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Prevalence and Risk Factors of Bronchial Asthma in Children

Kobilzhonova Sh.R., Mirrakhimova M.Kh., Sadullaeva Kh.A.
Author: Mirrahimova Maktuba Khabibullaevna. TTA, No. 1 Associate Professor of Pediatrics, Doctor of Medical Sciences.
Phone 90-176-40-78
Email: mmh.20@mail.ru
ORCID: https://orcid.org/0000-0003-2802-4357
Sadullayeva Hosiyat Abdurakhmonovna TTA, Associate Professor, Department of Environmental Hygiene, Candidate of Medical Sciences Phone 90-176-40-78
E-mail: xosiyat.sadullaeva@tma.uz
ORCID: https://orcid.org/0000-0003-2798-6079
Kobiljonova Shaxnoza Rustamovna. TTA, assistant «Department of Environmental Hygiene».
Phone 93-533-49-50
Email: shaxnoza_13_92@mail.ru

Summary
Objective: Identify clinical and laboratory features of the course of bronchial asthma in children living under the influence of adverse environmental factors.
Research materials and methods: epidemiological, clinical and laboratory, functional and statistical research methods.
The practical results of the study are as follows: It is proposed to conduct a modified ISAAC questionnaire in practical health care, the purpose of which is the early diagnosis of bronchial asthma in children. Established risk factors make it possible to identify children at an early stage at risk of developing bronchial asthma; It has been established that the adverse effect of the combined effect of increased anthropogenic load leads to an increase in the incidence of bronchial asthma. It has been proven that the results of this study make a significant contribution to the study of clinical manifestations, pathogenetic mechanisms of bronchial asthma in children living in the industrial regions of the Tashkent region.
Conclusions: The study of the anamnesis of the examined children showed that in children aged 7-8 years, wheezing in anamnesis occurred in 16.1% of cases. At the age of 13-14 years, this indicator was 1.4 times higher ($p<0.05$). The frequency of recurrence of bronchial asthma in children, according to official statistics, did not exceed three exacerbations per year. But according to the survey data, schoolchildren had from 4 to 12 attacks of wheezing during the year.

Key words: bronchial asthma, children, allergy, epidemiology.

Bronchial asthma is one of the most common chronic allergic diseases in children. The prevalence of the disease can be determined by the number of patients seeking medical help. In this regard, it is difficult to identify the prevalence of bronchial asthma, since many patients for some reason do not seek treatment in a timely manner, and doctors face difficulties in the timely diagnosis of bronchial asthma, especially in young patients. According to the data obtained, in many patients the diagnosis of mild bronchial asthma is unclear, or in moderate and severe bronchial asthma, the disease is diagnosed late.
The purpose of the study is to identify the clinical and laboratory features of the course of asthma in children living under the influence of adverse environmental factors.
Research methods: To achieve the goal of the study and solve the tasks set, the following methods were used: epidemiological, clinical and laboratory, functional and statistical research methods.
The practical results of the study are as follows: It is proposed to conduct a modified ISAAC questionnaire in practical health care, the purpose of which is the early diagnosis of bronchial asthma in children. Established risk factors make it possible to identify children at an early stage at risk of developing bronchial asthma; It

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has been established that the adverse effect of the combined impact of increased anthropogenic load leads to an increase in the incidence of asthma. It has been proven that the results of this study make a significant contribution to the study of clinical manifestations, pathogenetic mechanisms of bronchial asthma in children living in the industrial regions of the Tashkent region.

Discussion of the obtained results. The study of the anamnesis of the examined children showed that in children aged 7-8 years, wheezing in anamnesis occurred in 16.1% of cases. At the age of 13-14 years, this indicator was 1.4 times higher ($p<0.05$). The recurrence rate of BA in children, according to official statistics, did not exceed three exacerbations per year. But according to the survey data, schoolchildren had from 4 to 12 attacks of wheezing during the year. Monthly and more frequent exacerbations of asthma symptoms during the last year were noted in 1.25% of the children surveyed. Nocturnal episodes of bronchial obstruction in children aged 13-14 years occurred 3 times more than in children aged 7-8 years ($p<0.05$). At the same time, severe difficult wheezing with speech limitation to 1-2 words between breaths in children aged 7-8 years occurred 1.3 times more often than in schoolchildren aged 13-14 years.

The study of cause-and-effect relationships between health and the environment based on the materials of the socio-hygienic forecast and analysis of information data on human health indicators and the environment characterizes the tactics of researching the development of regional short-term and long-term preventive measures and programs to improve the environment and optimize public health.

