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FEATURES OF CLINICAL MANIFESTATIONS OF DISEASE AND PSYCHOLOGICAL STATUS OF ADOLESCENTS WITH BRONCHIAL ASTHMA OF VARIOUS LEVELS OF CONTROL AND THE INFLUENCE OF RISK FACTORS

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ABSTRACT

Introduction: The problem of psycho-emotional state of patients with asthma is of great importance from a mental and social point of view.

The aim: To find out the factors which influence mental state of adolescents, to determine features of clinical manifestations and of mental status in patients with bronchial asthma, depending on degree of its control.

Materials and methods: 108 adolescents aged 11-17, ill with BA, of various levels of control. Luscher color test was used to determine the child's mental status. Anxiety score was assessed by Spielberger-Hanin State-Trait Anxiety Inventory. Depressive status and depression severity were evaluated by HDRS.

Results: The patients with UC BA reported unsatisfactory living conditions significantly more often compared to those with C BA and the children with PC BA compared to those with C BA ($p < 0.01$). Patients with PC BA and UC BA were found to have significantly increased proneness to conflict, marked emotional tension and lability, mood swings, increased anxiety, vulnerability and sensitivity, as compared to those with C BA. Significantly lower state anxiety was revealed in the patients with C BA as compared to those with PC BA ($p = 0.004$) and UC BA ($p = 0.0001$). Significantly lower mean values of depression values were detected in the patients with C BA compared to those with UC BA ($p = 0.011$) and PC BA ($p = 0.0015$).

Conclusions: The major factors influencing the psychological status of adolescents were: unsatisfactory living conditions, psychic and physical punishment, stress, heavy workload etc. The patients with BA developed psychological disorders under the influence of those factors.

KEY WORDS: adolescents, bronchial asthma, psychosocial factors, psycho-emotional disorders, psychosomatic pathology

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INTRODUCTION

Psychosomatic pathology develops and persists due to a special mechanism of relationship between the state of mind and body – this is the so-called mechanism of vicious circle: somatic disorders which develop first result in psychic changes, and the latter, in their turn, cause further somatic disorders. Bronchial asthma (BA) is a disease in which psychic and somatic disorders are closely interconnected and influence each other, but none of the numerous theories could give comprehensive explanation of etiology and pathogenesis of psychosomatic disorders. Study of psychosomatic pathology development in children, particularly in adolescents, takes a special place in modern medical science. Adolescence is one of the critical phases in a person's life – the period of hormonal changes and sexual maturation, myelination of conductive pathways of the nervous system, personality development and formation of social attitudes [1]. Age of adolescence is characterized by strong emotional sufferings, difficult relations with adults [2, 3]. All these factors can increase the incidence and severity of BA course in adolescents. Psycho-emotional problems are most evident in the children with severe asthma [4].

Significantly high score of anxiety among BA children as compared to healthy children have been found by a number of researchers [5].

Modern conceptions of BA pathogenesis include, except chronic inflammation, the mechanisms of neurogenic inflammation, which involve neuropeptides and imbalanced chains of autonomous nervous system. Continuous effect of stress inevitably results in exhaustion of psychological adaptive reserves, leading to the increased risk of somatic disorders [6].

Thus, BA belongs to classic psychosomatic disorders, but some authors do not exclude the direct effect of psychological factors on bronchomotor tone. According to recent data, about 25-30% of BA exacerbations in children and adolescents are associated with the periods of emotional exertion [7]. Changes in emotional and psychic status lead to more severe BA course as well as to the worsening of quality of life [8]. There have been numerous studies of psychosomatic disorders in BA, but few of them deal with psycho-emotional status of adolescents ill with BA as well as the role of environmental factors in this status. The problem of psycho-emotional state in this period of life is

of great significance from psychic and social point of view, and study of BA on the basis of integrated psychosomatic approach is thought to be the most pressing today.

THE AIM

To find out the factors which influence mental state of adolescents, to determine features of clinical manifestations and of mental status in patients with bronchial asthma, depending on degree of its control.

MATERIALS AND METHODS

According to the purpose of the study, 108 adolescents (45 females and 63 males) aged 11-17, ill with BA, were examined. The children were divided into three groups according to BA control level. Group 1 consisted of 36 patients (33.3%) with controlled course of the disease. Group 2 included 38 adolescents (35.2%) with partially controlled BA course, and group 3 - 34 patients (31.48%) with uncontrolled BA. 54 healthy adolescents - 22 males and 32 females - served as controls. Along with the complaints and history details, the most essential psychological factors, inducing predisposition to BA development and influencing the control over the disease in adolescents were studied. All the children underwent general clinical laboratory tests, allergic skin tests, determination of specific IGE level, and pulmonary function test. Anxiety score was assessed by Spielberger-Hanin State-Trait Anxiety Inventory [9]. Depressive status and depression severity were evaluated by Hamilton Depression Rating Scale (HDRS) [10]. Luscher color test was used to determine the child's mental status. The study was carried out in compliance with the provisions of World Medical association Declaration of Helsinki (1989), and was approved by Ethics Committee at Vinnytsia National Pirogov Memorial Medical University. All patients gave an informed consent to participate in the study.

