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Control Level, Quality of Life and Physical Activity in Patients with Asthma and Osteoarthritis

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Abstract

Background: Asthma and osteoarthritis (OA) are common chronic diseases with increasing incidence and prevalence. This study aimed to evaluate the impact of osteoarthritis on the course of asthma, quality of life (QoL), and physical activity in patients with asthma.

***Methods and Results*:** This cross-sectional study included 137 patients with moderate asthma. Most patients were overweight or obese (81.8%). All patients were divided into two groups. Group 1 included 46 asthma patients without osteoarthritis (13 men and 33 women, mean age of 51.57±10.45 years); Group 2 included 91 patients with asthma and hip and knee OA (23 men and 68 women, mean age of 54.10±9.17 years).

All participants underwent a clinical assessment of diseases, X-ray examination of the knee and hip joints, determination of the Lequesne algofunctional index (LAI), and spirometry. Three questionnaires were used in this study: the International Physical Activity Questionnaire (IPAQ), the Asthma Quality of Life Questionnaire standardized version (AQLQ-S), and the Asthma Control Questionnaire (5-item version) (ACQ-5)

LAI was predictably higher in Group 2 than in Group 1 (9.77±4.18 vs. 2.35±1.93 points, $P<0.0001$). In Group 2, there were significantly more patients with uncontrolled asthma ($\chi^2=55.232$, $P=0.0000$) and obesity ($\chi^2=132,612$, $P=0.0000$) than in Group 1. In Group 2, the values of total physical activity and energy expenditure ≥3 MET, as well as the AQLQ(S) scores (on all domains), were significantly lower than in Group 1.

Positive correlations were revealed between the level of asthma control and the stage of osteoarthritis (r=0.55, $P=0.0000$) and BMI (r=0.63, $P=0.0000$). Also, there was a negative correlation between the stage of osteoarthritis and FEV1 (r=-0.23, $P=0.0234$) and FVC (r=-0.24, $P=0.0157$) as well as between BMI and FEV1 (r=-0.37, $P=0.0003$) and FVC (r=-0.44, $P=0.0000$).

***Conclusion*:** Osteoarthritis is associated with decreased asthma control and negatively affects physical activity and quality of life in patients with asthma.(**International Journal of Biomedicine. 2024;14(3):406-409.)**

Keywords: asthma • spirometry • osteoarthritis • physical activity • quality of life

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Abbreviations

BMI, body mass index; **FEV1**, forced expiratory volume in one second; **FVC**, forced vital capacity; **LAI**, Lequesne algofunctional index; **MET**, metabolic rate; **NCD**, noncommunicable disease; **QoL**, quality of life.

Introduction

Asthma, a major noncommunicable disease (NCD), affects people of all ages. The burden of asthma continued to rise, and the Global Burden of Disease Study estimated that 262 million people were affected by asthma in 2019.[1] Asthma is included in the WHO Global Action Plan for the Prevention and Control of NCDs and the United Nations 2030 Agenda for Sustainable Development.[2]

A distinctive feature of asthma is its occurrence in all age groups, which also reflects the social significance of the disease. The most common comorbid pathologies in asthma

are obesity, chronic obstructive pulmonary disease (COPD), gastroesophageal reflux disease, sleep and mental disorders.[3,4] Nearly 60% of adults with severe asthma in the US are obese.[5] Obesity is a major risk factor and a disease modifier for asthma. The mutual aggravating effect of obesity and asthma has been studied in detail.[6] Osteoarthritis (OA) is a less-studied comorbidity. It is known that obesity also contributes to the development of osteoarthritis, which makes it likely that the concomitant course of asthma and osteoarthritis is often recorded.

This study aimed to evaluate the impact of osteoarthritis on the course of asthma, quality of life (QoL), and physical activity in patients with asthma.

Materials and Methods

This cross-sectional study included 137 patients with moderate asthma aged 18 to 75. The diagnosis of asthma was based on the 2022 GINA Strategy Report.[7]

Partly controlled and uncontrolled asthma was found in 42,34% and 47,45% of cases, respectively (Table 1). All patients were divided into two groups. Group 1 included 46 asthma patients without osteoarthritis (13 men and 33 women, mean age of 51.57±10.45 years); Group 2 included 91 patients with asthma and hip and knee OA (23 men and 68 women, mean age of 54.10±9.17 years).

Table 1.

Baseline characteristics of the study sample.

Characteristic	n (%) Me [IQR]
Asthma control level	
Well controlled	14 (10.2%)
Partly controlled	58 (42.3%)
Uncontrolled	65 (47.4%)
Body mass index	
BMI, kg/m^2	32.4 [28.06; 35.7]
Normal weight	25 (18.2%)
Overweight	21 (15.3%)
Class I obesity	46 (33.6%)
Class II obesity	29 (21.2%)
Class III obesity	16 (11.7%)

The study did not include patients with acute respiratory infections, 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.

All participants underwent a clinical assessment of diseases, X-ray examination of the knee and hip joints, determination of the Lequesne algofunctional index (LAI),[8] and spirometry ("Diamant" spiro-analyzer, Russia). Three questionnaires were used in this study: the International Physical Activity Questionnaire (IPAQ),[9] the Asthma Quality of Life Questionnaire standardized version (AQLQ(S)),[10] and the Asthma Control Questionnaire (5-item version) (ACQ-5).[11]

Statistical data processing was carried out using the STATGRAPHICS Centurion 18 (StatGraphics Technologies Inc., USA). The normality of data distribution was assessed using Kolmogorov–Smirnov and Shapiro-Wilk tests. Baseline characteristics were summarized as frequencies and percentages for categorical variables. Continuous variables were presented as mean [M] (standard deviation [SD]) or as median [Me] (interquartile range [IQR]). Means of two continuous normally distributed variables were compared by independent samples Student's t-test. The Mann-Whitney U test was used to compare the means of two groups of variables that were not normally distributed. The frequencies of categorical variables were compared using the chi-squared test. Spearman's rank correlation coefficient was calculated to measure the strength and direction of the relationship between two variables. A probability value of $P<0.05$ was considered statistically significant.

