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QUALITY OF LIFE IN CHILDREN WITH DIFFERENT NOSOLOGICAL FORMS OF ALLERGIC DISEASE

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Abstract: *In this article, the results of the study of indicators of quality of life of patients with bronchial asthma combined with allergic rhinitis in children are highlighted. The study was conducted in the children's allergology department of the multidisciplinary clinic of the Tashkent Medical Academy. The indicators of quality of life in children under examination are "nasal symptoms", "general symptoms", the severity of practical problems in patients with various nosological forms of allergic rhinitis, indicators of negative symptoms, limitation of activity due to general AR - 65%, with BA - 68% and AR +BA comorbid when - 88.0% of patients had unsatisfactory results.*

Key words: *allergic rhinitis, bronchial asthma, children, quality of life, comorbid.*

INTRODUCTION

Allergic rhinitis is common in paediatric age worldwide, its prevalence ranging from 0.8% to 14.9% in 6–7-years old and 1.4% to 39.7% in 13–14-year-old children [19].According to the ISAAC Phase III study, AR prevalence increased from 8.5% in children aged 6–7 years to 14.6% in those aged 13–14 years, especially in many low-income and middle-income countries (LMICs) whereas little change was observed in western Europe [20]. In 80% of cases, AR symptoms occur before the age of 20 years, and 40% of these cases developed symptoms before the age of 6 years [21].

AR is frequently associated with other atopic diseases, including asthma, allergic conjunctivitis, and eczema. In particular, most patients with asthma have comorbid AR, whereas less than one-third of those with AR have asthma[22]. Indeed, epidemiological evidence indicates that about 30% of patients with rhinitis develop asthma during their life course and up to 80% of persistent asthma subjects suffer from coexisting rhinitis [23,24]. Of note, the relationship between the over mentioned conditions has been relatively consistent over the years, despite changes in global prevalence [25].

Overall, AR incidence in individuals with asthma appears to increase with age. Indeed, recent data have shown that adolescents with asthma have significantly more frequent comorbid rhinitis ($p = 0.02$; OR = 2.07) when compared with younger children [26]. In line with this finding, extensive prospective follow-up data from the MAS birth cohort study previously found that, at age 20, asthma occurred more frequently in association with AR than as a single entity [27]. When taking into account the patient's sensitization profile, despite previously published evidence of a more frequent association between allergic rather than non-allergic rhinitis and asthma, more recently, the *Mechanisms of the Development of ALLergy (MeDALL)* study, which included data from 12 European birth cohorts, showed that the coexistence of rhinitis and asthma is more common than expected by chance, regardless of IgE sensitization, suggesting that these diseases share causal mechanisms other than atopic sensitization [28,29].

There is evidence that AR has an impact on asthma, as shown in a large school-based cohort study reporting that the majority of children had comorbid AR, which was associated with increased asthma morbidity. In particular, in comparison with children without AR, those with comorbid asthma and AR had significantly fewer symptom-free days ($p < 0.001$), more daytime symptoms ($p < 0.001$), more rescue medication use ($p < 0.01$), and more activity limitation due to asthma ($p < 0.001$) [30].

Taken together, these findings suggest that AR should be routinely investigated in children and adolescents with asthma in order to optimize treatment and achieve better asthma control and, likewise, the resolution of AR symptoms.

In the world, the rate of comorbidity of allergic rhinitis with bronchial asthma is increasing day by day, especially in economically developing countries. According to the World Health Organization (WHO), "... allergic rhinitis comorbidity with bronchial asthma occurs in 18% to 45% of children and more" [1,2,3]. It is known that "... the prevalence of the disease in different countries is on average up to 4 cases per 1000 children". In many countries of the world, the constant increase in the number of children with allergic rhinitis is due to patients' misinterpretation of the symptoms of the disease, failure to consult a pediatric allergist in time, failure to perform diagnosis and treatment on time, which shows the severity of the problem. [1,4,6] In children with various forms of allergic disease, quality of life indicators are changed, which are important not only for patients, but also for the whole family [3,5].

Among the topical issues of modern allergology, the problem of allergic rhinitis (AR) in children has a special place [1,5]. Allergic rhinitis is one of the

common allergic diseases in childhood [2,4]. This disease is a global problem, because it has a high specific place in allergic pathology (60-70%) and is also common in the pediatric population (10-15%), which emphasizes the importance of this problem [4,6].