Statistical data processing was done with Statistical package for Windows v. 8.0 (№AXXR910A374605FA). The normal distribution was evaluated according to Shapiro-Wilk test. Digital information of all clinical investigations was processed by variance statistical method calculating the mean value (M) and its error (m). For all specific data, the median (Me), lower and upper quartiles [LQ25-UQ75] were established. The comparison of quality indicators was performed using the χ^2 criterion. The significance of difference between two means was calculated by Student's t-test (t), between two relative values - by Fisher angular transformation method (φ^*). Comparison of quantitative values in some clinical groups was done using non-parametric analogue of ANOVA (analysis of variance) - Kruskal-Wallis H-test, $p < 0.05$ was considered significant difference. In case of significant differences between the groups, their pair-wise comparison was performed using Mann-Whitney U-test with regard to Bonferroni correction for multiple testing. The difference between the groups according to Bonferroni adjustment was considered statistically significant in $p < 0.017$.

RESULTS

The major studied factors, influencing adolescents' mental state, were found to be fatigue, anxiety, restlessness, sleep

disorders, psychic tension and lability. Fatigue was reported by 76.8% of patients, anxiety and emotional lability - by 48.2% and 37.9% of patients, respectively, while sleep disorders were found in 92.8% of patients. 37.7% of patients had several signs of anxiety and depressive disorders (ADD). The questionnaire survey demonstrated that fatigue occurred in 10.1% of children with controlled BA (C BA) and in 73.7% of those with uncontrolled course of disease (UC BA), the percentage being significantly higher ($\chi^2 = 8.3$; $p < 0.01$). Apart from high probability of relationship between fatigue rate and asthma attacks in patients with UC BA, relatively high degree of relationship was found ($\varphi = 0.53$, $p < 0.001$). Psychic tension and anxiety was observed significantly more often in adolescents with UC BA and partially controlled BA (PC BA) than in those with C BA - 28.7% and 24.9% versus 2.6% ($\chi^2 = 5.61$; $p = 0.029$; and $\chi^2 = 10.8$; $p = 0.001$, respectively). Sleep disorders occurred in 8.2% of cases among those with C BA, while they were found in 98.7% of cases among children with UC BA and PC BA ($\chi^2 = 8.20$; $p < 0.001$) and 92.6% ($\chi^2 = 10.28$; $p < 0.001$), respectively. Apart from high probability of relationship between sleep disorder rate and asthma attacks in patients with UC BA and PC BA, high degree of relationship was found ($\varphi = 0.71$; $\varphi = 0.68$, $p < 0.001$, respectively). Mothers of the children with UC BA were unemployed four times as often as those with C BA - 19.0% versus 5.6% ($\chi^2 = 8.32$, $p < 0.01$). Among fathers of the children with UC BA and PC BA there were much less persons of trade jobs than among fathers of those with C BA (20.3% versus 41.1%; $\chi^2 = 10.17$, $p < 0.01$; 20.3% versus 55.6%, $\chi^2 = 8.06$, $p < 0.01$, respectively). The results of the study showed that most of families with UC BA and PC BA children had strained relations between the parents, different outlook on bringing up children and attitude towards the disease, as well as other negative factors, in contrast to the families who had children with C BA.

According to the results of the study, formation and development of BA are greatly influenced by unsatisfactory living conditions. The patients with UC BA reported unsatisfactory living conditions significantly more often compared to those with C BA (49.4% versus 12.2%, $\chi^2 = 8.57$, $p < 0.01$), and the children with PC BA compared to those with C BA (46.6% versus 12.2%, $\chi^2 = 4.16$, $p < 0.01$). The families of C BA children had better living conditions as opposed to those with UC BA and PC BA adolescents. 78.9% of children with C BA had a separate room in the family's private house or apartment compared to 56.3% ($\chi^2 = 6.86$, $p < 0.01$) and 49.7% ($\chi^2 = 9.22$, $p < 0.01$) of those with PC BA and UC BA, respectively. The children as well as their parents reported the presence of a private house or apartment with a separate child's room to be a positive factor in maintaining family well-being.

