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Affective and somatoform disorders in children in clinical settings of pulmonary department, their prevalence and impact on patient's life quality

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Chronic respiratory diseases affect the personality and emotional state of the people who experience them.

Purpose — to determine the incidence of hyperventilation syndrome (HVS) and depressive disorder in patients with organic and functional pathologies of the lungs at the pulmonary department and to assess their impact on the life quality of patients.

Materials and methods. We have examined 131 patients aged 6–17, among them there were 54.9% (n=72) boys and 45.1% (n=59) girls. The patients were divided into three groups: the children with somatoform disorder (SD) from the respiratory system 33.6% (n=44), those with bronchial asthma (BA) — 34.3% (n=45) and those with pneumonia — 32.1% (n=42). For the diagnosis of depression we used a questionnaire for children's depression by M. Kovacs (1992), for the diagnosis of HVS we used Nijmegen questionnaire. To determine the patient's quality of life we used Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire (PQ-LES-Q).

Results. The main structure of HVS 25 (19.1%) was composed of 17 (68%) children with SD, 5 (20%) children with BA and 3 (12%) children with pneumonia. Mild depression was determined in 56 (81.1%) sick children, an average one was found in 13 (19.9%) sick children. The severity of depression was significantly higher in the patients with SD in comparison to the patients with BA (95% CI: 6.5–15.5; $p<0.0001$) and in comparison to the patients with pneumonia (95% CI: 3.2–12.0; $p<0.0009$). The children with SD had the lowest rate of quality of life according to the PQ-LES-Q scale in comparison to the children with BA (95% CI: 5.4–14.6; $p<0.0001$) and the ones with pneumonia (95% CI: 6.2–12.6; $p<0.0001$).

Conclusions. Hyperventilation syndrome occurs in 25 (19.1%) of the patients with pulmonary pathologies in childhood. In general, 69 (52.6%) of the children had depressive symptoms. Most likely, the basis of low satisfaction with the quality of life in patients with pulmonary pathology might be depressive disorders, as evidenced by the inverse and strong correlation between the data scales for depression and quality of life, whereby $r=-0.773$ ($p<0.0001$).

The study was conducted in accordance with the principles of the Helsinki Declaration. The study protocol was approved by the Local Ethics Committee for all participants. Informed consent of the child's parents was obtained for the research.

No conflict of interests was declared by the authors.

Key words: depression, bronchial asthma, pneumonia, somatoform disorder, quality of life, children.

Депресивні і соматоформні порушення у дітей в умовах пульмонологічного відділення, їх поширеність і вплив на якість життя пацієнтів

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Хронічні респіраторні захворювання впливають на особистість та емоційний стан хворих.

Мета — виявити поширеність гіпервентиляційного синдрому (ГВС) та депресивного розладу в дітей з органічними та функціональними патологіями легень в умовах пульмонологічного відділення; оцінити їхній вплив на якість життя пацієнтів.

Матеріали та методи. Обстежено 131 пацієнта віком 6–17 років. Хлопчиків було 54,9% (n=72), а дівчаток — 45,1% (n=59). Пацієнтів поділено на три групи: із соматоформними розладами (СР) дихальної системи — 33,6% (n=44), із бронхіальною астмою (БА) — 34,3% (n=45), із пневмонією — 32,1% (n=42). Для діагностики депресії використано опитувальник дитячої депресії М. Kovacs (1992), для діагностики ГВС застосовано Наймігенський опитувальник. Для визначення якості життя пацієнтів використано педіатричний опитувальник задоволеністю якістю життя — PQ-LES-Q.

Результати. Основну структуру ГВС становили 17 (68%) дітей з СР, 5 (20%) дітей з БА та 3 (12%) пацієнти з пневмонією. Легкий ступінь депресії визначався у 56 (81,1%) дітей, середній — у 13 (19,9%) пацієнтів. Виразність депресії була значно вищою в пацієнтів із СР порівняно з пацієнтами з БА (95% ДІ: 6,5–15,5; $p<0,0001$) та порівняно з хворими на пневмонію (95% ДІ: 3,2–12,0; $p<0,0009$). У дітей з СР була найнижча якість життя за шкалою PQ-LES-Q порівняно з дітьми з БА (95% ДІ: 5,4–14,6; $p<0,0001$) і з пневмонією (95% ДІ: 6,2–12,6; $p<0,0001$).

