test, conjugation tables, logistic and linear regression models were used.

RESULTS AND DISCUSSION

The study covered all regions of the country (Figure 1). The vast majority of respondents lived in cities (75.4±2.1)%, which corresponds to the distribution of the population in Ukraine.

Data comparison by observation periods demonstrated that the share of schoolchildren with depressive symptoms increased during the pandemic by 13.3% (χ^2 =31.1; p<0.001) compared to the period before the pandemic. During the period before the pandemic, depressive borderline and clinical disorders were detected in (8.2±4.5)% of schoolchildren, during the first year of the pandemic in (15.5±3.2)%, during the second year in (21.5±7 .7)%. The upward trend was detected both in the group of boys (R^2=0.971) and in the group of girls (R^2=0.982). Along with this, the share of children with anxiety disorders in the second year of the pandemic decreased compared to the first year (p<0.05) and corresponds to the level before the pandemic (Figure 2).

In China, for instance, a study has evaluated 1036 quarantined children and adolescents (6-15 years) of which 10.8%, 18.9% and 6.6% presented depression, anxiety, and both, respectively [11]. There have also been reports in China of children and adolescents aged 3 to 18 years experiencing symptoms of

Fig. 1. Settlements, which residents participated in the study

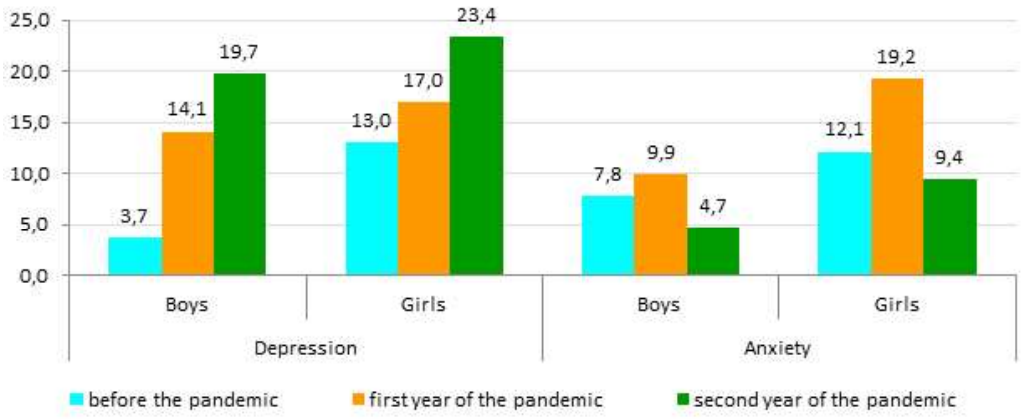

Fig. 2. The share of children with anxiety and depressive symptoms during the observation periods, %