Physical and psychological punishment was found to be used significantly more frequently by the parents of children with UC BA and PC BA compared to those with C BA. For example, punishment of various types, as the main form of education, was used significantly more often by the parents of UC BA children compared to those with PC BA (40.7%

versus 25.2%, $p < 0.01$) and C BA (25.2% versus 5.3 %, $p < 0.01$), while the parents of children with C BA used occasional punishment significantly more often as compared to those with UC BA (65.7% versus 42.1%, $p < 0.01$). No significant difference in this parameter was found between the children with PC BA and C BA (65.7% versus 49.5%, $p > 0.05$), PC BA and UC BA (42.1% versus 49.5 %, $p > 0.05$).

The study demonstrated that the first signs of bronchial asthma in the examined adolescents were caused by the following factors: psycho-emotional stress – 18.3%, stressful situations at school or family (changing school in particular) – 4.9%, divorce of the parents – 8.5%, loss of the beloved person – 4.9%.

The adolescents with UC BA and PC BA were found to have incomplete families as opposed to those with C BA (13.6% and 15.9% versus 6.1 %, $\chi^2 = 3.72$; $p < 0.05$, and $\chi^2 = 4.22$; $p < 0.05$, respectively), and 51.2% of patients with UC BA and PC BA lived in the families with low financial status. The frequency of stress situations among the adolescents was found to be similar: 52.3% - in the patients with UC BA, 50.8% - with PC BA and 44.5% - with C BA, with no significant difference between the groups, $p > 0.05$, respectively. 48.7% of adolescents with UC BA, 33.5% with C BA and 42.9% of children with PC BA studied at lyceums and gymnasiums. 28.9% of adolescents with UC BA and 19.8% with PC BA spent their study-free time at the computer (2-6 hours a day on an average), the boys preferring computer games and the girls – internet, as compared to the adolescents with C BA, who were engaged in sport activities significantly more often than being at computer (40.7% versus 9.4%, $p = 0.0001$). The study demonstrated that the adolescents with UC BA required communication with both parents significantly more often compared to those with C BA – 2.96 ± 0.58 versus 2.18 ± 0.50 , $p < 0.05$, while no significant difference between the groups of the patients with UC BA and PC BA was detected (2.96 ± 0.58 versus 2.77 ± 0.42 , $p > 0.05$). Need in communication with mother was observed significantly more often in the adolescents with UC BA compared to those with PC BA (2.58 ± 0.45 versus 2.02 ± 0.69 $p = 0.003$), while there was no significant difference between the groups of patients with UC BA and C BA, PC BA and C BA (2.58 ± 0.45 versus 2.47 ± 0.70 , $p = 0.09$ and 2.02 ± 0.69 versus 2.47 ± 0.70 , $p = 0.25$, respectively). Evaluation of emotional affinity with the child showed the following results: 94.9% of mothers of C BA children reported mutual understanding and warm relations, 5.1% - distancing of the child, while 31.0% of adolescents with UC BA marked the absence of confidential relations with the parents.

Adolescents with UC BA needed warm relations with father significantly more often compared to those with PC BA and C BA (2.09 ± 0.65 versus 1.59 ± 0.84 , $p = 0.0005$; and 2.09 ± 0.65 versus 1.80 ± 0.95 , $p = 0.02$, respectively). Adolescents with C BA reported the wish to communicate with mother, indicating the lack of contacts which would meet their emotional need.

Luscher color test was used to determine mental status of study adolescents.

Analysis of the data obtained found no significant differences in emotional status of adolescents with C BA as compared to the group of healthy adolescents (by the following parameters: ostentation ($p = 0.83$), asociality ($p = 0.96$), environment dependence ($p = 0.67$), frankness ($p = 0.31$), optimism ($p = 0.20$), need for understanding ($p = 0.83$), need for communication ($p = 0.80$), need for quietness ($p = 0.47$), rationality ($p = 0.49$), sensitivity ($p = 0.11$), psychic lability ($p = 0.61$), craving for dominance ($p = 0.48$), anxiety ($p = 0.62$), difficulty in adaptation ($p = 0.21$), proneness to conflict ($p = 0.79$), persistence ($p = 0.37$), fatigue ($p = 0.46$), feeling of desolation ($p = 0.24$), emotional tension ($p = 0.22$), emotional immaturity ($p = 0.62$), emotional vulnerability ($p = 0.49$)) (Fig. 1).