Intensive pollution of environmental objects with chemical pollutants in industrial cities leads to the appearance of various pathological processes, including skin lesions and allergic skin diseases (atopic and contact dermatitis), respiratory diseases, including bronchial asthma. According to researchers, the effect of chemical compounds on the skin leads to a decrease in its protective barrier function, depletion of buffer systems, which is expressed in a shift in the pH of the skin surface towards alkalosis, a decrease in skin resistance and an increase in the permeability of the stratum corneum of the epidermis.

And also, in the last decade in all countries of the world there has been a significant increase in the incidence of asthma, including among children, on the prevalence, which is significantly influenced by natural, climatic, environmental conditions, the factor of urbanization and the socio-economic development of a particular region or country. Implemented at the end of the 20th century throughout the world, international plans and national programs to combat bronchial asthma can slightly improve this state of affairs, but establishing the true prevalence of bronchial asthma is still a laborious epidemiological task.

The increase in the prevalence of bronchial asthma, allergic rhinitis and atopic dermatitis has been proven by the results of a unique epidemiological study carried out in various countries of the world (ISAAC), which is based on a standardized methodology recommended and approved by WHO. The prevalence of bronchial asthma in the world according to the criteria of the World Health Organization ranges from 1.4 to 14%, and in countries with similar climatic conditions, different indicators are recorded.

Thus, in Finland the prevalence of bronchial asthma is 1.8%, in Sweden - 7.7%, in Switzerland - 1.4%, in France - 6.7%, in the USA - 6% [7, 8, 12, 18].

In the United States for 25 years, the frequency of bronchial asthma has increased by 58%, and mortality from it has increased by 2 times [14, p.493]. In England, the prevalence of bronchial asthma among children in 1992 was 0.2%, in 2000 - 8.3%, and in 2013 - already 12% [8, 9, 10].

The prevalence of bronchial asthma among children in Italy is 5% [15], in Japan it ranges from 3 to 5% [11], and in children in various regions of Germany it is recorded with a frequency of 7.3 to 9.3% [9].

A number of epidemiological studies prove that the incidence of bronchial asthma in children is influenced by the age, specialty and social category of the parents at the time of the birth of the child, attendance at kindergartens, material and living conditions of the child. A group of Russian scientists listed the main causes of the risk of developing bronchial asthma in children. The authors believe that bronchial asthma is considered an emerging disease, in the implementation of which the burdened heredity for allergic diseases on the part of the mother, on the part of both parents, and the burdened heredity for chronic respiratory diseases are important. In their opinion, unfavorable factors of the ecological microenvironment also make their own contribution to the formation of bronchial asthma. Living near major highways, manufacturing plants and other environmentally unfriendly facilities also has an impact on the prevalence of bronchial asthma.

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Japanese scientists from Nagasaki [16] report in their work that the adverse effects of Asian dust affect the respiratory system of children, especially in the period from March to May. According to them, during this period, the number of respiratory diseases and cases of exacerbation of bronchial asthma increases.

The main sources of air pollution in residential premises, in addition to outdoor air and new building materials, are tobacco smoking, the use of gas stoves for cooking and heating rooms, as well as gas water heaters [18, 20].

The list of causative factors of bronchial asthma also includes industrial chemical compounds. Studies conducted in collaboration with professional pathologists revealed sensitization to industrial allergens (nickel, chromium, formaldehyde, etc.), which contribute to the formation of bronchial asthma [17]. Sources of anthropogenic pollution of the atmosphere, according to researchers, are transport, thermal power engineering, nuclear fuel cycle enterprises, industrial and agricultural enterprises. Despite the variety of substances emitted into the atmosphere by these sources, the most common emissions can be indicated: ash, dust, oxides of sulfur, nitrogen, hydrogen sulfide, hydrocarbons, ammonia, carbon oxides, etc.

In the work of Canadian scientists, the main attention was paid to the relationship between air pollution and the occurrence of asthma in cities [17]. Associations between exposure to industrial emissions and childhood asthma were studied in a population cohort of newborns in Quebec, Canada, Uzbekistan (2011-2020) [4,8].

Italian scientists [18] assessed the prevalence of asthma and associated risk factors in children and adolescents living in the industrial area of Termoli, Molise, Central-South Italy. The prevalence of asthma was assessed by introducing modified ISAAC questionnaires. According to the authors, asthma outcome was significantly associated with people living in the city of Termoli, which, despite its industrial/manufacturing activities, is also subject to higher environmental pressure due to the existence of a toll road, national highway, railway and seaport, which can cause air pollution from vehicular traffic and increase the induction of asthma.