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The "United airways disease" (UAD) concept clearly defines that upper and lower airways are part of a single organ. Upper and lower airway diseases frequently co-occur, reflecting the existence of a common underlying immunological background. UAD includes rhinitis, chronic rhinosinusitis (CSR), nasal polyposis (NP), and concomitant/comorbid lower airways disorders: asthma, chronic obstructive pulmonary disease (COPD), bronchiectasis, cystic fibrosis (CF), and obstructive sleep apnoea (OSA) [11].

Under the epidemiological perspective, the cross-relationship between allergic rhinitis and asthma is clear-cut. As mentioned above, approximately 80% of asthma patients suffer from rhinitis, and 30% of patients with rhinitis have asthma. AR represents a significant risk factor for asthma (odds ratio, OR 3.5). The risk of asthma in AR is more evident in children than in adults (OR 4.1 vs 3.4) [31]. The involvement of both upper and lower airways leads to a greater burden in terms of patients' health status and requires a more complex diagnostic and therapeutic plan. Of note, even in the absence of symptomatic asthma, a relevant proportion of patients affected by AR do present airway hyper-responsiveness (AHR) documented by positive bronchial provocation test and reversible airflow obstruction. Non-asthmatic patients with AR also showed the presence of lower airway inflammation and some degree of airway remodeling [30].

Different mechanisms may underlie the increased bronchial hyper-reactivity in the presence of an impaired nasal function. The loss of nasal function due to mucosal congestion and retention in the nasal cavity hampers the airflow through the upper airways in favour of oral respiration and oral breathing, which are associated with a higher risk of bronchospasm [30,31]. In fact, oral breathing bypasses the functional role of the nose in terms of warming and humidifying air, which therefore reaches the bronchi being cooler and drier. In addition, nasal mucus and mucus-ciliary apparatus filter the particles and gaseous materials in inhaled air before they reach the lower airways; on a functional ground, in the nose both innate and specific immune system

cooperate to avoid infectious agent to reach the lower airways[26,27]. Therefore, nasal obstruction is strictly related to the allergens or cold air loading directly into the bronchial airways, and to the consequent increase of airways causing hyper-responsiveness.

Another mechanism that could underlie bronchial hyper-reactivity in AR patients is the so-called nasobronchial reflex. It represents a branch of the diving reflex, which physiologically leads to suppression of respiration, laryngospasm, and bronchoconstriction when the head is underwater water [17, 18]. In that case, vagal and trigeminal pathways and afferent receptor site mediate broncho-constriction. However, the relevance of that mechanism in AR patients' bronchial hyper-responsiveness is still controversial [19,30].

Materials and research methods. The study was conducted in the pediatric allergology department of the multidisciplinary clinic of the Toshken Medical Academy. Allergic rhinitis, bronchial asthma, and bronchial asthma combined with allergic rhinitis were examined. The age of patients diagnosed with allergic rhinitis was from 7 to 12 years, and the average age was 9.1 ± 0.31.

Research methods and materials. The study was performed at the Children's Allergology Unit of multifunctional clinic of Tashkent Medical Academy where we examined 79 patients with diagnosed allergic rhinitis.

The age of patients diagnosed with allergic rhinitis varied from 6 to 12 years old with average one 9.1 ± 0.31 years old.

Prior to coming to the clinic all the patients completed a questionnaire aiming definition or confirmation of allergic rhinitis. The questionnaire was worked out and adopted within international ARIA program. The questionnaire consists of two main and 10 minor questions. Minor chapters included "yes" or "no" answers (Table 1).

The diagnosis was determined according to ARIA international classification. In the process of the study forty patients were diagnosed with intermittent AR (IAR) and thirty-nine with persisting AR (PAR). When interviewed about the history we found out that besides AR manifestations all the patients had clinical symptoms of BA (attacks of short-breathing, coughing, and dispnoe).

By means of scratching test we determined sensitivity to various groups of allergens. Efficacy of immune therapy was assessed on the basis of 4 grade scale:

"4" – very good result (complete elimination of clinic manifestations after the course of therapy);

"3" – good result (significant improvement of nasal breathing, restoration of olfactory function, rhinorrhea and sneezing had strong correlation with allergy);

"2" – satisfactory result (significant decrease of manifestation of basic symptoms compared to the state before the therapy, less need in pharmaceutical therapy);

"1" – non-satisfactory result (no effect of therapy).