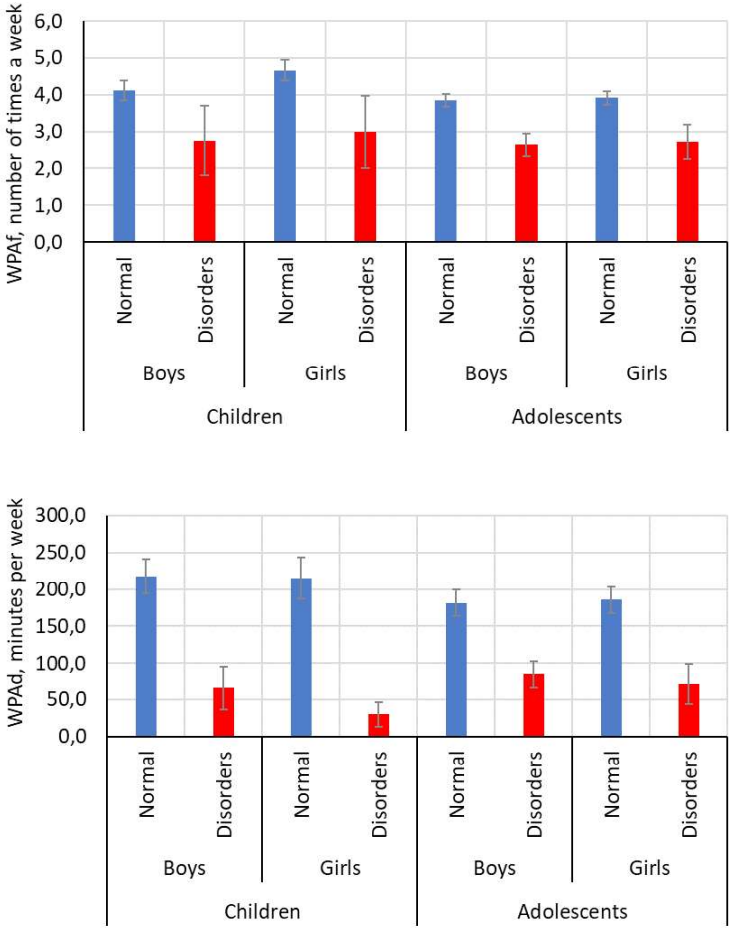

Fig. 3. Variance of the duration and frequency walking of children and adolescents according to their mental disorders

inattention, attachment, worry and irritability during this pandemic [12].

Another study showed a high prevalence of psychological distress in children and adolescents quarantined by the COVID-19 pandemic in India: experienced helplessness – 66.11%, worry – 68.59% and fear – 61.98% [13].

In our study, among the schoolchildren with normal body weight, the share of children with anxiety and depressive disorders was 12.3%, among the schoolchildren with excessive body weight and obesity – 21%. Pairwise comparisons of adjusted means using the Bonferroni test demonstrated that the higher is the BMI – the shorter is the sleep (β=-1.9; p=0.004), the longer is the sedentary behavior duration (β=3.4; p=0.001) - the shorter is MVPA (β =-1,4; p=0,005). And CDC report also emphasizes that children with obesity may have worse outcomes from COVID-19 [14].

It was established that depressive disorders are 2.4 times more common among the children with chronic diseases than among the healthy children (χ^2 =51.1; p<0.001). The indicator specific for depression and anxiety increases with a decrease in parental education (β=-1.0; p=0.028), an increase in BMI (β=0.4; p=0.009) and presence of chronic diseases in the pupil.

Probability of pathological increase of anxiety and depression in schoolchildren in the absence of interactive learning is 1.8 times higher (OR=1.78; CI 1.17-2.69; p<0.01) than in its presence. However, it was established that the impact of online lessons on the mental adaptation of the children differs depending on their duration. If all online lessons have the same duration, children are 4.3 times less likely to develop anxiety and depression.

It is known that in order to maintain optimal development, children and adolescents need walks in the fresh air. But the share of the schoolchildren, who walked for at least 60 minutes a day 5-7 times a week during quarantine measures amounted only to 10.3%. Before the quarantine introduction, the share of schoolchildren, who walked for more than 1-2 hours/day amounted to 48.5%. At the same time, during the pandemic for the observation period, both duration and frequency of walks were significantly lower for the children with mental disorders (Figure 3).

Also, constant stay in an apartment or within a household during quarantine leads to an increase in the chances of anxiety-depressive disorders by 2.2 times in boys and 2.9 times in girls (OR=2,02; CI 1,39-2,93).

About the need to increase physical activity has been repeatedly pointed out [15, 16]. Given the negative trends in health of the Ukrainian children and prevalence of distance education, increasing physical activity issue is relevant.

During the 2021 lockdown and remote learning, the share of primary school age children with a sufficient level of moderate and high-intensity physical activity (MVPA) (60 min/day) amounted to (29.0±4.2)%, during the adaptive quarantine - (39.6±6.7)%. A decrease in the level of MVPA of the school-aged children (by 12.7%) during the quarantine in 2021 compared to 2020 (p<0,001) was established.

