EARLY DETECTION AND PREVENTION OF BRONCHIAL ASTHMA.

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Abstract: Bronchial asthma is a chronic disease characterized by inflammation and hyperreactivity of airways. This disease is manifested by episodes of difficulty breathing, coughing, wheezing and chest pain. Early detection and prevention of the disease is very important due to the fact that it affects large sections of the population and the serious complications of the disease. In recent years, the number of patients with bronchial asthma has increased significantly around the world. According to the World Health Organization (WHO), more than 300 million people suffer from bronchial asthma, and this number is increasing every year. The incidence of the disease is high among children, especially in urban areas.

Key words: Bronchial asthma, airways, inflammation, genetic factors, allergens, immunoglobulin E, environmental factors, infections, stress and psychological, drugs, ige and allergic, bronchial hyperreactivity, bronchial obstruction, spirometry, chest ultrasound.

BRONXIAL ASTMA KASALLIGINI ERTA ANIQLASH VA OLDINI OLISH CHORALARI.

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Annotatsiya: Bronxial astma — nafas yo‘llarining yallig‘lanishi va giperraktivligi bilan xarakterlanadigan surunkali kasallikdir. Ushbu kasallik nafas olishni qiyinlashtiruvchi epizodlar, yo‘tal, hansirash va ko‘krakdagi og‘riq bilan

namoyon bo‘ladi. Aholining keng qatlamlariga ta’sir etishi va kasallikning og‘ir asoratlari sababli uni erta aniqlash va oldini olish juda muhimdir. So‘nggi yillarda bronxial astma bilan og‘rigan bemorlar soni dunyo bo‘yicha sezilarli darajada oshdi. Jahon sog‘liqni saqlash tashkiloti (JSST) ma‘lumotlariga ko‘ra, bronkial astma bilan 300 milliondan ortiq odam og‘riydi va bu raqam har yili ortib bormoqda. Bolalar o‘rtasida ham kasallikning uchrash tezligi yuqori bo‘lib, ayniqsa shahar hududlarida yuqori statistik ko‘rsatkichlar qayd etilgan.

Kalit so'zlar: Bronxial astma, nafas yo‘llari, yallig‘lanish, genetik omillar, allergenlar, mmunoglobulin E, ekologik omillar, infeksiyalar, stress va psixologik, dori vositalari, ige va allergic, bronxlar giperreaktivligi, bronxlar obstruksiyasi, spirometriya, ko‘krak ultratovush.

Bronchial asthma is a disease based on chronic inflammation of the airways, characterized by reversible narrowing of the bronchial passages, which is observed under the influence of various factors. Etiology: Genetic factors: Hereditary predisposition plays an important role in the development of bronchial asthma. If one or both parents suffer from asthma, the risk of developing this disease in a child increases. Changes in the production of immunoglobulin E (IgE) are genetically influenced. Allergens: Indoor allergens: dust mites, animal hair, mold fungi. Outdoor allergens: plant pollen (pollen), insect allergens. Food allergens: nuts, eggs, seafood. Environmental factors: Atmospheric air pollution: chemicals, industrial waste, vehicle emissions. Passive or active smoking (cigarette smoke). Living in an urban environment, especially in developed industrial areas. Infections: Viral and bacterial infections, such as respiratory viral infections and streptococci, can aggravate bronchial inflammation. Occupational factors: Allergic reactions to chemicals, dust or fumes in the workplace. Working in the construction or pharmaceutical industries. Stress and psychological factors: Severe emotional stress or psychological pressure can trigger asthma symptoms. Medications: Some medications, such as beta-blockers, aspirin and other nonsteroidal anti-inflammatory drugs, can trigger asthma attacks. Respiratory irritants: Cold air, dust, strong odors (perfumes or paints), physical exertion. These factors interact in the development of bronchial asthma, and the clinical course of the disease also depends on individual characteristics. The pathogenesis of bronchial asthma is a complex process, the main mechanisms of which are associated with chronic inflammation of the airways, hyperreactivity and obstruction (narrowing) of the bronchi. The main pathogenetic mechanisms are as follows: 1. Chronic inflammation : Inflammatory cells : Mast cells, eosinophils, lymphocytes, and macrophages play a key role in the development of asthma. During the inflammatory process, mediators (histamine, leukotrienes, prostaglandins) are released and affect the permeability of the bronchi. 2. Bronchial hyperreactivity : The airways become

hypersensitive to various stimuli (allergens, cold air, physical exertion). Receptors in the bronchial wall (e.g., β2-adrenergic and muscarinic receptors) are altered, which increases muscle contraction. [2,8,12,].