Висновки. ГВС зустрічався у 25 (19,1%) пацієнтів із легеневою патологією дитячого віку. Загалом у 69 (52,6%) дітей спостерігалася депресивна симптоматика. Найімовірніше, в основі низької задоволеності якістю життя в пацієнтів із легеневою патологією можуть бути депресивні порушення, про що свідчить зворотний та сильний кореляційний зв'язок між даними шкал за депресією та якістю життя, де $r=-0,773$ ($p<0,0001$).

Дослідження виконано відповідно до принципів Гельсінської декларації. Протокол дослідження ухвалено Локальним етичним комітетом зазначеної в роботі установи. На проведення досліджень отримано інформовану згоду батьків дітей.

Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: депресія, пневмонія, бронхіальна астма, соматоформний розлад, якість життя, діти.

Introduction

Chronic respiratory diseases affect the personality and emotional state of the people suffering from them. In particular, patients with severe asthma may have concomitant psychopathological disorders such as alexithymia, anxiety and/or depression that lead to a worsening of the clinical course of the underlying disease [3].

During the recent years we have seen significant progress in understanding the pathogenesis and development of effective treatments for bronchial asthma (BA). However, there are still a number of patients who fail to achieve control of treatment, despite the use of modern and effective anti-asthmatic drugs [11].

Bronchial asthma is highly prevalent in children (7–10%). The success of treatment of the children with BA is influenced by personal characteristics, family environment, demographic characteristics such as age and gender, as well as the presence of affective disorders. According to the literature, the incidence of depression is 45% and occurs in 64.5% of boys and in 35.5% of girls [20]. During the patient's life the prevalence and type of comorbid conditions of BA can change, that further complicates the diagnosis and treatment of BA [8].

Recently there has also been a growing interest in assessing the quality of life of patients with respiratory diseases. Modern studies have shown a decline in the quality of life of patients with BA, exacerbated by the hyperventilation syndrome (HVS). In addition, it has been shown that HVS impairs control over asthma attacks [18].

Hyperventilation syndrome belongs to somatoform disorders (SD) making up a group of mental disorders of neurotic nature. The distinctive feature of this group is presented by the numerous signs of somatic diseases that are not confirmed by objective clinical studies. This condition is characterized by excessive ventilation, hypocapnia and respiratory alkalosis. It is observed in a variety of clinical symptoms [14].

In International Classification of Diseases 10 (ICD-10) HVS refers to a SD of the autonomic nervous system of the respiratory system (F45.33). It should be noted that the group of SD has been somewhat categorically changed in the classification of DSM-5 (Diagnostic and Statistical Manual of mental disorders) in comparison to ICD-10. Thus, in DSM-5 the category «Somatic symptom and related disorders» has appeared that corresponds to the category of SD in ICD-10 [10].

The main etiological factors of HVS are anxiety and depressive disorders of various severities [9]. Somatic symptoms are supposed to be the most common clinical symptoms of depression [15]. In the majority of children, somatic manifestations can hide long-term emotional disorders, forming a variety of masks of depression, reducing the effectiveness of their treatment, one of which may be HVS [13].

For the patients suffering from BA, the presence of HVS can lead to a reassessment of the severity of asthma symptoms and, accordingly, affect its treatment [25]. Moreover, in the patients with BA or any other organic pathologies of the lungs HPV can further lead to the appearance or intensification of symptoms such as cooling and drying of the airways because of hyperventilation, narrowing of the airways due to cholinergic activation [2].

Depressive disorder that occurs in children aged 5–12 affects psychological and social development adversely, and its early onset is associated with an increased risk of recurrence, psychiatric morbidity and disorders [1].

The children with somatic complaints have an increased risk of emotional disorders in childhood. Frequent and recurrent somatic complaints in childhood have suggested emotional disorders in adulthood, especially depression and generalized anxiety disorder [22].

However, at the national level, insufficient attention is paid to the discussion of psychopathy as a comorbid condition in BA and other diseases of the respiratory system [11].

Taking into consideration the above given data, the purpose of the study was to determine the incidence of HVS and depressive disorder in patients with organic and functional lung pathologies at the pulmonary department and to assess their impact on the disease and patient's quality of life.

