

PRACA ORYGINALNA
ORIGINAL ARTICLE

PECULIARITIES OF THE COURSE OF BRONCHIAL ASTHMA IN PATIENTS WITH EXCESSIVE BODY WEIGHT OR OBESITY

ODMIENNOŚCI W PRZEBIEGU ASTMY OSKRZELOWEJ U PACJENTÓW Z NADWAGĄ LUB OTYŁOŚCIĄ

Daria O. Lahoda, Valentyna I. Velychko, Victoriia E. Nakhashova

ODESSA NATIONAL MEDICAL UNIVERSITY, ODESSA, UKRAINE

ABSTRACT

Introduction: Clinical studies that were devoted to the analysis of the asthma course during concomitant obesity or excessive body weight, demonstrated a number of typical features. Both asthma and obesity or overweight are diseases that form a persistent chronic inflammatory process in the body. The combination and mutual enhancement of the factors of chronic inflammation leads to a more severe clinical course of asthma and reduced control of the disease.

The aim: The main goal of our study was to determine the peculiarities of the course of bronchial asthma of various degrees of severity in patients with excessive body weight or obesity.

Materials and methods: Anamnesis and examination of 86 patients with a major diagnosis of bronchial asthma were performed. According to the body weight index, patients were divided into two groups: main and comparison, and 20 somatic-healthy patients who were included in the control group also participated in the study.

Results and conclusions: The patients had upper respiratory tract diseases, namely rhinitis, sinusitis, bronchitis, and pneumonia. A different incidence rate of respiratory infections in a child was noted in patients, depending on the severity of the course. The patients in the main group took an antibiotic on an average 3-4 times a year, of whom patients with severe bronchial asthma took antibiotics 4-5 times a year. In the comparison group, the average level of antibiotic ingestion coincided with that of the control group, namely 1-1.5 times a year. The patients have a close direct correlation between the asthma test and the body mass index. 28.75% of the patients in the main group had no symptoms of allergy. Damp basements, rooms with lots of dust or outdoor work with high concentrations of dust or pollen have a negative effect on the patients with asthma. 81% of the patients in the main group did not adhere to the appointments of the doctor, it should be noted that these are patients with any course of asthma.

KEY WORDS: bronchial asthma, excessive body weight, obesity

Wiad Lek 2018, 71, 5, 1015-1018

INTRODUCTION

In 2014, the Global Allergy and Asthma European Network conducted a meta-analysis, which confirmed the association between bronchial asthma (BA) and excessive body weight (EBW) or obesity in a population of eight European countries [1, 2]. Clinical studies devoted to the analysis of the asthma course with concomitant obesity and EBW have demonstrated a number of common features, namely it was found that it was usually older people with the presence of various comorbidities. There are indications that the association of asthma and EBW is more common in women. This may be due to a dependence of the asthma course on hormonal changes and features of the mechanism of the relationship of these diseases, taking into account the specific initial metabolism of the adipose tissue in women [3]. However, according to most researchers, there was no significant difference in the main demographic indices among patients with asthma with and without EBW [3,4]. It once again emphasizes that the effect of EBW or obesity on the course of asthma does not depend to a large extent on the lifestyle and social status of the patient, but is likely to have united pathogenetic nature.

A possible mechanism of interaction of asthma and EBW or obesity can be a response that includes a cascade where free fatty acids cause oxidative stress, which affects tumor necrosis factor (TNF- α) and monocyte chemotaxis, which in turn affects monocytes and causes their migration. This interaction causes a response in the adipose tissue, such as the allocation of adipocyte leptin and tumor necrosis factor α (TNF- α), and monocytes release of TNF- α , IL - 1B, interleukin -6 that provoke inflammation and Th-2 immune response, and causes the development or exacerbation of asthma [5, 6].

Thus, according to research results, both asthma and obesity, or EBW are diseases that form a persistent chronic inflammatory process [7]. In the first case, it is more local, concentrated mainly in the walls of the respiratory tract, in the second case it is a chronic general process, which affects many organs and systems. Conditions of maintenance of such inflammation and its further strengthening may be: 1) involvement of large volumes of biological tissues, primarily fat in this process; and 2) participation of large segments of the immune system in it, such as congenital and humoral immunity. Combination and mutual enhancement of these factors leads to a more severe clinical course of asthma and a decrease in the control of the disease [8,9].

THE AIM

The main aim of our study was to determine the peculiarities of the course of asthma of various degrees of severity in patients with excessive body weight or obesity.