3. Bronchial obstruction (narrowing) : Bronchial narrowing occurs through three main mechanisms: Bronchial smooth muscle contraction : In response to stimuli, the bronchial muscles contract, narrowing the airways. Mucosal edema : As a result of inflammation, the bronchial mucosa thickens and narrows the airways. Increased mucus production : Excessive mucus production leads to airway obstruction. 4. IgE and allergic reaction : The main mechanism in the allergic form of asthma is immunoglobulin E (IgE). As a result of repeated contact with the allergen, mast cells are activated and secrete mediators (e.g., histamine), which leads to bronchial narrowing. 5. Role of eosinophils : Eosinophils are activated during inflammation and secrete toxic substances (e.g., major basic protein). This damages the bronchial mucosa and increases hyperreactivity. 6. Cytokines and chemokines : Cytokines such as IL-4, IL-5, IL-13 attract eosinophils and stimulate IgE production. Tumor necrosis factor (TNF) and interleukins enhance the inflammatory process. 7. Airflow limitation : As a result of narrowing of the airways, airflow is impaired, which leads to expiratory obstruction (difficulty in exhaling air). As a result, symptoms such as shortness of breath and wheezing appear. 8. Reversibility : One of the characteristic features of bronchial asthma is the partial or complete recovery of bronchial narrowing. This process usually occurs under the influence of bronchodilator drugs. Summary: The pathogenesis of bronchial asthma consists of a complex interaction of immunological (IgE-mediated), inflammatory and neuromuscular mechanisms. The severity and course of the disease depend on the degree of activation of these mechanisms. Clinical manifestations of bronchial asthma The clinical picture of bronchial asthma is associated with bronchial narrowing and airway hyperreactivity and is characterized by the following main symptoms: 1. Main symptoms: Shortness of breath (dyspnea): Usually in the form of expiratory dyspnea (difficulty in exhaling) . During an attack, breathing becomes difficult, especially at night or in the early morning. Wheezing: Wheezing sounds are heard during inhalation or exhalation. These sounds can be heard from a distance. Cough: It begins with a dry and irritating cough, sometimes accompanied by mucus or phlegm. It often occurs at night or after physical activity. Chest tightness: The patient feels pressure or tightness in the chest. This symptom is accompanied by difficulty breathing. 2. Characteristics of the course of the disease: Attacks (asthmatic episodes): Start under the influence of allergens, cold air, stress, physical exertion or infection. During the attack, the patient's breathing becomes faster, wheezing sounds increase, and exhalation is prolonged. Intermittent period: Between attacks, the patient feels relatively well, symptoms may be absent or minimal. Worsening of symptoms at night and in the morning: Bronchoconstriction increases at

night or in the morning, and symptoms are more severe. 3. Severity of the disease: Mild episodic asthma: Attacks are observed rarely (1–2 times a week), are short-lived. During the intermittent period, the patient feels completely healthy. Mild persistent asthma: Attacks occur several times a week, but are mild. Nighttime symptoms may recur several times a month. Moderate persistent asthma: Symptoms occur during the day, and at night 1–2 times a week. Physical activity and sleep are impaired. Severe persistent asthma: Symptoms occur very frequently during the day and at night. Bronchial narrowing is partially relieved by bronchodilators. 4. Dangerous conditions (status asthmaticus): A severe attack of bronchial asthma that is not controlled by bronchodilators. It can cause shortness of breath, impaired arterial blood gas, and even life-threatening. Additional symptoms: Fatigue and weakness: Occur due to constant lack of oxygen. Sputum: Clear and viscous sputum is released after the attack. Blueness of the lips and nails (cyanosis): Observed in severe asthma attacks, this is a sign of respiratory failure. Symptoms of bronchial asthma can vary depending on the patient's age, the course of the disease, and the causes. Early diagnosis and appropriate treatment are essential for improving quality of life [1,5,6,].

Laboratory diagnostics . Laboratory methods for diagnosing bronchial asthma help to assess the presence of an inflammatory process, allergic reactions, and the state of the respiratory tract. The following are laboratory diagnostic methods: 1. Complete blood count (CBC): Eosinophilia : An increase in the number of eosinophils (> 5%) is characteristic of the allergic form of bronchial asthma. Leukocytosis : Often observed in asthma accompanied by infection. 2. Immunological tests: Determination of IgE levels : An increase in the level of general and specific IgE is characteristic of allergic asthma. A specific IgE analysis in serum is performed to identify allergic factors. Cytokine levels : An increase in cytokines such as IL-4, IL-5, IL-13 indicates an allergic process. 3. Bronchodilator test with spirometry: Forced expiratory volume (FEV1) and bronchial patency are assessed. Broncholytic test: An improvement in FEV1 of 12% or more confirms bronchial asthma. 4. Skin allergy tests (prick test): Skin sensitivity to various allergens (dust, pollen, animal hair) is determined. A positive result indicates the presence of allergic asthma. 5. Sputum analysis: Eosinophils : An increase in eosinophils in sputum (>2–3%) is characteristic of asthma. Curschmann spirals : Appear in the form of fibrous spirals of mucus released from the bronchi. Charcot-Leyden crystals : Formed as a result of eosinophil degranulation and are a sign of asthma. 6. Blood gas analysis: During an asthma attack, the levels of oxygen (PaO2) and carbon dioxide (PaCO2) in the blood change. In severe attacks, hypoxemia and hypercapnia are observed. 7. Exhaled nitric oxide (FeNO): The amount of nitric oxide in exhaled air is measured. In allergic asthma, the level of FeNO is increased, which indicates inflammation of the airways. 8. Provocation tests: Methacholine or histamine test: Used to assess bronchial hyperreactivity. A positive

result is observed in patients with increased bronchial sensitivity. Exercise stress test: Determines bronchial constriction during physical activity. 9. IgE-mediated allergen panel: To accurately determine allergic causes, specific IgE to various allergens is determined in the blood serum. 10. Additional methods according to indications: Urinalysis: Sometimes leukotriene metabolites (for example, LTE4) are detected. Bronchoscopy: Performed when sputum collection or assessment of the interior of the bronchi is necessary. [3,11,8,].

