

Asthma Control in Multimorbid Patients

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Abstract

Background: The aim of this study was to evaluate the asthma control in multimorbid patients to personalize asthma treatment.

Methods and Results: The study involved 237 asthma patients (51 men and 186 women) aged 18 to 78 years (mean age of 52.6 ± 1.3 years). All patients were divided into 3 groups: Group 1 included 59(24.9%) patients with normal body weight, Group 2 included 69(29.1%) overweight patients, and Group 3 had 109(46.0%) obese patients. The mean BMI was of 23.14 ± 2.84 kg/m², 27.60 ± 2.58 kg/m², and 35.82 ± 10.23 kg/m² in Groups 1, 2, and 3, respectively ($F=65.572$, $P=0.0000$). Research methods included numerical rating scale (NRS) for a qualitative assessment of the severity of asthma clinical symptoms, asthma control questionnaire (ACQ-5) to assess asthma control, asthma quality of life questionnaire (AQLQ). Comorbidities were analyzed according to medical records.

The mean number of comorbidities among all studied patients was 4.31 ± 0.27 : 55(23.2%) people had ≤ 2 comorbidities, 118(49.8%) people had 3-5 comorbidities, and 64(27.0%) people had ≥ 6 comorbidities. The Group 3 patients had significantly more comorbidities than patients of Groups 1 and 2 ($P=0.000$). The mean value of the ACQ-5 results was 0.97 ± 0.32 , 1.06 ± 0.53 , and 1.82 ± 0.55 in Groups 1, 2, and 3, respectively ($F=77.1896$, $P=0.0000$). The level of AC, according to the ACQ-5, had a positive correlation with the number of comorbidities ($r=0.5418$, $P<0.05$) and a negative correlation with all scales of the AQLQ: activity limitation ($r=-0.6376$, $P<0.05$), symptoms ($r=-0.6577$, $P<0.05$); emotional function ($r=-0.4535$, $P<0.05$); environmental stimuli ($r=-0.4529$, $P<0.05$), and general QOL ($r=-0.6504$, $P<0.05$).

The asthma course is negatively affected by multimorbidity, which is most pronounced in obese patients. An increase in the number of comorbidities significantly worsens AC in patients of all studied groups, while the worst control level was observed in obese patients. A personalized program for managing multimorbid asthma patients should be developed and implemented, considering the multivariate assessment of treatable signs of disease. (**International Journal of Biomedicine. 2023;13(1):37-40.**)

Keywords: asthma control • multimorbidity • body mass index

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Abbreviations

AC, asthma control; ACQ, asthma control questionnaire; AQLQ, asthma quality of life questionnaire; BMI, body mass index; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; ENT, ear, nose, and throat; NBW, normal body weight; NRS, numerical rating scale; OA, osteoarthritis; QOL, quality of life.

Introduction

Asthma is a disease with a global burden. About 348 million patients worldwide suffer from asthma.⁽¹⁾ Despite the stepwise asthma treatment algorithm developed over almost 30 years, including modern immunobiological treatments of

stages 4-5, there is still a low level of asthma control (AC) around the world; in fact, 57% of European patients have no control over the disease. According to the results of the NIKA multi-center observational study in Russia, well-controlled asthma was found in 23% of patients, partly controlled and uncontrolled asthma was diagnosed in 25% and 42% of

patients, respectively.⁽²⁾ Worldwide, there is a trend toward an increase in the number of patients with asthma among middle-aged and older people with a high incidence of comorbidities. The presence of comorbidities not only impairs AC but contributes to more frequent visits to medical care and reduces the quality of life (QOL) and response to standard treatment.⁽³⁾

Epidemiological data show that obesity, which has a pandemic distribution throughout the world, is not only associated with asthma but also precedes its development.⁽⁴⁾ Obese individuals have an increased risk of developing hypertension, diabetes mellitus (DM), osteoarthritis (OA), oncological diseases, and asthma, which creates difficulties in the rational choice of pathogenetic treatment of obesity with comorbidities.⁽⁵⁾ In this regard, a comprehensive assessment of multimorbidity, especially obesity, is a relevant track of a multivariate individual assessment of asthma patients to ensure the highest possible levels of AC.

The aim of this study was to evaluate the AC in multimorbid patients to personalize asthma treatment.

Materials and Methods

The study involved 237 asthma patients (51 men and 186 women) aged 18 to 78 years (mean age of 52.6±1.3 years). The diagnosis of asthma was established in accordance with GINA 2022 criteria. Obesity was diagnosed with BMI ≥30 kg/m².

Patients with acute respiratory infections and asthma exacerbation within the previous 3 months were excluded from the study. Excluded criteria also included active malignant neoplasms of any localization, the presence of other diseases of the respiratory system, decompensated somatic diseases, including mental disorders and severe brain lesions, pregnancy and lactation, and severe infectious diseases.