Table 1

ADOPTED ARIA, ALLERGIC RHINITIS QUESTIONAIRE

Question	Answer	
1.Do you have the following symptoms at least for one hour most days (or are they seasonal)?		
• *excretion from nose*	Y	N
• *sneezing, frequent attacking*	Y	N
• *nasal congestion*	Y	N
• *nasal itching*	Y	N
2. Do you have the following symptoms?		
• only unilateral nasal symptoms	Y	N
• nasal congestion without other symptoms	Y	N
• green or yellow thick excretion from nose	Y	N
• *thick excretion from nose to throat or/and*	Y	N
• *recurrent nasal bleeding*	Y	N
• *deterioration of olfactory function*	Y	N

The obtained results were processed using SPSS. Within the study degree of every characteristic was compared between the groups.

Reliability degree (P) of statistic analysis for all tests was calculated, and accepted critical value was equal to 0.05.

When all patients were asked for anamnesis information, it was found that they had not only AR clinical symptoms, but also BA clinical symptoms (asphyxia attacks, acute cough, wheezing). Standard clinical, allergological and immunological diagnostic methods were used to diagnose allergic rhinitis and bronchial asthma.

When studying nasal symptoms from the point of view of quality of life, they were examined in the entire group of patients with different nosological forms of AR. "Nasal congestion" was the least expressed in AR patients (3.20±0.16) compared to AR +BA group (4.21±0.28) $r<0.05$. In AR patients with AR, the "runny nose" became apparent during periodic or significant contact

with allergens. In this category of patients, nasal congestion became permanent during the period of sensitization by allergens due to the progression of the disease. AR+BA patients had higher values of "runny nose" (4.21±0.28), children in this group had both allergic and inflammatory runny nose, which was less severe than AR patients.

"Rhinorrhea" was more observed in comorbid disease compared to AR (2.47±0.23) and AR+BA (4.24±0.18) and it had a continuous character r<0.001. "Sneezing" occurred at the same frequency in all patients, significantly, no difference was found between groups, r>0.05. "Nasal itching" was significantly expressed in patients with AR+BA (4.61±0.19) compared to patients with AR (3.85±0.21) (r<0.05) (Table 2).

Table 2

Evaluation of indicators of "nasal signs" in children under investigation

Group	AR n=40	AR+BA n=33
Simtoms	M±m	M±m
Runny nose	3,20±0,16	4,21±0,28*
Rhinorrhea	2,47±0,23	4,64±0,23**
Sneezing	2,45±0,22	3,24±0,18*
Itchy nose	3,85±0,21	4,61±0,19*

*Note: **r < 0.001 - significance of differences between groups 1 and 2;*

The "common symptoms" of AR were also studied, such as daytime fatigue, weakness, decreased learning, decreased concentration, thirst, and headaches. When comparing these indicators between groups, it was found that all these indicators were significantly expressed in patients with AR+BA r<0.001.

In the AR group, patients with AR+BA had a lower rate of attention deficit compared to patients with BA. In patients with AR, no "general symptoms" were observed in the absence of the main symptoms of AR during the remission period of the disease, but during the exacerbation of the disease, these symptoms episodically affected the child's daily life, resulting in a decrease in the quality of life index. AR+BA patients in group 3 had a serious impact on quality of life indicators due to inflammation and allergic process during the exacerbation of the disease. As a result of the progression of the disease in patients with BA, many patients adapted to their condition and this indicator almost did not bother them, r> 0.05. (Table 3).

Table 3

Assessment of indicators of quality of life according to "common symptoms" in children with different nosological forms of allergic disease

Groups	AR n=40	AR+BA n=39	BA n=33
Signs	M±m	M±m	M±m
Daytime fatigue	2,75±0,23	4,23±0,14*'**	2,74±0,24
Dry mouth "thirst"	3,12±0,24*	4,39±0,11*'**	3,10±0,27**
A decrease in the assimilation of the lesson	2,55±0,23*	4,83±0,34 *'**	3,69±0,13**
Fatigue	2,63±0,26*	5,52±0,24 *'**	3,77±0,24**
Decreased concentration	2,3±0,21	3,9±0,12	2,71±0,35
Headache	2,13±0,24*	4,84±0,12*'**	3,34±0,29**

*Note: *r < 0.001 - significance of differences between groups 1 and 2.*

The relationship between quality of life indicators "general symptoms" and the main symptoms of AR was studied.

Patients with AR showed a moderate, direct correlation (r = 0.48–0.43) between nasal and general symptoms (r < 0.05). The main symptoms of children in this category are not related to general symptoms, because the duration of the disease was at least 1 month, and the symptoms were quickly eliminated, and did not affect the quality of life of the child.

