

MODERN ASPECTS OF EPIDEMIOLOGY AND PATHOGENESIS OF BRONCHIAL ASTHMA

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DOI: 10.5958/2249-7137.2021.02720.8

ABSTRACT

The review and analytical article describes the pathogenetic mechanisms of the formation of bronchial asthma, describes a cascade of immune interactions that cause bronchial obstruction. The authors studied the features of the spread and etiopathogenesis of respiratory allergoses, among which bronchial asthma occupies the highest frequency.

KEYWORDS: *Bronchial Asthma, Allergy, Pathogenesis, Immunity, Epidemiology*

INTRODUCTION

One of the most important generalizations in immunology over the last 10-15 years has been a fairly complete and convincingly substantiated understanding of the innate and acquired components of the immune system. The concept of innate (from English: innate immunity) and adaptive or acquired (from English: adaptive immunity) immunity has been formed. Currently, the parameters characterizing the characteristics of each of these components of the immune system are clearly defined and the links (subsystems) linking them into a single whole are characterized [1,3,6].

The immune system interacts closely with other systems of the body, primarily with the nervous and endocrine, exerting a regulatory influence on many vital functions of the body [2].

The current understanding of the function of innate and acquired components of the immune system is important for practical medicine and clinical immunology. There is still an opinion among specialists of many medical specialties that a number of factors (for example, the integrity of the skin, mucous membranes, bactericidal activity, etc.) influence the so-called natural resistance of the body. Indeed, such factors may be important in protecting against pathogenic microorganisms. However, in the mechanisms of protection against malignant neoplasms, from genetically foreign cells and proteins, in the immune relationship between mother and fetus, in the control of genetically "one's own" and in many other immune processes, the so-called factors of "nonspecific immunity" are of little or no significance. Terms such as "non-specific protection factors", "non-specific immunity" have lost their use in the practice of modern immunology [4].

From an immunological standpoint, the epithelium of the respiratory tract mucosa is an area of concentration of a population of allergen-presenting cells that actively express a group of receptors of the innate immune system. These immune responses are also characteristic of allergic inflammation of the upper respiratory tract. However, the effect of significant microbial

allergocomponents on the nature of the immune-mediated inflammatory reaction in the seasonal and year-round form of allergic rhinitis, which is reflected in the characteristic cytokine profile, has not actually been studied. The profile of such cytokines is particularly interesting, which are synthesized in epithelial cells of the mucous membrane TSLP, TNF α , GM-CSF when stimulated indirectly through the system of innate immunity receptors [9].

BA is a chronic respiratory disease characterized by reversible airway obstruction and hyperreactivity of the airways to nonspecific bronchoconstriction agonists as the main underlying pathophysiology. Over the past 40 years, the incidence of asthma has increased dramatically worldwide. The World Health Organization (WHO) estimates that currently more than 300 million children and adults worldwide suffer from this incurable disease and 255,000 die from it every year. It is now generally accepted that asthma is a heterogeneous syndrome and many clinical subtypes have been described. Viral infections such as respiratory syncytial virus (RSV) and human rhinovirus (HRV) have been implicated in exacerbating asthma in children due to their ability to cause severe inflammation of the respiratory tract and wheezing. Infections with atypical bacteria also seem to play a role in the induction and exacerbation of asthma. Recent studies confirm the existence of an infectious etiology of asthma mediated by Chlamydia pneumoniae (CP) and possibly other viral, bacterial and fungal microbes. It is also likely that early infections with microbes such as CP can lead to changes in the lung microbiome that significantly affect asthma risk and treatment outcomes. These infectious microbes can aggravate the symptoms of established chronic asthma and may even contribute to the initial development of the clinical onset of the disease. It is now increasingly recognized that the patterns of airway inflammation differ depending on the trigger responsible for the initiation and exacerbation of asthma. Thus, a deeper understanding of asthma subtypes is currently being studied more actively, not only to decipher pathophysiological mechanisms, but also to choose treatment and prognosis [10,15,18].

BA is a chronic disease of the pathways, which is characterized by the presence of symptoms such as shortness of breath, wheezing, chest congestion, cough. An important link in AD is mast cells, eosinophils and lymphocytes. BA is one of the important diseases that progresses every year, as the number of patients with the disease is increasing. Many factors (exogenous, endogenous) play a role in the development of this disease [11].

The incidence of AD is increasing worldwide. It is among the top ten non-communicable chronic diseases that are the main cause of death in middle and old age, reducing the average life expectancy of men by 6.6 years, women by 13.5 years. Today there are about 300 million patients with AD in the world. (Report of the Second World Assembly on Aging Madrid; 2011.). Despite the large amount of information in the available literature, there is no information whether the age of patients in which the disease developed can influence its manifestations and course [9].