In the course of 3d linear modeling of normalized indicators with different measurement units in the range from 0 to 1 (0 is the worst value of the indicator, 1 is the best value), we can see that a decrease in both light physical activity (LPA) and MVPA leads to deterioration in mental health indicators of the children (Figure 4).

The correlation between the psycho-emotional condition of children and their parents has been established: if parents have anxiety symptoms during quarantine, the level of depression in children of all age groups increases by 22.4% (t=3.4; p=0.001), the level of anxiety - by 15.7% (t=2.5; p=0.015). If parents have depressive symptoms, the level of depression in children increases by 27.8% (t=5.2; p<0.001), the level of anxiety – by 18.7% (t=3.5; p=0.001). Children, whose parents have higher education, are 1.5 times less likely to have depressive disorders than children whose parents have secondary or special secondary education (χ^2=10,6; p<0,005).

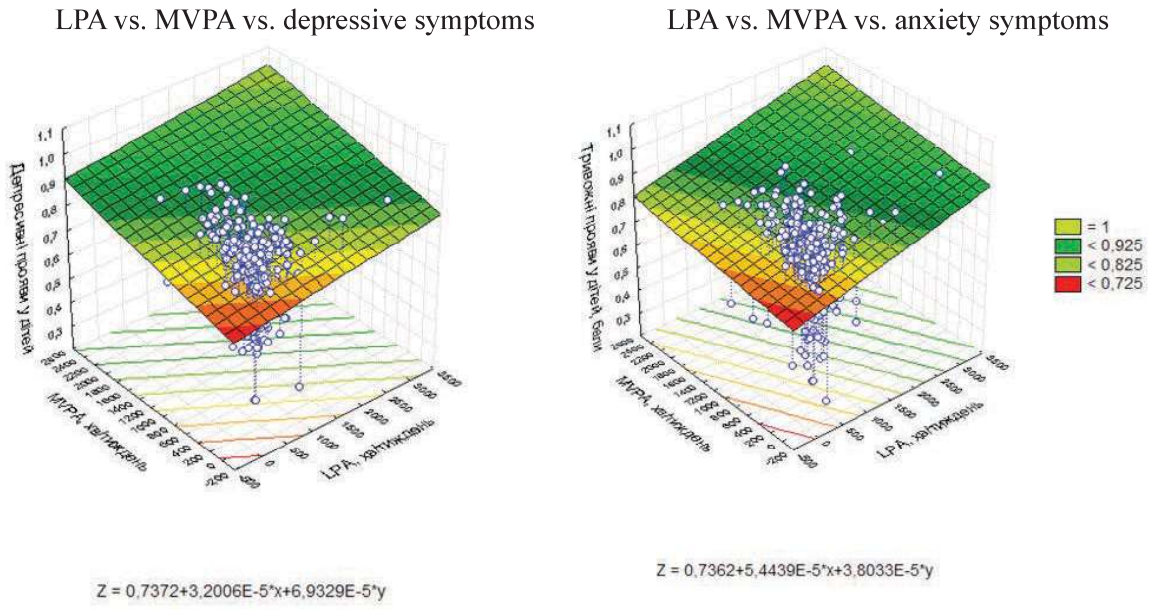

Fig. 4. 3d linear modeling of the correlation between indicators of children's anxiety and depression and motor activity indicators

Multiple survey studies indicate that the impact of the COVID-19 pandemic on mental health of children and adolescents is multifaceted and substantial, so research continuation can help to overcome the pandemic consequences [17-19].

CONCLUSIONS

Main factors of the negative impact on children's mental health during the COVID-19 pandemic are: permanent stay at home (OR=2.02; CI 1.39-2.93), frequency of walks less than 4 times a week and duration less than 220 minutes per week (OR=1.96; CI 1.12-3.45), non-interactive remote learning (OR=1.78; CI 1.17-2.69), overweight and obesity of schoolchildren (OR=1.52; CI 1.11-2.08), presence of chronic diseases (OR=2.79; CI 1.99-3.91), anxiety disorders in parents (OR=3.67; CI 1.02-13,25) and their lack of higher education (OR=1,27; CI 1,03-1,56).