Patients with PC BA and UC BA were found to have significantly increased proneness to conflict ($p = 0.004$; $p = 0.002$, respectively), marked emotional tension ($p = 0.03$; $p = 0.02$, respectively) and lability ($p = 0.016$; $p = 0.003$, respectively), mood swings ($p = 0.001$; $p = 0.007$, respectively), increased anxiety ($p = 0.028$ and $p = 0.047$), vulnerability ($p = 0.0059$ and $p = 0.008$), and sensitivity ($p = 0.006$ and $p = 0.007$, respectively), as compared to those with C BA (Fig. 2).

The desire to free from restrictions and craving for freedom and self-affirmation proved to be significantly stronger among wide range of problems in patients with UC BA and PC BA. Yellow and red colors were first to be chosen significantly more often both by patients with UC BA and those with PC BA as compared to those with by patients C BA (27.3% and 23.3%, versus 10.9 %, $p < 0.05$, respectively).

The first position of yellow color implied the desire to free from conflict, hope for freedom. Red and yellow (23.3 % and 29.8 %, versus 8.7%, $p < 0.001$, respectively) colors took the second position, while dark blue and violet (24.8% and 20.7%, versus 5.4 %, $p < 0.001$, respectively) colors appeared on the third position. Besides, 22.2% of adolescents with UC BA, 18.6 % of adolescents with PC BA and 1,2 % of adolescents with C BA gave the first position to additional colors – black, grey and brown, being indicative of need for escaping the reality, unrealistic requirements to life, subjectivism, emotional immaturity, non-participation, detachment, the desire to protect oneself against any external influence.

Besides, black color on the first positions suggested some additional source of anxiety in children, the protest against current circumstances, predisposition to depression. In children with C BA and in the control group red, dark blue and green colors took the third place significantly more often, as compared to those with by patients UC BA and PC BA (33.8 % and 32.2 %, versus 9.3 % and 11,4 %, $p < 0.001$, respectively).

The average values of both trait and state anxiety by Spielberger-Hanin State-Trait Anxiety Inventory appeared to be significantly higher than anxiety scores in healthy individuals – 44.0 [35.0; 49.0] scores and 41.0 [34.0; 48.0] scores, respectively, versus 24.0 [22.0; 28.0] and 28.0 [26.0; 32.0] scores, respectively ($p < 0.05$). Adolescents ill with BA had significantly higher level of trait and state anxiety