MATERIALS AND METHODS

We examined 86 patients (54 women and 32 men whose average age was 42.80 ± 1.19) who had the main diagnosis of bronchial asthma of various degrees of severity, obesity or excessive body weight and were treated on the basis of the Department of Family Medicine and General Practice of Odessa National Medical University. The diagnosis was made in accordance with international approval documents. The inclusion criteria included: approval of the patient to take part in the study, the age of patients over 18 years old; BA of various degrees of severity. Exclusion criteria: refusal to participate in the study, presence of acute infection, acute pathology and decompensation of any somatic concomitant pathology, endocrinous obesity, metabolic syndrome, oncological pathology, mental disorders. Distribution of patients to groups was carried out by simple randomization with stratification elements.

The patients were divided into two groups: the group O1- patients with asthma against the background of overweight or obesity ($n = 60$), group P2- patients with asthma with harmonic physical development ($n = 26$) in the background. Also, the study included 20 practically healthy individuals with harmonious physical development. All patients were able-bodied.

The patients were asked to have a comprehensive examination, which included: anamnesis, routine physical examination, ACT test, anthropometry, and a study of the component body composition using bioelectric impedance on the OMRON BF 51 (Japan) device. The functional method of the study is spirometry on the apparatus of Alpha Spirograph (Germany). In order to evaluate the function of external respiration, our study took into account the most widely used indicators, namely VC – vital capacity, FEV1 – and PEF.

Statistical analysis was carried out according to generally accepted methods of variation statistics. Validity was evaluated by the Student t criterion. Differences were recognized as important at the significance level of $p \leq 0.05$. The correlation connection was established using the Spirman correlation coefficient.

RESULTS AND DISCUSSION

According to the hygienic hypothesis proposed by Strachan with co-authors, the reduction of contact with infectious agents reduces the possibility of switching the Th2-cell immune response formed during the antenatal and neonatal periods with predominance of it over the Th1-cell response towards the balanced ratio of T-helper of the 1st and 2nd types, which promotes persistence of allergic inflammation [10]. Therefore, in taking the patients' anamnesis, we paid attention to the childhood,

namely, viral and bacterial infections and the frequency of such diseases per year. The patients in the main group dominated in the upper respiratory tract diseases, namely, rhinitis diagnosed in 100% of cases; sinusitis – in 60%; bronchitis – in 55%; and in 40% of cases pneumonia was diagnosed. In the patients, depending on the severity of the course, a different incidence of respiratory infections in childhood was noted, and the patients with mild progress were mostly ill on an average 5 times a year (70%), and the patients with moderate to severe course fell ill 10 or more times per year (65%). A similar tendency was observed among patients in the comparison group, but only 30% of patients fell ill more than 10 times a year, but the incidence was lower, namely rhinitis was diagnosed in 95% of cases, pharyngitis and bronchitis were revealed rarer, no more than 40%. The patients who were included in the control group were ill more than 10 times a year only in 20% of cases; the most common diseases were mainly rhinitis (95%) and bronchitis (25%). The frequency of antibiotic use in children (in the period of the active development of adaptive immunity) is also of importance, so we have found that patients in the main group took an antibiotic on an average 3-4 times a year, of which patients who had a severe course of bronchial asthma took antibiotics more frequently, up to 4-5 times a year. In the comparison group, the average level of antibiotic ingestion coincided with that of the control group, namely 1-1.5 times a year.

It is commonly known that EBW or obesity is an aggravating factor in the course of bronchial asthma. By stratification method, our patients were divided by the severity of the course of asthma. Thus, the patients in the main group had mild ($n = 10$), moderate ($n = 28$) and severe ($n = 22$) BA. In the comparison group, patients had an intermittent ($n = 16$) and moderate severity course ($n = 10$). But according to the design of the study, all patients in the comparison group had a harmonious physical development, but in this group of patients, the body component composition was also studied. The data on the body mass index and its component composition in relation to the severity of the course are given in Table I.

A correlation analysis of the indices presented in Table I was performed. It was found that body mass index and ACT test had a strong direct correlation, that is, the higher BMI, the lower are the indices of the asthma control and ACT tests, respectively ($r = 0.87$)

In case of allergic history, 28.75% of patients in the main group had no symptoms of allergy of other organs. Those patients in the main group who had allergic manifestations of the respiratory tract in the history were most often noted allergies to different plants, namely 30% of patients; the second was skin and gastrointestinal allergy to food and household chemicals. In the comparison group, 30% of patients did not have other allergic manifestations, but a combined allergy to plants and food products was diagnosed in 70% of patients. In the control group, other allergic manifestations were determined in 25% of the patients; they were not of a permanent nature and in most cases developed during the flowering of one or another

Table I. Body mass index and patients' body component composition of the main group and the comparison group.