BA leads to permanent disability, to a decrease in the quality of life, as well as mortality. According to statistics, there are about 130 million patients. The fear of an attack, which can manifest itself in AD, does not allow you to do simple work, and the symptoms of the course lead to patient care for several days [12].

In the Russian Federation, about 12% (adult population) and 19% (children) suffer from AD, in recent years the incidence of AD has worsened, and the number of cases has increased by 2

times. According to statistics, the birth rate of a child with BA is 50% if both parents are sick, but at the same time, characteristic symptoms may not manifest, the environment plays a big role. BA is most commonly found in Australia, New Zealand, the USA, Israel and Ireland [3].

In 1991, the first standardized protocol of the International Study of Asthma and Allergies in Children (ISAAC) was developed to conduct multicenter epidemiological studies in different regions of the world. The research under the ISAAC program involves 3 phases. In phase I, screening of schoolchildren aged 6-7 years (in Russia – 7-8 years) and 13-14 years (at least 3,000 children in each group) is carried out using a standardized questionnaire to study the prevalence and severity of symptoms of allergic diseases. Phase II provides for clarification of the diagnosis and etiological factors of the detected diseases based on an in-depth examination of persons identified by the results of the questionnaire in phase I. Phase III is a repetition of phase I of the program in at least 3-5 years to assess the dynamics of the prevalence of allergic diseases. For each center, the annual change in the prevalence of symptoms was calculated as the difference in the prevalence of indicators between phase I and phase III, divided by the number of years between the two surveys. The main tool of the program is a questionnaire with adapted questions about the relevant symptoms, such as wheezing, chest tightness, shortness of breath and cough (for BA), or sneezing, runny nose or stuffy nose, itchy eyes and watery eyes (for AR) [9,11].

At the same time, the assessment of current symptoms (within the last 12 months) is the most reliable for the epidemiological diagnosis of an allergic disease. Since there is no epidemiological definition of asthma, the International Center for the Study of Asthma and Allergies in Children believes that the most accurate diagnosis of the disease reflects the positive answers to questions about wheezing, wheezing in the chest over the past 12 months. Similarly, the epidemiological diagnosis of AR corresponds to questions about the presence of sneezing, runny nose or stuffy nose without signs of a cold in the last 12 months [4,5,14].

Scientists investigated how the environment affected the genotype-phenotype relationship in a genetically homogeneous but geographically separated population and evaluated 18 single-nucleotide polymorphisms (SNPs) corresponding to 8 genes (ADAM33, ALOX5, LT- α , LTC4S, NOS1, ORMDL3, TBXA2R and TNF- α), lung function and five respiratory/allergic conditions (asthma, bronchitis, rhinitis, dermatitis and atopia) in two populations of Inuit living either in the western part of Denmark or in rural Greenland. The results showed that lung function was associated with genetic variants in ORMDL3, with polymorphisms having significant interaction with the place of residence. LT- α SNP rs909253 and rs1041981 were significantly associated with the risk of bronchitis. LT- α SNP rs2844484 was associated with susceptibility to dermatitis and significantly depended on the place of residence [12].

BA is the most common chronic disease worldwide among children and young people. Due to the early onset of the disease (one out of four people in the general population gets asthma before the age of 40) BA is one of the main causes of disability and a decrease in the quality of life of patients. The problem of BA requires a significant increase in health care costs and contributes to a noticeable loss of labor productivity. Despite the large number of reports on the prevalence of BA in different populations, the lack of an accurate and universally accepted definition of the disease prevents an adequate comparison of data on the prevalence of BA obtained in different countries. Nevertheless, based on standardized methods for assessing the

prevalence of asthma and diseases accompanied by wheezing in children and adults, it can be argued that the prevalence of asthma in different countries of the world ranges from 1 to 21%. There is reliable evidence that differences between countries regarding the prevalence of BA symptoms have decreased, especially in the age group of 13-14 years, with the prevalence decreasing in North America and Western Europe, and increasing in regions where it was previously low. Although the overall prevalence of wheezing has changed little, the percentage of children with registered BA has increased significantly; perhaps this reflects greater awareness of BA or a change in diagnostic practice. The increase in the prevalence of BA symptoms in Africa, Latin America and parts of Asia shows that the damage in the world from BA continues to grow, but the global differences in prevalence are decreasing. Approximately 250,000 people die from BA per year, while mortality rates are poorly correlated with the prevalence of the disease. The lack of data does not allow us to determine the possible causes of intra- and inter-population differences in the prevalence of BA [2,6,17,19].

CONCLUSION

The prevalence of asthma and allergic diseases is disproportionately distributed among different population groups, and there is an upward trend in Western countries. BA is an ecologically caused disease, the course of which is largely determined by the state of the environment and climatic conditions. In addition, the impact on the human body of various exogenous factors creates conditions for high allergenic loads.

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