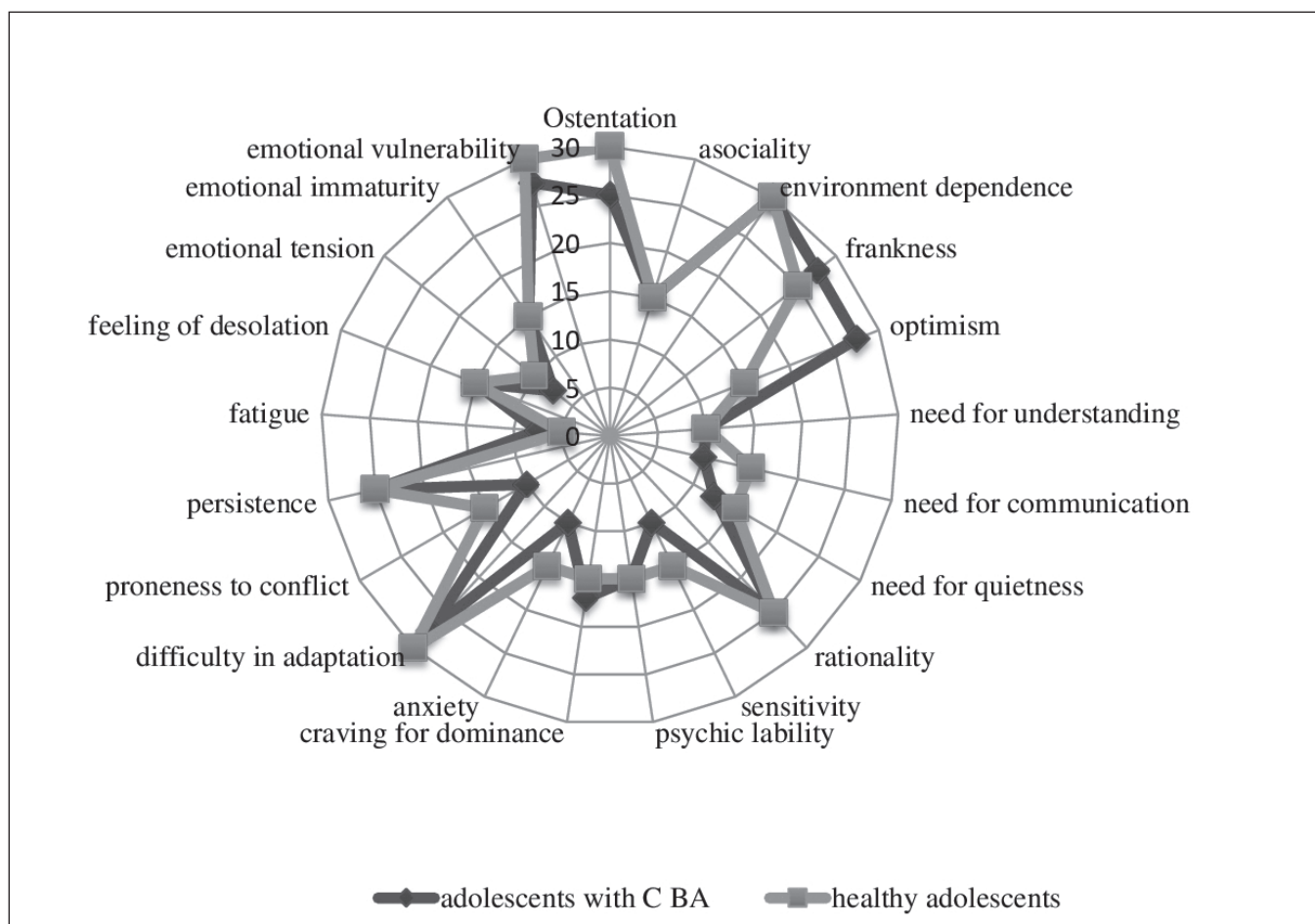


Fig. 1. Indicators of the emotional status of adolescents with C BA and healthy adolescents by Lusher's test

(TA and SA) by Spielberger-Hanin scale compared to their healthy counterparts (48.1% versus 8.5% $\varphi^*_{emp} = 4.732 > 1.64 = \varphi_{cr}, \rho_{\varphi} < 0.001$ and 42.6% versus 6.7%, $\varphi^*_{emp} = 4.262 > 1.64 = \varphi_{cr}, \rho_{\varphi} < 0.001$, respectively). Low SA level was found significantly more often in the group of adolescents with C BA (83.3%) compared to those with PC BA (25.9%), at $\varphi_{emp} = 2.819 > 1.64 = \varphi_{cr}, \rho_{\varphi} < 0.01$ and UC BA (16.7%), at $\varphi^*_{emp} = 3.606 > 1.64 = \varphi_{cr}, \rho_{\varphi} < 0.01$, respectively.

Evaluation of TA and SA in the patients with various degrees of BA control demonstrated significant difference in SA between the studied groups (K-W $H(2) = 21.47, p = 0.000 < 0.05$), while no significant difference in TA was found (K-W $H(2) = 2.75, p = 0.25 > 0.05$). SA level in the patients with C BA was revealed to be significantly lower as compared to those with PC BA (M-W $U = 415, Z = -2.90, p = 0.004 < 0.017 = 0.05/3$) and UC BA (M-W $U = 242, Z = -4.37, p = 0.000 < 0.017 = 0.05/3$), while there was no significant difference in this index between the groups of patients with UC BA and PC BA (M-W $U = 445.5, Z = 2.26, p = 0.02 > 0.017$), (Fig. 3).

Mean values of depression (DD) in adolescents ill with BA proved to be 13.1 ± 5.1 scores by HDRS scale, being significantly higher than those in the control group - 3.3 ± 1.9 scores ($p < 0.001$).

The analysis of DD values in the patients with various control levels found significant difference between the groups according to HDRS (K-W test: $H(2) = 9.85, p = 0.007 < 0.05$). Significantly lower DD values were detected in the patients with C BA compared to those with UC BA (M-W $U = 397.0, Z = -2.5, p = 0.011 < 0.017 = 0.05/3$) and PC BA (M-W $U = 390.0, Z = -3.17, p = 0.0015 < 0.017 = 0.05/3$). No significant difference in DD values between the groups of patients with UC BA and PC BA were found (M-W $U = 624.0, Z = -0.24, p = 0.080 > 0.017 = 0.05/3$) (Fig. 4).

Thus, bronchial asthma changes the lifestyle of sick children and negatively influences

their psychological status. BA is known to change the emotional state of the patients, leading to pathologic anxiety, - the factor contributing to emotional hyperfunction.