Group	N ^o	Degree of severity	BMI kg/sm ²	% fat	Visceral fat	ACT-test
Main	1	Mild	**29.24±1.18*	34.62±1.87*	**13.40±1.53*	**19,4±0,5
	2	Moderate	**30.56±0.43*	36.36±1.08*	**12.07±0.73*	14,6±0,4*
	3	Severe	**34.92±1.35*	42.40±2.65*	**16.64±1.91*	**10,4±0,4*
Comparison	1	Intermittent	22.14±0.67	25.74±3.08	5.13±0.82	19,3±0,6
	2	Moderate	24.70±0.14	39.3±0.01	6.00±1.41	13,9±0,6

Note: * $p_{0-ci} \leq 0.05$ (CI –intermittent comparison group)
 ** $p_{0-cm} \leq 0.05$ (CM – moderate comparison group)

plant. Allergic manifestations of hereditary nature were observed in 70% of patients in the main group, in 40% of patients in the comparison group and in 20% of the control group. In 36.6% of patients in the main group asthma had its continuation from relatives, in the comparison group - 15%, respectively.

Working conditions are of importance in the course and control of asthma. Damp basements, rooms with lots of dust or vice versa, outdoor work with high concentrations of dust or pollen have a negative effect on patients with bronchial asthma. Among our patients, the main group had 40% acceptable working conditions, 56.6% worked at harmful production, and only 3.4% of patients worked in optimal conditions, in accordance with the Labor Code of Ukraine. In the comparison group, it made 40%, 50%, and 10% respectively. However, the patients increased asthma control with changing working conditions for the best.

It is well-known that controlled physical activity positively affects the course of asthma. Our study has found that few of the patients knew about it, but if they knew, they did not follow this postulate. So we found that 40% of patients in the main group walked no more than 2000 steps per day, 30% of patients walked 3000 steps and only 5 of 60 walked 5000 or more steps per day. As for the comparison group, they walk a little more. For example, 5000 or more steps per day are walked by 20% of patients, which is twice as high as in the main group. Additional physical exercises are performed by only 10% of patients in the main group at home for 5-10 minutes several times a week and 20% of patients in the comparison group, but not regularly. Harmful habits in the form of smoking were registered in 36.6% of the patients in the main group and in 30% of the comparison group; they smoked on an average 1 pack of cigarettes per day. None of the patients practice respiratory gymnastics.

The first manifestations of BA in 80% of the patients of the main group and the comparison group were identical and most frequently there was an asthma attack against the background of colds, flu or pneumonia, or soon after them in 80%, only 20% of patients began to feel suffocation against the background of somatic well-being. The triggers in exacerbating the course of asthma in patients of the main and comparison group were the same, namely changes in weather conditions, dampness, and colds. Frequent exacerbations were noted in the spring-autumn period in 63%

of patients. The number of exacerbations in patients in the main group was greater, and was 2.2-3.1 times a year, compared with 1.1-1.6 times in the comparison group ($p \leq 0.05$). Similar data were obtained regarding the hospitalization of our patients, namely 2.2 times in the main group and 0.5-0.8 times a year in the comparison group ($p \leq 0.05$).

Today, a characteristic feature of the course of infectious diseases is a significant increase in chronic infectious and inflammatory diseases, which have a negative impact on the course of BA [11]. In conducting our study, we were interested in such indices as the erythrocyte sedimentation rate (ESR) and eosinophilic cationic protein (ECP) as markers of chronic inflammation. We found that patients in the main group having severe BA had mean ECP values of 36.95 ± 3.73 ng / ml, patients with moderate and mild progress of 23.55 ± 2.38 ng / ml and 19.88 ± 1.88 ng / ml ($p \leq 0.05$; $p \leq 0.05$), respectively. In the patients of the comparison group, a tendency to much lower indices of ECP was observed, namely 18.36 ± 2.67 ng / ml in intermittent course of BA and 14.66 ± 2.55 ng / ml in moderate course ($p \geq 0.05$).

It was also found that patients with severe asthma who had frequent antibiotic preparations in the history, had an average ESR of 18 ± 0.3 mm Hg. compared with 10 ± 0.5 and 9 ± 0.2 in the comparison and control group, respectively ($p \leq 0.05$; $p \leq 0.05$). That is, it can be concluded that patients with a severe course with the history of frequent antibiotic preparations, have a direct close correlation with chronic persistent inflammation, as evidenced by the high level of eosinophilic cationic protein and ESR ($p = 0.973$).