Materials and methods

The research was conducted on the clinical basis of the Department of Pediatrics, Obstetrics and Gynecology Faculty of Postgraduate Education, National Pirogov Memorial Medical University at the pulmonary department of Khmelnytsky regional children's hospital, in Khmelnytsky. Having signed the informed consent of parents and children, 131 patients aged 6–17 were included in the study, among them there were 54.9% (n=72) of boys and 45.1% (n=59) of girls. The patients were divided into three groups: those with SD from the respiratory system — 33.6% (n=44), those

with BA – 34.3% (n=45) and those with pneumonia – 32.1% (n=42). We did the selection of the children and made the diagnosis of SD after a general clinical examination and according to the criteria of SD ICD-10. The Nijmegen Questionnaire was used to diagnose HVS as the main manifestation of SD. The questionnaire evaluates 16 symptoms associated with HVS according to a five-point scale. The sum of scores according to the Nijmegen Questionnaire >23 has a sensitivity of 91% and a specificity of 95% for the diagnosis of HVS [15]. The Children's Depression Inventory (CDI) questionnaire by M. Kovacs, 1992, was used to detect depression in children with lung disease behavioral problems. The overall normal CDI rate can range from 0 to 54, 50 is a critical value, after which the intensity of symptoms increases [12]. The Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire (PQ-LES-Q) was used to determine patients' quality of life and comorbidities. The questionnaire was developed by Jean Endicott to assess the degree of satisfaction in different areas of life in children aged 6–17 [5]. The scale was later evaluated and validated in children with major depressive disorder [6]. This questionnaire assesses the general health, well-being and perception of the patient's life and consists of 15 points according to a five-point scale.

The Statistical analysis was performed using the software package Statistica 8.0.360 (Stat SoftInc., No. GCHGG863UAHG4WCDH2CG), MedCalc.7.4.4.1. (No. XXZVRKAHL4D4H-QFZWYXZ) and Excel (2007). The hypothesis about the normality of the distribution was tested using the Shapiro-Wilk Test. Quantitative characteristics are given in the form of $M \pm \sigma$ (arithmetic mean \pm standard deviation). The veracity of differences was assessed using Student's two-sample t-test and constructing a 95% confidence interval (CI) for the difference between the means, as well as by correlation and regression analysis. Values at $p < 0.05$ were considered reliable.

The study was conducted in accordance with the principles of the Declaration of Helsinki. The study protocol was approved by the Local Ethics Committee for all participants.

Results and discussion

Hyperventilation syndrome is a common disease characterized by recurrent episodes of excessive ventilation in response to anxiety or fear [23].

Functional somatic symptoms are quite often associated with emotional disorders such as depression and anxiety, forming their clinical «masks»

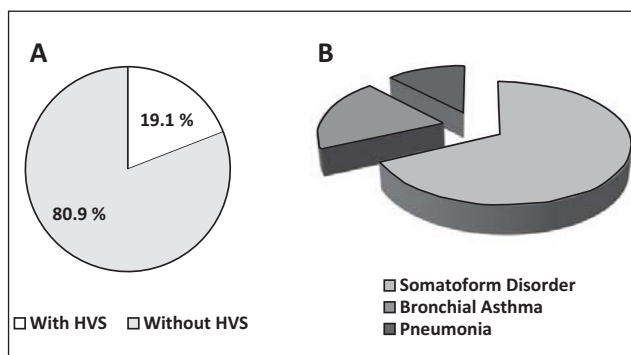


Fig. 1. A. The incidence of HVS in children with functional and organic pulmonary pathologies at the pulmonary department. **B.** The structure of HVS depending on the pathology of the lungs

and leading to misdiagnosis of the underlying disease and ineffective treatment [13]. Applying the Nijmegen Questionnaire, 25 (19.1%) out of 131 patients with respiratory disease had HVS (Fig. 1A). HVS occurred in 17 (68%) cases among the children with somatoform respiratory disorders, among the patients with asthma BA and the children with ambulatory pneumonia it was emerged in 5 (20%) and 3 (12%) cases relatively (Fig. 1B).