The data obtained were confirmed by the clinical study data. In adolescents with UC BA and PC BA, accompanied by ADD, asthma attacks rate significantly increased unlike those with UC BA and PC BA with no signs of ADD (5.2 ± 0.8 and 4.7 ± 0.5 versus 2.2 ± 0.4 and $1.8 \pm 0.2, p < 0.05$, respectively). Patients with UC BA and PC BA were found to require medicines for emergency care significantly more often as compared to those with no ADD signs (8.7 ± 0.5 and 7.6 ± 0.3 versus 2.3 ± 0.4 and $1.2 \pm 0.2, p < 0.05$, respectively),

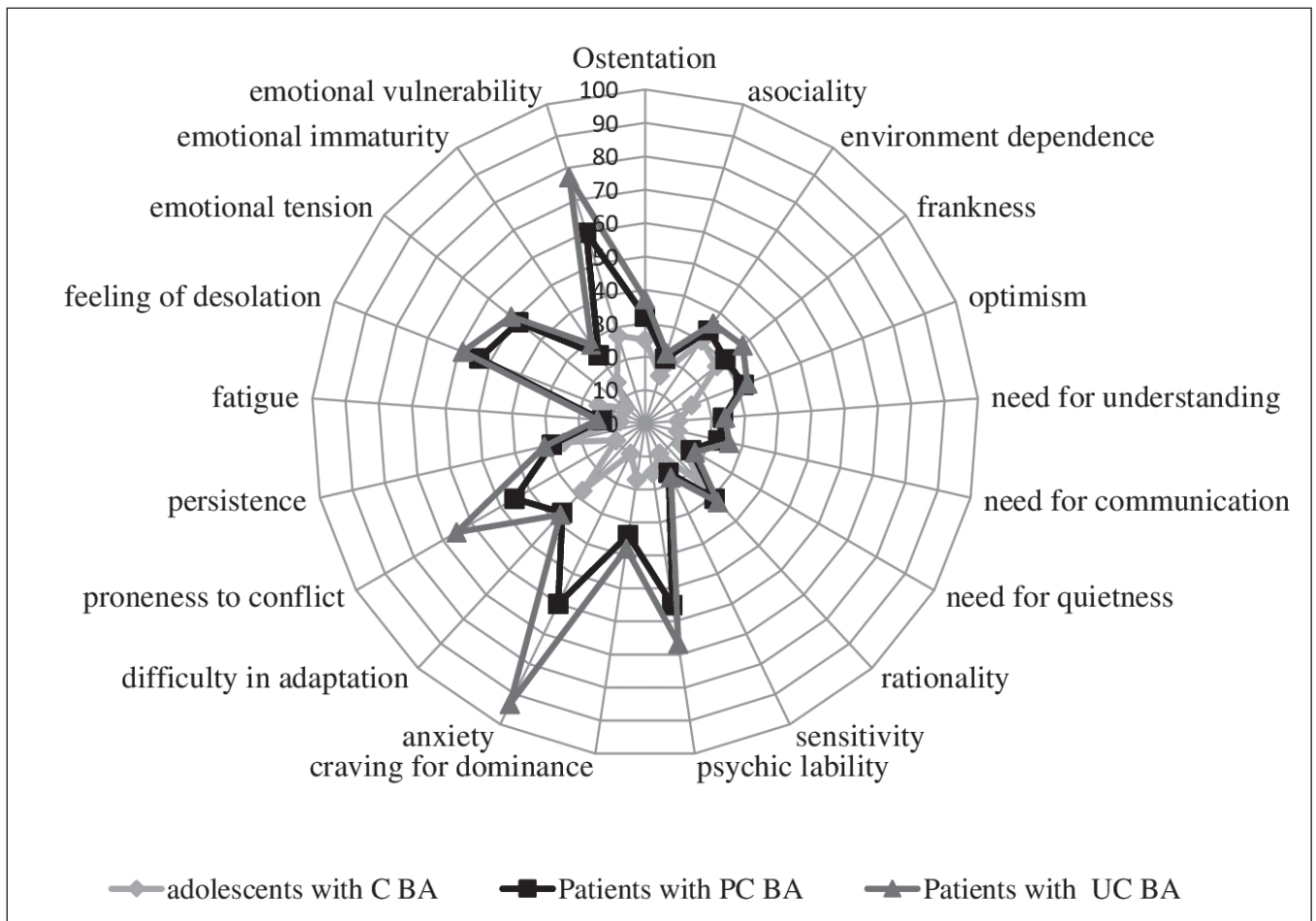


Fig. 2. Indicators of the emotional status of adolescents with C BA, UC BA and PC BA by Lusher's test.

their hospital stay was 23 ± 2.4 days, being significantly longer than in patients with no ADD, 11.3 ± 0.9 days, $p < 0.05$, respectively.