Severe nasal itching in AR+BA patients in group 3 affected the severity of all practical problems, resulting in an inverse, strong correlation (r = 0.8; 0.94; 0.61), r< 0.01. A severe runny nose during an exacerbation requires significant practical problems with the need to carry a handkerchief and rub the nose (r = 0.82; 0.59). Practical problems were clearly observed in this group, as the presence of a joint factor of inflammation and allergic genesis in the process was confirmed (r<0.01).

Result and Discussion. Patients with AR+BA often showed negative symptoms such as irritability (4.56±0.28), anger (3.93±0.25) and resentment (4.33±0.26) during the exacerbation of the disease. <0.01. No significant differences were found in the analysis of negative symptoms during disease progression when comparing the AR and BA groups. Compression was detected in patients of all groups, but its frequency did not have significant differences (r>0.05) when comparing between the examined groups.

In the group with AR, emotional lability was noted, during the period of AR exacerbation, it was manifested by embarrassment and frustration from a runny nose during the day, an inverse, moderate correlation was noted (r=0.52, 0.41), (p <0.01). Frequent sneezing caused a feeling of discomfort (r=0.5), (p <0.01). Moderate and direct correlation r<0.05 was found as sneezing caused feelings of nervousness (r=0.39) and embarrassment (r=0.49) together with emotional lability.

A moderate, direct correlation was found between emotional lability in the form of nasal symptoms (sneezing) and feeling of discomfort during the exacerbation of the disease with BA (r=0.49), r<0.01. Mild or absent runny nose, sneezing, and coughing did not affect emotional symptoms in children in this group, as no correlation was found between them. With the persistence of the disease, patients have already adapted to these conditions, and they did not affect the emotional state of the child and did not worsen the quality of life.

In the 3rd group with AR+BA, due to severe itching, the child had a feeling of irritability and anger, irritability (r = 0.8; 0.6), (r < 0.01). A significant, direct correlation was noted between nosebleeds and emotional symptoms, i.e. child's resentment, anger and embarrassment (r =0.65, r=0.51; 0.59) r<0.01. Nosebleeds during exacerbation of AR significantly affected the child's emotional state, worsened the quality of life of the patient and his family.

The concept of general activity limitation in children with AR+BA includes assessment of impairment in daytime functioning, learning ability, peer communication problems, and reluctance to play sports. Activity limitation in these children is a decrease in daily activity (5.27±0.20), learning difficulties (4.58±0.4), difficulties in communicating with peers (4.91±0.1) and reluctance to play sports. (4.42±0.3) was observed r<0.001. In patients with AR and BA, the indicators of general activity limitation had almost the same values.

In patients with allergic rhinitis, runny nose limited the child's daytime activity in the period of exacerbation of AR (r=0.52), and sneezing caused discomfort in sports (r <0.01). All indicators of limitation of activity in patients with BA were expressed, but nasal symptoms did not affect the course of the disease, only a correlation was found between nasal stuffiness and a decrease in daily activity (r = 0.56), (r<0.01). In this group of patients, obvious hypoxia is detected, but due to the persistence of the disease, the patients have adapted to their condition.

In group 3 children with AR+BA, there is a correlation between persistent nosebleeds and activity limitations, for example: a correlation was noted between decreased daily activity (r =0.61) and educational process (r =0.5). Sneezing caused limitations in sports activities (r =0.6; 0.51). Strong itching in

the nasal cavity was observed to be related to activity restrictions, for example: a correlation between daily activities (r =0.69), sports (r =0.58) was found, r <0.01.

In patients with different nosological forms of AR, problems with sleep disorders reduced daily activity, limited the desire to play sports, which subsequently led to a decrease in the ability of patients to study, learn (r = 0.69) and communicate with peers (r = 0.57). A clear and direct correlation was noted between sleep disturbances and behavioral problems in this group of patients with AR. In patients with BA, sleep problems were reflected in the educational process only during the exacerbation of the disease, a moderate, direct correlation (r =0.48) was found, r<0.01. In patients with AR+BA in group 3, sleep disturbance affected the educational process (r =0.7) and reluctance to do sports (r =0.67). In this group of patients, the correlation was significant and direct, because under the influence of two factors, i.e. inflammation and allergic processes together aggravated the course of the main disease. Subjective evaluation of the condition, i.e., the well-being of patients, includes evaluation of the quality of life as good, satisfactory and unsatisfactory.

Conclusion. Thus, 65% of patients with AR, 68% with BA, and 88.0% of patients with combined AR +BA assessed their general condition as unsatisfactory due to limitation of general activity. Patients with different nosological forms of the disease have negative emotional symptoms associated with the course of the main disease, which is also important for the quality of life of the patient and his family.

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