The combination of organic and dysfunctional respiratory disorders has been observed in many studies. This phenomenon must be taken into account in the management of such patients, since the presence of HVS or other dysfunctional disorders can worsen the underlying disease and mislead the physician about the ineffectiveness of treatment. The occurrence of the dysfunctional respiratory disorders in patients with organic lung disease is possible in the presence or development of anxiety and depressive disorders. This may be a response either to the underlying pathology or the existence of the disorders before the development of an organic disease, which leads to their decompensation. Hereditary and social factors, as well as the peculiarities of raising a child (for example, hyper-care) play a significant role in this issue. Thus, depressive disorders were detected in 29.2% of adolescents with SD from the cardiorespiratory system in the research works of Yu.N. Lysytsia et al. (2019) [13].

The presence of HVS varied depending on the age and gender of the patients. According to the questionnaire, the largest number of children with HVS occurred in the age group of 6–10 (10 out of 48 patients, i.e. 20.8%). Slightly lower incidence of HVS occurred in the age group of 11–14 (9 out of 47 children, i.e. 19.1%) and the lowest incidence was in the group of adolescents aged 15–17 (6 children out of 36, i.e. 16.6%). HVS was also al-

most twice as common among girls as among boys (64% and 36%, respectively). A similar tendency was also found in the study of Yu. N. Lysytsia et al. (2019). The researches explained that there were a higher tendency of women to develop depressive disorders and anxiety, which may be the basic cause for the development of SD [13].

The highest score according to the Nijmegen Questionnaire was found for the children with HVS associated with BA, slightly lower scores were found for the children with pneumonia and the lowest ones were for the patients with SD. This difference is probably due to the premorbid psychoemotional background and autonomic disregulation in the children suffering from organic lung disease. These factors in the period of organic disease lead to decompensation of autonomic regulation of the respiratory system, which in combination with pathophysiological disorders due to the underlying disease and emotional stress, can lead to increased shortness of breath and severity of HVS. Thus, for the patients with BA, the number of points according to the Nijmegen Questionnaire was 31.2 ± 3.0 , and it significantly exceeded the number of points for the children with SD – 24.1 ± 1.8 (95% CI: 4.9–9.3; $p < 0.0001$). Additionally, for the patients with pneumonia, the number of points was 29.7 ± 9.8 , and it significantly exceeded the number of points for the children with SD (95% CI: 0.7–10.4; $p < 0.02$). There was no significant difference in the questionnaire scores between the patients with BA and the ones with pneumonia.

It should also be noted that the number of points according to the Nijmegen Questionnaire, although not that statistically significant, was higher among the girls than among the boys (27.5 ± 5.3 and 23.9 ± 1.4 , respectively). This tendency may indicate a greater predisposition to the development of HVS in females. In our study, HVS was almost twice as common among girls as among boys (64% and 36%, respectively). The predominance of females with HVS can be explained by their greater psycho-emotional instability and predisposition to anxiety and depressive disorders. According to many researchers, the female gender is one of the main risk factors for the development of anxiety and depressive disorders, on the basis of which HVS can be formed as a somatic symptom of their manifestation [17,19].

Numerous studies have established the role of serotonin in the modulation of respiratory rhythm and respiratory patterns. The collection of experimental data suggests that serotonin plays a

crucial role in central respiratory control. Changes in the serotonin system (related to genetic and / or environmental factors) cause severe respiratory disorders that can occur since the early postnatal period and up to neurodegenerative diseases in the elderly [7]. It is also known that serotonin is involved in the development of depressive disorders, changes in the production and metabolism of which have been observed in some categories of children, especially with SD [16]. It is possible that the general biochemical mechanism of these disorders does not exclude the interconnection between the occurrence of HVS and depression, both in SD and in organic lung pathologies. The presence of depression itself may be a key cause of the development of HVS in the patients with SD of the respiratory system. The inclusion of depression in organic diseases with the onset of HVS can significantly complicate the course of the underlying disease and its correct diagnosing.

A screening study for the presence of depressive symptoms in children suffering from organic diseases and SD of the respiratory tract has shown the presence of depressive symptoms and its dependence on individual factors.

The study of the entire cohort of children ($n=131$) showed that 69 (52.6%) ones had a total score above the upper limit of 55 on average according to Kovacs Questionnaire, that could indicate the presence of depressive symptoms (Fig. 2A).