A group of Polish authors [19] reports on a study on the respiratory health of children (n = 5733) conducted in the period 2003-2004 in Bytom, one of the largest cities in the Silesian metropolis (Poland). A number of studies have shown a link between road traffic air pollution and adverse respiratory health outcomes in children.

Chinese researchers studied the risk factors for AD among children aged 0-14 living in the city of Zhongshan [13]. According to them, the main stationary sources of atmospheric air pollution are oil refineries and power plants, the emissions of which amount to hundreds of thousands of tons of harmful substances (sulphurous anhydrite, carbon monoxide, ammonia, sulfuric acid aerosols, hydrogen sulfide, hydrocarbons, organic acids, etc.) that cause irritation of mucous membranes. and removing protective barriers. In the emissions of biochemical plants, unacceptably high levels of furfural, methanol, paprin, etc. are recorded. According to the authors, with constant monitoring of the efficient operation of treatment facilities, mild and moderate forms of BA prevail.

Over the past 5 years in the Republic of Kazakhstan, the number of patients with bronchial asthma has increased by 18.9% [1]. The performed analysis of the study of the incidence of bronchial asthma among children (0-14 years old) in Almaty allowed the authors to establish the main factors influencing the occurrence of this pathology in the structure of allergic diseases.

According to the epidemiological data conducted in Uzbekistan over the past 10–15 years, the incidence of BA among the population has also increased by more than 3 times, but, despite this, remains the lowest in comparison with the rates among the CIS countries [3,4,5,6 ,eight]. According to the data of the Republican Scientific and Practical Center for Pediatrics of the Ministry of Health of the Republic of Uzbekistan, during epidemiological screening, patients with mild BA prevailed (78.6%), while among patients taken for dispensary registration in medical institutions, the majority are patients of moderate severity and severe course (90.2%).

Thus, a sudden shift for the worse in the ecological situation due to industrial and anthropogenic pollution of the environment in the absence of the necessary compliance with environmental protection measures leads to a violation of immunoregulatory processes and an increase in the number of allergic diseases in industrialized regions of the world. Non-compliance with environmental measures contributes not only to the rise in the incidence of asthma, but also to its most severe course, which is saved for many years. An analysis of the literature of recent years shows that in the Republic of Uzbekistan, large-scale studies on the prevalence of BA among children living in industrial regions using ISAAC have not been conducted.

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Characteristics of the ecological situation in the industrial regions of the Tashkent region: the assessment of the role of adverse effects on the human body caused by environmental pollution is the most important task of medicine and is of great not only medical, but also social significance [2]. This task is of particular importance for pediatrics, which deals with a growing organism that is sensitive to any environmental influences. The increase in the prevalence of allergic diseases among the population, including among children, noted over the past two decades, is largely associated by most researchers with environmental pollution (atmospheric air, water, soil with chemical compounds).

Sources of pollutants of anthropogenic origin are transport and enterprises of the leading industries of the Republic: oil and gas production and processing, energy, metallurgical, construction, chemical and others.

The Hydrometeorological Service of the Republic of Uzbekistan has been monitoring air pollution in the cities of the Republic for many years. Observations are carried out in 25 cities and towns. In total, there are 63 stationary posts in the republic. The monitoring program covers 5 main pollutants: dust (solid suspended particles), carbon monoxide (carbon monoxide), nitrogen dioxide, sulfur dioxide, nitrogen oxide. Other parameters are added to the measurement programs depending on the composition of industrial emissions and the characteristics of the nearest cities and adjacent territories (ammonia, phenol, formaldehyde, ozone, chlorine, solid fluorides, hydrogen fluoride). Observations of the state of atmospheric air are carried out daily with a frequency of 3 times a day [3,8].

The information obtained from 63 stationary observation posts made it possible to judge the average level of atmospheric air pollution in the whole country and to calculate the air pollution index (hereinafter referred to as API), which gives an integral characteristic of the air pollution level for cities for the year.

The Comprehensive Air Pollution Index (hereinafter referred to as API5) is calculated for five substances with the highest normalized MPC values, taking into account their hazard class.

Assessment of the role of adverse effects on the human body caused by environmental pollution is the most important task of medicine and is of great not only medical, but also social significance [2,23]. This task is of particular importance for pediatrics, which deals with a growing organism that is sensitive to any environmental influences. The increase in the prevalence of allergic diseases among the population, including among children, noted over the past two decades, is largely associated by most researchers with environmental pollution (atmospheric air, water, soil with chemical compounds).