Instrumental and functional diagnostics. In addition to laboratory diagnostics, instrumental and functional examinations are also important in the diagnosis of bronchial asthma. They help to determine the state of the airways, bronchial patency and hyperreactivity. 1. Spirometry is the most important functional examination method in the diagnosis of bronchial asthma and other respiratory diseases. Expiratory volume : Spirometry measures FEV1 (forced expiratory volume in 1 second) and FVC (forced expiratory volume). FEV1/FVC ratio : In asthma, this ratio may be below 70%. Expiratory obstruction is observed in asthma. Bronchial reactivity : Spirometry is accompanied by bronchial provocative tests (for example, methacholine or histamine). A positive result indicates a decrease in bronchial patency. 2. Peak flowmetry is a simple and effective method for quickly assessing airway obstruction. This method determines the patient's peak expiratory flow (PEF) . PEF measurements : The PEF level of patients with asthma changes during daily monitoring, and this is an important indicator in the management of the disease. Attack monitoring : The degree of obstruction in a patient during an asthma attack is determined using PEF analysis. 3. Bronchodilator test is performed using spirometry, in which a bronchodilator agent (for example, salbutamol) is used. Positive result : An increase in FEV1 by 12% or more indicates the presence of bronchial asthma, that is, a temporary improvement in bronchial permeability. 4. Measurement of exhaled nitric oxide (FeNO) - used to detect bronchial asthma and other inflammatory processes. The level of nitric oxide (NO) is measured in exhaled air. FeNO levels are increased in asthma and allergic inflammation. It is an indicator of inflammation : This test helps to detect allergic inflammation in the airways. 5. Chest X-rays are particularly useful in ruling out conditions that present with symptoms similar to asthma (e.g., pneumonia or other lung conditions). Chest X-rays : Asthma is not usually radiographic in nature, but are useful in differentiating it from infections, emphysema, or other conditions. [4,7,10,12]

6. Bronchoscopy - is performed to visually assess the condition of the airways. This method is usually used in cases of severe asthma or to rule out other diseases. Sputum collection : Bronchoscopy is used to collect sputum from the bronchi and send it for laboratory analysis. Mucosal examination : Helps to identify signs of inflammation and thickening of the mucous membrane. 7. Provocation tests. Provocation tests - are used to determine the hyperreactivity of bronchial asthma.

Methacholine test : Hyperreactivity of the bronchi is determined using substances such as histamine or methacholine. Bronchoconstriction is observed in patients with asthma. Physical activity test : The reaction of asthma to physical exercise can be studied. This test causes shortness of breath and wheezing. 8. Chest ultrasound. Chest ultrasound is sometimes used to detect airway obstruction or lung pathology. However, this test is used as an adjunct, not a primary tool in the diagnosis of asthma [1,2,9,13] .

Treatment. Rapid-acting bronchodilators: Salbutamol, Fenoterol — dilate the bronchi during an attack. Inhaled corticosteroids: Beclomethasone, Budesonide — reduce inflammation. Leukotriene antagonists: Montelukast — useful in allergic asthma. Combination drugs: Salmeterol + Fluticasone, Formoterol + Budesonide — reduce bronchodilation and inflammation. Severe asthma: Oral corticosteroids: Prednisolone — for severe attacks. Monoclonal antibodies: Omalizumab — for allergic asthma. Attack management: Rapid-acting drugs: Salbutamol, Prednisolone. Oxygen therapy: In hypoxic conditions. Allergy and prevention: Allergen avoidance and immunotherapy (vaccination). Monitoring: PEF monitoring: Monitoring breathing. Patient education: Proper use of medications. Continuous monitoring and an individual approach to treatment are necessary to reduce asthma symptoms and prevent attacks. [3,6,8,].

Prevention of bronchial asthma. Avoidance of allergens: Protection from dust, pollen, animal hair and other allergens. Keeping the house clean, preventing dust accumulation. Protection of the respiratory tract: Avoidance of harmful gases, pollution and railway smoke. Not smoking and avoiding passive smoking. Physical activity:

Exercise regularly, but avoid strenuous exercise during an asthma attack. Allergen immunotherapy (vaccination): Immunotherapy against specific allergens is beneficial for patients with allergic asthma. Early detection of the disease:

Quickly identify and treat asthma symptoms, and prevent attacks.

Patient education: Teaching patients how to use medications properly and how to prevent attacks. Prompt treatment: Using medications to manage and treat asthma attacks. [2, 5, 9,14,10].

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