Among the children with somatoform (psychosomatic) respiratory disorders the depression was diagnosed in every second child that equaled 37 (53.6%). Among the children with BA, the depressive disorders occurred in 12 (17.4%), and in almost every third child with pneumonia that equaled 20 (29.0%), (Fig. 2B).

The presence of depression in the vast majority of patients with SD may indicate its key role in the

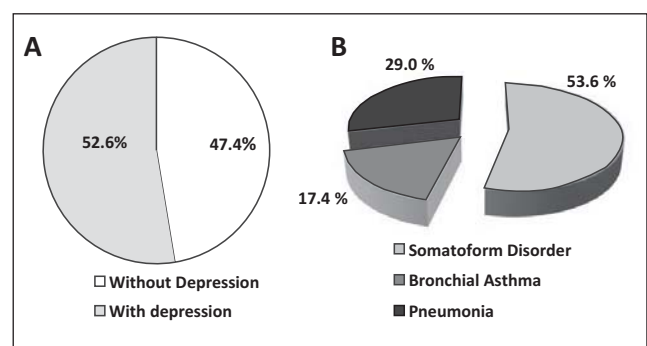


Fig. 2. A. Depressive symptoms were revealed in children with respiratory diseases according to the Questionnaire of Children's Depression (Maria Kovacs, 1992). **B.** The structure of the depression depending on the pathology of the respiratory system

development of this disorder, but its comorbidity with pathological anxiety disorders is not excluded, which may also underlie SD. A high prevalence of depression in children with SD (43.2%) was also observed in the study by L. Pyra et al. (2020). It was suggested that for a certain category of children SD may be based on depression as the primary cause of this disorder (indicated by low serotonin levels). At the same time, there are patients with SD who do not have any clinical manifestations of depression. Probably, SD can be a multifactorial pathology with different pathogenetic subtypes [16].

At the same time, the presence of the depression in the patients with BA and pneumonia rather indicates its secondary cause in response to the development of organic lung disease, as a person's response to stress, but which can worsen the underlying disease and its rehabilitation.

Thus, in the study by D.S. Lakshminarasappa et al. (2021) most children with uncontrolled BA had depression combined with anxiety in comparison with the children who had controlled BA. This may indicate the impact of anxiety and depression on the severity and course of BA [24]. The existence of different phenotypes of depression in such patients requires further study, as there may be different approaches to treatment that may affect the effectiveness of treatment of organic disease and SD.

An important indicator of depression is its severity. Thus, in the general structure, a mild degree of depression was determined in 56 (81.1%) patients, the moderate one was found in 13 (19.9%) patients. No severe depression was observed in this category of children. This tendency was also observed in the groups of patients. In the group with SD (n=37) mild depression was detected in 28 (75.6%) cases, the moderate one occurred in 9 (24.4%) cases, in the group with BA (n=12) mild depression was detected in 10 (83.3%) cases, the moderate one occurred in 2 (16.7%) cases, and in the group with pneumonia (n=20) mild depression was determined in 18 (90.0%) cases, the moderate one was in 2 (10.0%) cases.

According to the questionnaire, the largest number of children with depression occurred in the age group from 11 to 14 (30 out of 69 people, that equaled 43.5%). Depression was slightly less common in children aged 6–10 (25 out of 69 children, that equaled 36.2%), and less common among adolescents aged 15–17 (14 out of 69, that equaled 20.3%). One of the possible important factors for

the frequent occurrence of depression in children aged 11–14 may be the formation of personality and the onset of puberty, which can lead to increased sensitivity to various stressors with the development of depressive symptoms. It is also found in other author's studies [16].

Depression was more common in girls than in boys (36 (52.2%) and 33 (47.8%), respectively). It confirms the female gender is one of the risk factors for depression.

According to the Depression Scale (CDI) the highest score was shown by the children with SD, significantly lower scores were shown by the children with pneumonia, and the lowest one was found in the patients with BA. It is likely that higher levels of depression in children with SD may be due to the presence of depression as the basis of the pathology or as the cause of SD, and somatic symptoms of the respiratory system, including HVS, may be its clinical manifestations. While lower levels of depression in the children with organic lung disease may indicate mostly the onset of depression as a personality response to the disease that also subsides as the underlying disease disappears. Thus, in the patients with SD, according to the CDI scale the number of scores was 59.8 ± 10.6 and it significantly exceeded the number of scores shown by the children with BA — 48.8 ± 10.8 (95% CI: 6.5–15.5; $p < 0.0001$), and in the children with pneumonia it equaled 52.2 ± 9.9 (95% CI: 3.2–12.0; $p < 0.0009$). There was no significant difference between the patients with BA and pneumonia according to the CDI scale.