The Comprehensive Air Pollution Index (hereinafter referred to as API5) is calculated for five substances with the highest normalized MPC values, taking into account their hazard class.

Data analysis showed that during the studied period, the increase in the air pollution index was increased in all the studied cities of the Tashkent region, but especially in the city of Angren [4,8,23]. The complex indicator of pollution was 5.12 in 2014, 5.32 in 2016 and 5.30 in 2017, which corresponds to the II degree, corresponding to an increased level of atmospheric pollution, which leads to a deterioration in the living conditions of the population.

On the part of the Sanitary and Epidemiological Supervision, monitoring of the main industrial air pollutants was carried out: nitrogen oxide, sulfur dioxide (SO2 sulfur dioxide), carbon monoxide (CO carbon monoxide), nitrogen dioxide (NO2), dust (solid suspended particles), as well as specific pollutants - ammonia, phenols, heavy metals, hydrogen sulfide, organic solvents and others.

According to the results of instrumental control for 2014-2018, the excess of the established standards for emissions of pollutants into the atmosphere were found at the following enterprises:

• "Navoiazot" (Angren) - up to 2.84 times for nitrogen oxides and up to 1.17 times for ammonia;
• Almalyk MMC - up to 20 times for dust, up to 7.7 times for sulfur dioxide and up to 2.7 times for nitrogen oxides.
• "Uzmetkombinat" (Chirchik) - up to 3.7 times for dust, up to 1.6 times for nitrogen oxides and up to 3.1 times for sulfur dioxide;
• Maksam-Chirchik — up to 2.6 times for ammonia and up to 4.7 times for nitrogen oxides;

Instrumental control over the quality of wastewater is carried out at the sources of pollution of enterprises, the effluents of which are discharged into water bodies, irrigation fields and other areas through treatment facilities. Observations are carried out on 17 pollutants [7.18.21].

According to the results of observations of the state of water bodies in 2017-2019, the established standards are exceeded at:

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• Maxam-Chirchik for iron up to 3.7 times;
• Navoiazot for ammonium nitrogen up to 3 times, nitrate nitrogen up to 2 times, nitrite nitrogen up to 5 times and copper up to 1.9 times;
• Uzmetkombinat for sulfates up to 2.1 times, iron up to 1.3 times, fluorides up to 3.6 times and nitrite nitrogen up to 1.5 times;
• Angren Mining Administration "Kochbulok" in terms of ammonium nitrogen up to 9.26 times, sulfates up to 2.7 times and nitrite nitrogen up to 3 times.
According to the results of regular observations of the state of soils in 2017-2019, the established standards are also exceeded:
• Ammophos-Maxam sludge accumulator — up to 5.6 times for lead, up to 1.8 times for cadmium, up to 6.1 times for copper, up to 1.7 times for iron and up to 19.5 times for phosphates;
• the tailing dump of the Almalyk MMC - up to 1.5 times for lead, up to 1.8 times for cadmium, up to 6.7 times for copper and up to 1.5 times for iron;
• "Akhangarancement" (Angren) - for lead up to 2 times, for cadmium up to 2.4 times, for copper
• "Uzmetkombinat" (Angren) - for sulfates and cadmium up to 1.6 times.
Despite the decrease in gross emissions of pollutants in the industrial sectors of the surveyed regions, the sanitary condition of the air environment in the settlements of the Tashkent region is not accompanied by stabilization. Despite the decrease in gross emissions of pollutants in the industrial sectors of the surveyed regions, the sanitary condition of the air environment in the settlements of the Tashkent region is not accompanied by stabilization.

Conclusions:

1. According to official statistics for the period 2014-2018, there is an increase in the incidence of atopic pathology among children living in the industrial regions of the Tashkent region. Despite the fact that in recent years there has been a stabilization of the indicators of allergic morbidity among children, their general trend has a significant tendency to increase. For example, if in 2014 BA among children was recorded in 1.2% of cases, by 2018 it had almost tripled and amounted to 3.7%.
2. Thus, the combined influence of a number of factors contributes to the deterioration of the environmental situation in the Tashkent region. This creates a real threat to increase the incidence among the child population, primarily bronchial asthma.
3. Analysis of the data showed that during the studied period, the increase in the air pollution index was increased in all the studied cities of the Tashkent region, but especially in the city of Angren.

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