The study was approved by the Ethics Committee of Voronezh State Medical University named after N.N. Burdenko. Written informed consent was obtained from all included patients.

Results

Most patients were overweight or obese (81.8%) (Table 1). The groups were comparable by sex ($P=0.71$), age ($P=0.16$), and duration of asthma ($P=0.34$). Differences between groups were obtained in the asthma control level ($P=0.0000$), LAI ($P=0.0000$), and BMI (P=0.0000). In Group 2, there were significantly more patients with uncontrolled asthma ($\chi^2=55.232$; $P=0.0000$) and obesity ($\chi^2=132.612$; $P=0.0000$) than in Group 1.

The groups also differed in spirometry parameters and the ACQ-5 questionnaire results (Table 2). In Group 2, asthma control corresponded to partially controlled or uncontrolled asthma (1.85±0.57 points); in Group 1, asthma control corresponded to controlled or partially controlled asthma (1.00±0.42 points).

In addition, the groups differed in their level of physical activity. In Group 2, the values of total physical activity and energy expenditure ≥3 MET were lower than in Group 1. LAI was predictably higher in Group 2 than in Group 1 (9.77±4. 18 vs. 2.35±1.93 points, $P<0.0001$). Differences were also found in all domains of the AQLQ(S). Considerable differences were observed in the «activity» domain and total AQLQ score (Table 2). In Group 2, the AQLQ(S) scores (on all domains) were significantly lower than in Group 1.

Positive correlations were revealed between the level of asthma control and the stage of osteoarthritis (r=0.55, $P=0.0000$) and BMI (r=0.63, $P=0.0000$). Also, there was a negative correlation between the stage of osteoarthritis and FEV_1 (r=-0.23, $P=0.0234$) and FVC (r=-0.24, $P=0.0157$) as well as between BMI and FEV_1 (r=-0.37, $P=0.0003$) and FVC (r=-0.44, $P=0.0000$).

Table 2.

Asthma control, QoL, physical activity, and spirometry results in study groups.

Variable	Group 1 (n=46)	Group 2 (n=91)	*P*-value
ACQ-5, points			
Shortness of breath	0.93±0.37	2.05±0.86	<0.0001
Nighttime awakenings due to asthma	1.15±0.73	2.03±0.66	<0.0001
Symptom severity upon awakening	0.89±0.53	1.52±0.55	<0.0001
Wheezing within the past week	0.85±0.51	1.57± 0.73	<0.0001
Activity limitation due to asthma	1.15±0.70	2.08±0.86	<0.0001
Domain	AQLQ(S), points		
Symptoms [S]	5.28±1.03	3.56±1.12	<0.0001
Activity limitations [AL]	5.73±0.99	3.75±1.07	<0.0001
Emotional function [EF]	4.49±1.39	3.75±1.24	0.0019
Environmental stimuli [ES]	4.77±0.94	3.52±1.13	<0.0001
Total score	5.01±1.13	3.65±0.95	<0.0001
IPAQ and LAI			
Total physical activity (MET-min/week)	2936.15±437.17	2325.64±183.75	<0.0001
Energy expenditure ≥3 MET (kcal/day)	3952.8±570.87	3273.01±315.10	<0.0001
LAI, points	2.35±1.93	9.77±4. 18	<0.0001
Spirometry			
FEV_1, %	74.1 [63.0;89.5]	64.2 [55.0;73.4]	0.0001
FVC, %	97.45 [86.5;103.5]	89.3 [82.4;97.8]	0.0108
FEV_1/FVC	76.70 [71.59;85.83]	73.29 [65.7; 83.58]	0.0055

Discussion

The study showed a high frequency of concomitant courses of osteoarthritis and asthma in the selected sample. On the one hand, this can be explained by the high prevalence of both pathologies in the population, as well as the activation of the systemic inflammatory process in asthma, which can provoke other inflammatory diseases.[12,13] However, a study by Koo et al.[14] showed that the prevalence of osteoarthritis among patients with asthma is higher than among patients with COPD. In addition, the association between osteoarthritis and asthma remained significant after adjusting for BMI. This suggests the existence of additional pathogenetic links between diseases.

The study results showed an association between the presence of osteoarthritis and lower levels of asthma control. This fact is consistent with the data presented in the study by Mahmood et al.,[15] who also identified an association between the occurrence of osteoarthritis in patients with asthma and uncontrolled asthma. The same study also found that patients with concomitant asthma and osteoarthritis of the knee and hip joints had more severe pain syndrome.

Evidence indicatesthe need to increase physical activity in patients with asthma to achieve asthma control.[16] At the same time, our data indicate decreased physical activity in the case of concomitant osteoarthritis and asthma. This reflects the negative impact of both diseases on exercise tolerance: asthma due to cough and shortness of breath, osteoarthritis due to pain with movement, muscle weakness, and locomotion disorders.

In addition, QoL is a significant factor influencing the level of control and course of asthma.[17] Our study showed decreased QoL of patients with concomitant asthma and osteoarthritis. According to the AQLQ(S) questionnaire, considerable differences between groups were identified in the “activity” domain. Thus, the study determined that osteoarthritis negatively impacts all studied parameters in patients with asthma. This indicates the need to consider the presence of osteoarthritis when diagnosing and treating asthma.

In conclusion, osteoarthritis is associated with decreased asthma control and negatively affects physical activity and quality of life in patients with asthma.

Competing Interests

The authors declare that they have no competing interests.

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