DISCUSSION

Asthma is one of the most common chronic diseases of childhood. Those particularly affected are young, poor, children. Paediatric bronchial asthma causes respiratory related mortality and morbidity globally and elevates the risk of psychological and social problems (psychosocial problems); which may result in poorer asthma control [4, 8, 13, 14]. Some studies which identify anxiety disorders as very common among children with asthma. Despite the ample published research on asthma prevalence and asthma management interventions, there is little research available on barriers to asthma care among [1,7, 11, 15]. The data received in the study are consistent with those obtained by Bellin M. H., et al., [7] children with a reduced socioeconomic status have low levels of control and effects of symptoms. Low socioeconomic status of mothers can lead to social deterioration or deficits in many areas such as finance, self-management and home management, knowledge of the disease, as well as the ability to understand asthma education.

Tunde-Ayinmode M. F., [8] found that psychological morbidity was present in 25% of the children. Psychological morbidity was significantly associated with lower maternal education ($p=0.020$) and occupation ($p=0.038$), polygamy ($p=0.012$), fathers having more than 5 children ($p=0.027$) and mothers having inadequate spousal support ($p=0.012$), which is consistent with our data

Özkaya E., et al., [11] report that depressive disorders are also very common or even more prevalent among these patients, while usually there are cases of anxiety and depression. The data received in the study are consistent with those obtained by S.L. Letitre et al., [12] indicating that children with well controlled bronchial asthma have no increased risk of anxiety, depression and low self-assessment.

Family factors have always received attention in literature as being able to influence onset and course of asthma and as risk factor of psychological morbidity in both child and family members. Sadof M et al., [13] indicate that family emotional characteristics, asthma management behaviors, and physiological factors account for key influences on pediatric asthma onset and outcomes. Behavioral and physiological mechanisms may act independently or may interact to affect asthma manifestations. Families with specific emotional characteristics may be at an elevated

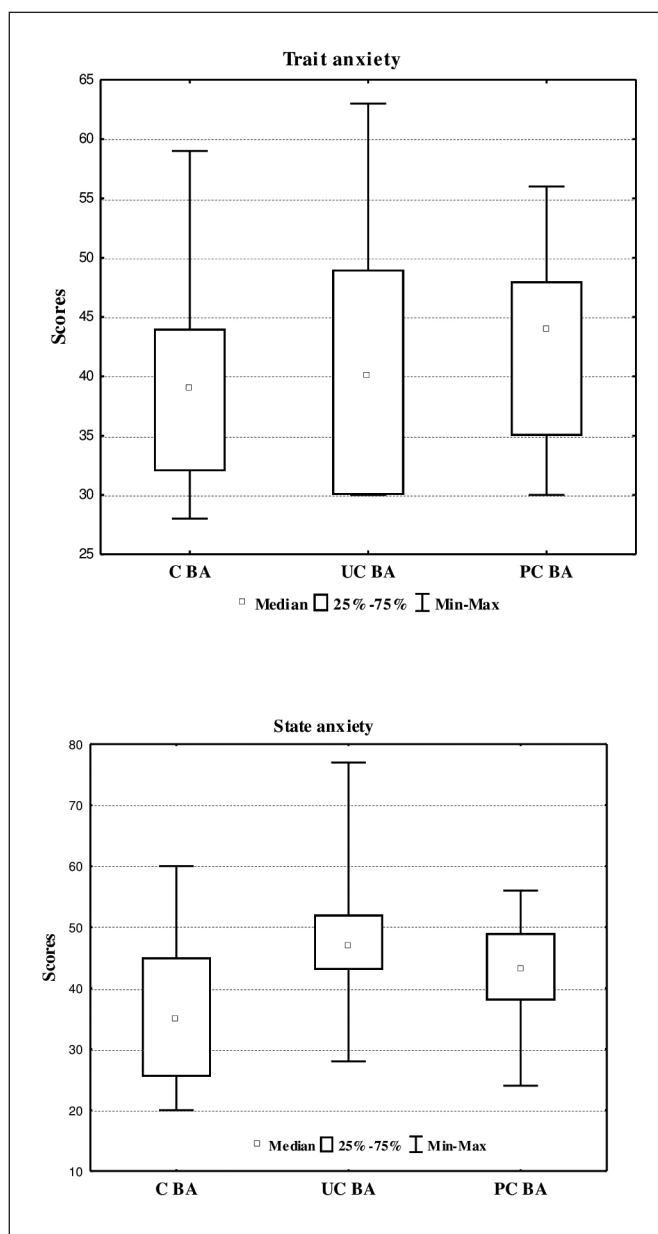


Fig.3. Levels of TA and SA by Spielberger-Hanin scale in adolescents ill with BA of various control levels (scores).

risk for poorer asthma outcomes. Different types of parental stress/coping behaviors and parenting styles may differently predict their children’s asthmatic status, and such associations may change as children grow, which is consistent with our data.