Research methods included:

1. Numerical rating scale (NRS) for a qualitative assessment of the severity of asthma clinical symptoms (shortness of breath, feeling of suffocation, cough)

2. Asthma Control Questionnaire (ACQ-5) to assess AC

3. Asthma Quality of Life Questionnaire (AQLQ) (authorized Russian version)⁽⁶⁾ in 5 domains: activity limitation, symptoms, emotional function, environmental stimuli, general QOL

Statistical analysis was performed using STATGRAPHICS Plus 5.1. For descriptive analysis, results were presented as mean±standard deviation (SD). Inter-group comparisons were performed using One-Way ANOVA. Group comparisons with respect to categorical variables were performed using chi-square test. Pearson's correlation coefficient (r) was used to determine the strength of the relationship between the two continuous variables. A probability value of $P < 0.05$ was considered statistically significant.

The study was conducted in accordance with ethical principles of the WMA Declaration of Helsinki (1964, ed. 2013) and approved by the Ethics Committee of Voronezh State Medical University named after N. N. Burdenko. Written informed consent was obtained from all participants.

Results

The 237 asthma patients were divided into 3 groups: Group 1 included 59(24.9%) NBW patients, Group 2 included 69(29.1%) overweight patients, and Group 3 had 109(46.0%) obese patients. The mean BMI was of 23.14±2.84 kg/m², 27.60±2.58 kg/m², and 35.82±10.23 kg/m² in Groups 1, 2, and 3, respectively ($F=65.572$, $P=0.0000$).

All groups were comparable by sex and age: Group 1 (15 (25.4%) men and 44(74.6%) women, mean age of 52.17±1.37 years; Group 2 (12(17.4%) men and 57(82.6%) women, mean age of 52.12±1.17 years; Group 3 (24(22%) men and 85(78%) women, mean age of 54.04±0.94 years.

The mean number of comorbidities among all studied patients was 4.31±0.27: 55(23.2%) people had ≤ 2 comorbidities, 118(49.8%) people had 3-5 comorbidities, and 64(27.0%) people had ≥6 comorbidities. The Group 3 patients had significantly more comorbidities than patients of Groups 1 and 2 (Table 1).

Table 1.

The number of comorbidities among the study groups

Group	≤2	3-5	≥6	P-value
Group 1 (n=59)	29(49.2)	20(33.9%)	10(16.9%)	0.000
Group 2 (n=69)	23(33.3)	32(46.4%)	14(20.3%)	
Group 3 (n=109)	3(2.7)	66(60.6%)	40(36.7%)	

The range of comorbidities identified in all examined patients was wide: OA, hypertension, DM, allergic diseases, rhinitis, other ENT pathology, CAD, and gastroesophageal reflux disease. It should be noted that OA prevailed in Group 3, as well as hypertension, DM, CAD, allergic diseases, rhinitis, and other ENT pathology (Table 2)

Table 2.

The number of main comorbidities among the study groups

Comorbidity	Group 1 (n=59)	Group 2 (n=69)	Group 3 (n=109)	P-value
Hypertension	43	35	94	0.000
CAD	-	-	28	0.000
DM	-	-	23	0.000
OA	49	34	108	0.000
Allergic diseases	33	20	48	0.008
Rhinitis	41	32	53	0.014

According to the results of the ACQ-5 test, in Group 3, there were significantly more patients with uncontrolled asthma (74/68% patients). In contrast, in Groups 1 and 2 uncontrolled asthma was found in 3(5%) patients and 15(22%) patients, respectively. Of the 237 patients included in the study, 33(13.9%) had controlled asthma: 13 patients in

Group 1 and 20 in Group 2. Partially controlled asthma was found in 112(47.2%) patients: 43, 34, and 35 in Groups 1, 2, and 3, respectively. The mean value of the ACQ-5 results was 0.97 ± 0.32 , 1.06 ± 0.53 , and 1.82 ± 0.55 in Groups 1, 2, and 3, respectively ($F=77.1896$, $P=0.0000$).

In our study, the AC level was assessed depending on the number of comorbidities. With an increase in the number of comorbidities, patients of all groups had lower AC. In Groups 2 and 3, with ≥ 6 comorbidities, asthma had an uncontrolled course, and the worst control level was observed in Group 3.

All patients underwent an assessment of the severity of clinical symptoms according to the NRS data. Patients in Groups 2 and 3 suffered significantly more from shortness of breath and coughing than Group 1 patients. The mean score of dyspnea was 2.3 ± 2.02 points, 3.8 ± 2.94 points, and 4.2 ± 2.23 points in Groups 1, 2, and 3, respectively ($F=12.1755$, $P=0.0000$). The mean score of coughs was 1.9 ± 1.93 , 3.3 ± 2.43 , and 2.9 ± 2.26 in Groups 1, 2, and 3, respectively ($F=6.5925$, $P=0.0016$). There were no significant differences in the symptom of suffocation between the groups (3.2 ± 1.56 points, 3.9 ± 2.86 points, and 3.8 ± 2.20 points in Groups 1, 2, and 3, respectively [$F=1.7743$, $P=0.1719$]). At the same time, the analysis of the ACQ-5 showed that for patients of Group 3, physical activity restriction was a more distressing symptom than existing respiratory problems. These data again confirm that in patients with asthma and multimorbidity, individual symptoms of comorbidities may prevail over respiratory complaints, negatively affecting AC. A comparison of the disease-specific QOL indicators, using the AQLQ, revealed a significantly negative effect of asthma on activity, symptoms, and general QOL in patients with obesity (Fig.1).