The obtained results must be taken into account when developing further preventive strategies and tactics for overcoming the pandemic consequences.

Conflicts of interest: absent.

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ОСНОВНІ ЧИННИКИ НЕГАТИВНОГО ВПЛИВУ ПАНДЕМІЇ COVID-19 НА ПСИХІЧНЕ ЗДОРОВ'Я ДІТЕЙ

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Актуальність. Загальновизнано, що хвороба COVID-19 є серйозною проблемою для громадського здоров'я. Пандемія COVID-19 розвивається, довгостроковий вплив на здоров'я постійно зростає, і здоров'я дітей викликає особливе занепокоєння. Тривалість впливу, неоднорідність та множинність біопсихосоціальних факторів мають непередбачувані наслідки для психічного здоров'я вразливих груп населення, таких як діти та підлітки.

Ціль: визначення основних факторів впливу на психічне здоров'я школярів під час пандемії COVID-19 з метою подальшої розробки здоров'язберігаючих заходів.

Матеріали та методи. Під час впровадження карантинних заходів у зв'язку з пандемією COVID-19 ми вивчали особливості життя та психічного здоров'я школярів у 2020-2021 роках (n=1393) з усіх регіонів України. Використовували опитувальники Q-RAPH, GPAQ, RCADS-P-25. До початку пандемії було проведено опитування 500 школярів методом «Анкета дитячих неврозів». Використовували описову статистику, коефіцієнти Стьюдента, однофакторний та багатофакторний дисперсійний аналіз з наступною апостеріорною оцінкою середніх різниць за критерієм Бонферроні, таблиці спряженості, логістичну та лінійну регресійні моделі.

Результати. Постійне перебування в квартирі під час карантину призводить до збільшення ймовірності виникнення тривожно-депресивних розладів в середньому в 2,5 рази. Під час пандемії за період спостереження як тривалість, так і частота прогулянок були достовірно меншими у дітей з психічними розладами. Ймовірність патологічного підвищення тривожності та депресії у дітей шкільного віку без інтерактивного навчання в 1,8 рази більша. Попарне порівняння скоригованих середніх за допомогою тесту Бонферроні продемонструвало, що чим вищий ІМТ, тим коротший сон (β=-1,9; p=0,004), тим довша тривалість сидячої поведінки (β=3,4; p=0,001) - коротша – MVPA (β =-1,4; p=0,005). Встановлено, що у дітей із хронічними захворюваннями депресивні розлади зустрічаються у 2,4 рази частіше, ніж у здорових дітей (χ^2 =51,1; p<0,001). Під час 3d лінійного моделювання нормованих показників бачимо, що зниження як легкої фізичної активності (LPA), так і MVPA призводить до погіршення показників психічного здоров'я дітей.

Висновки. Основними факторами негативного впливу на психічне здоров'я дітей під час пандемії COVID-19 є: постійне перебування вдома (OR=2,02; ДІ 1,39-2,93), частота прогулянок менше 4 разів на тиждень і тривалість менше 220 хвилин на тиждень. (OR=1,96; ДІ 1,12-3,45), неінтерактивне дистанційне навчання (OR=1,78; ДІ 1,17-2,69), надмірна вага та ожиріння школярів (OR=1,52; ДІ 1,11-2,08), наявність хронічних захворювань (OR=2,79; ДІ 1,99-3,91), тривожні розлади у батьків (OR=3,67; ДІ 1,02-13,25) та відсутність у них вищої освіти (OR=1,27; ДІ 1,03-1,56).

Отримані результати необхідно враховувати при розробці подальших профілактичних стратегій і тактик подолання наслідків пандемії.

Ключові слова: COVID-19, здоров'я дітей, симптоми депресії та тривоги, спосіб життя та фізична активність