According to the international global strategy for treating GINA BA, patients with asthma should be treated for a long time; our study found that 76% of the patients in the main group did not follow the appointments of the doctor, it should be noted that they are patients with any course of BA. In the comparison group, 23% of patients had a good compliance and adherence to the prescribed therapy. The most commonly used "drug of the first aid" in both groups of patients was salbutamol, and according to the severity of the course, patients used it from 2-3 times a month to daily repeated use in the severe course of asthma. The data obtained coincide with studies conducted in the UK and presented in the NERAD report, which suggests that excessive use of β -adrenergic agents is short-acting and drugs of basic therapy are not sufficient, which is characteristic of most patients [12].

Thus, asthma in patients with excessive body weight or obesity has a more severe course and chronic persistent inflammation; therefore, an individualized selection of complex therapy should be made for patients with EBW or obesity, in addition to the basic one and there is a need for clear recommendations and general practitioners and family medicine doctors in management of such patients.

CONCLUSIONS

1. The patients with severe bronchial asthma in the presence of excessive body weight or obesity in their infancy were twice as likely to be infected with viral and bacterial infections and took antibacterial drugs than patients with a mild and intermittent degree of the course.
2. There was established a close direct correlation between the body mass index and the patient's ACT test, i.e., the larger the body mass index, the lower is the control of bronchial asthma by the patients ($r = 0.872$).
3. At least 40% of the patients with bronchial asthma in the presence of excessive body weight or obesity have sedentary lifestyle, do not practice physical activity and walk less than 2,000 steps a day.
4. The patients with severe bronchial asthma had a history of frequent intake of antibiotic preparations and a more severe chronic persistent inflammation, which had a direct strong correlation with eosinophilic cationic protein and ESR ($r = 0.973$).
5. The complication to treatment in patients was critically low and amounted to an average of 20%, which led to poor control of asthma and improper use of the drugs of "first aid".

REFERENCES

1. Global Strategy for Asthma Management and Prevention, Global Initiative for Asthma, 2017. Available from: www.ginasthma.org
2. Gibson J, Loddenkemper R, Lundbäck B, Sibille Y. Respiratory Health and Disease in Europe: The new European Lung White Book. *European Respiratory Journal* 2013 Sep; 42(3): 559-63

3. Scott H. et al. Airway Inflammation is Augmented by Obesity and Fatty Acids in Asthma. *European Respiratory Journal*. 2011; 38(3): 594-602
4. Schatz M, Zeiger RS, Zhanq F et al. Overweight/Obesity and Risk of Seasonal Asthma Exacerbations. *Journal Allergy Clin Immunology Pract* 2013; 6: 618-622.
5. Kim Sang-Ha, E. Rand Sutherland, Erwin W. Gelfand Is There a Link Between Obesity and Asthma? *Allergy Asthma Immunol Res*. 2014 May; 6(3): 189-195
6. Assad N, Qualls C, Smith LJ et al. Body mass index is a stronger predictor than the metabolic syndrome for future asthma in women. *The longitudinal CARDIA study*. *Am J Respir Crit Care Med*. 2013; 188: 319-326.
7. National Center for Environmental Health. Fact sheet 2010. Asthma and obesity. [Electronic resource]. Available from: <http://www.cdc.gov>
8. Mineyev VN, Lalayeva TM, Trofimov VI Bronchial Asthma and Obesity (Internet Resource). Available from: cyberleninka.ru
9. Pertseva T.A, Nudga N.P. Astma and obesity: is there any interconnection? *Ukraynskyy pulmonologichnyy zhurnal* 2011; 1: 61-64.
10. Chernysheva O.Ye. Role of infectious-inflammatory process in forming bronchial asthma in children. *Zdorovye rebyonka* 2014; 4 (55): 117-124.
11. Klimenko V.A, Adaryukova L.M, Plakhotnaya O.N. et al. Virus-induces bronchial asthma in children: state of problem and way of its resolving. *Astma i alergiya* 2011; 4: 50-57.
12. Royal College of Physicians. Why Asthma Still Kills? The National Review of Asthma Deaths (NRAD) [online] 2014. Available from: <https://www.rcplondon.ac.uk/projects/outputs/why-asthma-still-kills> [Last accessed: December, 2016].

The data in the article is part of a scientific research project of MOH of Ukraine and the Department of Family Medicine and General Practice of Odesa National Medical University "Age features in treatment and rehabilitation of pulmonary, endocrinological diseases in overweight patients in Family Practice" (registration number 0115U006645).

Authors' contributions:

According to the order of the Authorship.

Conflicts of interest:

The Authors declare no conflict of interest.

CORRESPONDING AUTHOR

Daria Lahoda

Bazarnaia str.19 f.10, Odesa,Ukraine

tel: +380966419743

e-mail: dlagoda19@gmail.com

Received: 10.03.2018

Accepted: 05.06.2018