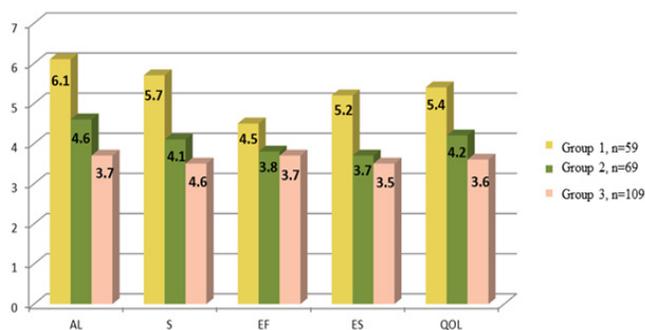


Fig. 1. QOL indicators according to the AQLQ in patients in the study groups

AL - activity limitation; S - symptoms; EF - emotional function; ES - environmental stimuli; QOL - general QOL

The conducted correlation analysis confirmed the data. We found statistically significant relationships between the estimated indicators. The level of AC, according to the ACQ-5, had a positive correlation with the number of comorbidities ($r=0.5418$, $P<0.05$) and a negative correlation with all scales of the AQLQ: activity limitation ($r=-0.6376$, $P<0.05$), symptoms ($r=-0.6577$, $P<0.05$); emotional function ($r=-0.4535$, $P<0.05$); environmental stimuli ($r=-0.4529$, $P<0.05$), and general QOL ($r=-0.6504$, $P<0.05$).

Our data are comparable with the results of clinical trials. In a study by Weatherburn et al.,⁽⁷⁾ 62.6% of the examined asthma patients had at least 1 comorbidity, and 16.3% had 4 or more comorbidities. Wardzyńska et al.⁽⁸⁾ found that among 93 patients with asthma aged >65 years and 78 patients aged 30-50 years, there was a high incidence of chronic comorbidities (an average of 8.4 and 4.7, respectively).

Currently, asthma is not considered a classic multimorbid condition; researchers often pay attention only to a combination of diseases with common or similar etiological and pathogenetic factors. According to recent publications, the most common comorbid conditions in asthma are diseases of the upper respiratory tract, chronic sinusitis, obesity, and depression.⁽⁹⁻¹¹⁾ Thus, only a multicomplex assessment of an asthma patient with an uncontrolled course makes it possible to determine the tools for influencing AC for the selection of personalized treatment in each individual case.⁽¹²⁻¹⁴⁾

The negative effect of obesity on AC is confirmed by the authors, who showed that physiological changes in lung function occur in visceral obesity: a decrease in vital capacity and residual lung volume, an increase in chest rigidity, and the development of dyspnea. And in patients with abdominal obesity, the expiratory reserve volume and functional capacity of the lungs are significantly reduced.⁽¹⁵⁾

A study by Tomisa et al.⁽¹⁶⁾ found that most of the 12,000 patients with asthma had at least 1 comorbidity (the most common - obesity, COPD, and CAD). An increase in the number of comorbidities significantly increased the risk of uncontrolled asthma. Other factors that also had a significant negative effect on AC were female gender, age 46-65 years, high BMI, long smoking history, and a long history of asthma.

Thus, currently, in most asthma patients, it is not possible to achieve complete control of the disease. This dictates the need to form a new approach to asthma treatment aimed at treatable traits of diseases that are characterized by clinical significance for a particular patient. Given this approach to managing asthma patients, we identified clinically significant, identifiable signs that contribute to the lack of AC. These include multimorbidity, especially in combination with obesity. In the group of patients with obesity, there were significantly more comorbidities than in patients who were not obese nor overweight. In multimorbid asthma patients, individual symptoms of comorbidities were prevalent over respiratory complaints, which negatively affects AC, making it difficult to achieve, and which must be considered when developing personalized algorithms for treating asthma in this group of patients.

Conclusions:

1. The asthma course is negatively affected by multimorbidity, which is most pronounced in obese patients. An increase in the number of comorbidities significantly worsens AC in patients of all studied groups, while the worst control level was observed in obese patients.

2. A personalized program for managing multimorbid asthma patients should be developed and implemented, considering the multivariate assessment of treatable signs of disease.

Competing Interests

The authors declare that they have no competing interests.

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