Goodwin R. D., et al., [14] found that more severe and persistent asthma at age 5 was associated with significantly increased odds of affective, anxiety, somatic, oppositional defiant and conduct problems at ages 5-17. Mild asthma and remitted asthma were not associated with heightened vulnerability to mental disorders. Results suggest that youth with symptomatic asthma are more likely to suffer from a wide range of mental health problems, and that the likelihood of mental health problems appears to increase as a function of asthma severity. Youth with poorly con-

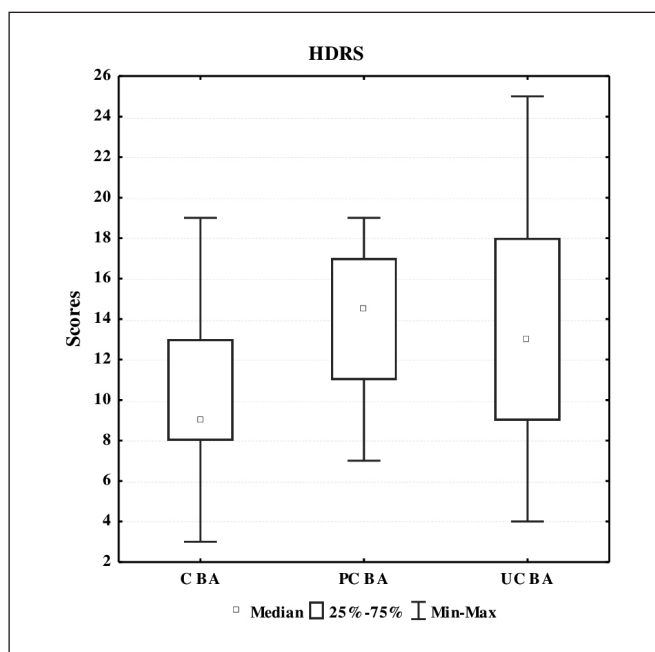


Fig. 4. Values of HDRS scale in adolescents with BA and various types of disease control (scores).

trolled and/or more severe and persistent asthma may be considered a vulnerable group who might benefit from mental health screening in clinical, school and community settings. According to our data, patients with UC BA had the signs of depression and anxiety significantly more often, while mental state of adolescents with C BA was characterized by low anxiety score and depression. The data received in the study are consistent with those obtained by Brady A.M., Deighton J. et al., [15] found a strong relationship between asthma in adolescence and an increase in the prevalence of anxiety and depressive disorders. The psychological characteristics of asthmatic patients and the presence of mental problems, have been shown to be linked to both asthma severity and level of disease control.

According to Yatham L.N., et al., [6] anxiety produces constant tension, similar to chronic uncontrolled stress with consequent disturbances in neuromediator system which influence the immune system and lead to persistent BA. Psychological trauma (even the minimal one), in its turn, enhances the anxiety, leading to the development of clinical symptoms of the disease due to neuropeptide overproduction, as well as the activation of sympathetic or parasympathetic nervous system. Increased anxiety, combined with atopic mechanisms of BA formation, result in more severe clinical manifestations of the disease and contribute to its progression.

Difficulties in achieving the objectives of asthma therapy suggested by current guidelines may depend also on psychological factors. Despite numerous data support this association, a causal relationship between asthma and mental health is not clear. Independently of the nature of this association, when a psychological problem or

difficulty is present, it interferes with an optimal disease management, especially in patients with severe asthma and poor control. At the same time, the psychological characteristics of asthmatic patients have an influence on symptoms' recognitions, daily management and disease outcomes.

A screening of mental symptoms and psychological aspects that are known as associated to asthma, could lead to plan appropriate intervention to better control asthma and to improve the patient's well-being.

CONCLUSIONS

The main factors influencing mental status of adolescents were: psychic and physical punishment, absence of trusting relationships with parents, stress, heavy workload, emotional lability and tension. The results obtained were indicative of emotional disorders in adolescents ill with BA, their severity depending on the level of disease control. Under the influence of those factors, patients with BA developed the following psychological disorders: anxiety, psychic and emotional tension, restlessness. Patients with UC BA most often had the signs of depression and anxiety, while mental status of adolescents with C BA was characterized by low anxiety score and depression.

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Authors' contributions:

According to the order of the Authorship.

Conflict of interest:

The Authors declare no conflict of interest.

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