Recurrent BA in children is often associated with emotional disorders such as anxiety and depression that have a significant negative impact on the course of the disease. According to the study of T. Deraz1 et al. (2018) 34.4% of the children with BA had anxious symptoms, and 33.3% of them were depressive. The children with BA in combination with depression were more likely to seek emergency care for the underlying disease than children without depression. The use of multivariate regression analysis showed that concomitant illness with anxiety or depression was an independent risk factor for poorly controlled BA. Moreover, severe BA, uncontrolled BA, and concomitant depression were independent risk factors for anxiety in the children with BA. Also, the duration of BA for more than 5 years and the presence of other atopic diseases were independent risk factors for depression in children [11].

It should also be noted that the severity of depression according to the CDI scale was significantly higher in girls than in boys. Thus, the number of scores according to the CDI scale in girls was 63.9 ± 4.8 , while in boys it was 60.0 ± 3.9 (95% CI: 1.8–6.0; $p < 0.0005$). This evidence confirms over again the depression has more severe course and a higher tendency to develop in women than in men; as well as that a female gender is a risk factor for depression.

While using the PQ-LES-Q pediatric quality of life satisfaction questionnaire, the lowest score was observed in the children with SD, and a significantly higher score was observed in the children with organic lung disease (BA and pneumonia). Thus, the total score according to the PQ-LES-Q scale in the children with SD was 47.5 ± 6.6 , and it was significantly lower than the overall score in the children with BA that equaled 57.5 ± 13.9 (95% CI: 5.4–14.6; $p < 0.0001$), and the patients with pneumonia had a total score of 56.9 ± 8.4 (95% CI: 6.2–12.6; $p < 0.0001$). There was no significant difference in scores between the children with BA and those with pneumonia. Most likely, low satisfaction with the quality of life in the children with SD in comparison to the young patients with organic diseases may be due to the anxiety and depressive disorders that are mostly distinct in this category of patients and compose the main symptoms of the disease.

Thus, it is possible to suggest the presence of the relationship between quality of life satisfaction primarily with the psycho-emotional state of the child, rather than with the presence of an organic disease, which requires further study and may be of great social importance.

Taking into consideration the received data, it is possible to suggest a certain link between the presence and severity of depression and the development of HVS. Moreover, it is possible that the decline in quality of life in children with functional

and organic lung diseases may be due not only to the course of the underlying disease, but also to the occurrence of both primary and secondary to the main pathology depressive symptoms. Correlation and regression analysis were used to determine such correlation.

Figure 3 shows a linear regression diagram demonstrating a direct interrelation between CDI values and the Nijmegen HVS Questionnaire.

The analysis of the chart has shown some features of the relationship between the amplification of depressive symptoms and the occurrence of HVS. The coefficient of determination $R^2 = 0.321$ shows that in 32.1% of the cases, the increase in scores according to the depression scale leads to the increase in scores according to the Nijmegen questionnaire with the possible occurrence of HVS. The calculated correlation coefficient r is 0.565 ($p < 0.0001$). Thus, there has been found out a reliable direct and average correlation according to Chaddock's scale between the values according to the CDI scale and the Nijmegen Questionnaire HVS, i.e. with an increase in scores according to the Depression Scale, the score increases also according to the Nijmegen Questionnaire, which may indicate the significance of depressive symptoms for possible development of HVS.

Figure 4 shows a linear regression chart demonstrating a direct relationship between the increase in depressive symptoms (CDI scale) and the quality of life of the patients with pulmonary pathology (according to the PQ-LES-Q questionnaire). The coefficient of determination $R^2 = 0.598$ shows that in 59.8% of cases, an increase in scores according to the depression scale leads to a decrease in scores according to the PQ-LES-Q scale. The calculated correlation coefficient $r = -0.773$ ($p < 0.0001$).

Thus, a reliable feedback and a strong correlation according to Chaddock's scale between the values according to the CDI scale and the quality of life scale have been revealed. The obtained data

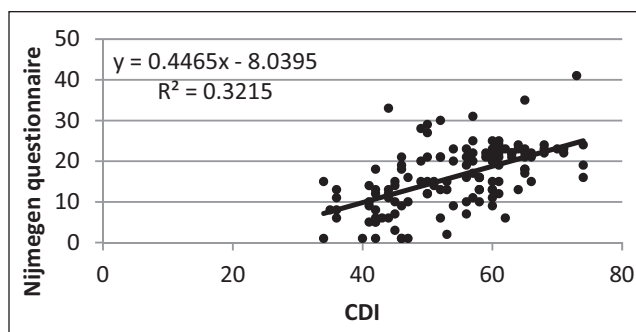


Fig. 3. The relationship between the increase of depressive symptoms according to the CDI scale and the occurrence of hyperventilation syndrome according to the Nijmegen questionnaire

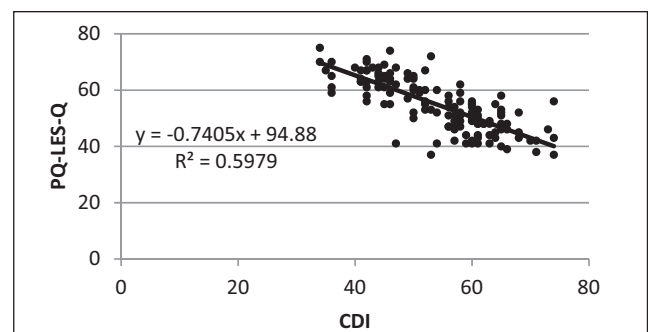


Fig. 4. The relationship between the increase in depressive symptoms according to the CDI scale and satisfaction with the quality of life according to the PQ-LES-Q questionnaire

show that with an increase in scores according to the depression scale, the score according to the PQ-LES-Q scale decreases. This indicates the importance of depressive symptoms in reducing the quality of life in the patients with respiratory diseases.

Conclusions

Hyperventilation syndrome occurs in 25 (19.1%) of children with respiratory diseases and was diagnosed almost twice more often in girls than in boys (64% and 36%, respectively). It was mostly associated with SD of the respiratory system in children, in 68% of cases, and much less common in patients with pneumonia, in 12%. Significantly more often, the HVS was manifested in children with BA, in comparison to the children with SD (95% CI: 4.9–9.3; $p < 0.0001$). Its development is facilitated by premorbid psychoemotional background and decompensation of autonomic respiratory disregulation that leads in combination with pathophysiological disorders due to the underlying disease and emotional stress to increased shortness of breath and severity of HVS. There was a direct and moderate correlation between these scales for depression and the frequency of HVS, whereby $r = 0.565$ ($p < 0.0001$).

69 (52.6%) of pulmonary patients had various degrees of depressive symptoms. The main structure of depression constituted 53.6% of the children with SD, they had more severe depressive symptoms, in comparison to the young patients with BA (95% CI: 6.5–15.5; $p < 0.0001$) and in

comparison to the patients with pneumonia (95% CI: 3.2–12.0; $p < 0.0009$). Depressive disorders were found more common and more severe in girls than in boys (95% CI: 1.8–6.0; $p < 0.0005$). The presence of depression in the vast majority of the patients with SD may indicate its key role in the development of this disorder. At the same time, the presence of depression in the patients with BA and pneumonia rather indicates its secondary cause in response to the development of organic lung disease, as a person's reaction to a stressful event, but which can worsen the underlying disease and its rehabilitation.

Most likely, low satisfaction with quality of life in patients with pulmonary pathologies, especially in patients with SD, may be due to the depressive disorders, as evidenced by the inverse and strong correlation between the data according to depression and quality of life scales, whereby $r = -0.773$ ($p < 0.0001$).

To optimize approaches to the treatment and prevention of pulmonary pathologies in children, it is necessary to consider not only the main mechanisms of development of the underlying disease, but also the psycho-emotional state of the patient. Early detection of the emotional disorders, especially depression, and their well-timed correction can increase the effectiveness of treatment, improve the course of the disease and social adaptation, as well as reduce the frequency of relapses.

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