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ACUTE RESPIRATORY DISEASES IN CHILDREN: ANALYSIS OF CAUSATIVE AGENTS AND CLINICAL MANIFESTATIONS

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Abstract: This article provides a comprehensive analysis of the etiological factors and clinical manifestations of acute respiratory diseases in children. Particular attention is paid to the role of viral and bacterial pathogens in the development of respiratory infections, their pathogenic mechanisms, and age-related characteristics of disease progression. The article examines the relationship between causative agents, clinical symptoms, disease severity, and the risk of complications. Modern laboratory and instrumental diagnostic methods, differential diagnosis, and approaches to pathogen-specific treatment are discussed. Special emphasis is placed on the influence of immunological characteristics, environmental factors, and comorbidities on the clinical course of respiratory diseases in pediatric patients. Early identification of infectious agents and appropriate assessment of clinical manifestations are essential for improving treatment effectiveness, preventing complications, and reducing morbidity among children.

Keywords: acute respiratory diseases, children, etiological factors, respiratory infections, viral pathogens, bacterial pathogens, clinical manifestations, differential diagnosis, immune response, prevention, pediatric patients.

ОСТРЫЕ РЕСПИРАТОРНЫЕ ЗАБОЛЕВАНИЯ У ДЕТЕЙ: АНАЛИЗ ВОЗБУДИТЕЛЕЙ И КЛИНИЧЕСКИХ ПРОЯВЛЕНИЙ

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Аннотация: В статье представлен комплексный анализ этиологических факторов и клинических проявлений острых респираторных заболеваний у детей. Особое внимание уделено роли вирусных и бактериальных возбудителей в развитии респираторных инфекций, механизмам их патогенного воздействия и

возрастным особенностям течения заболеваний. Рассмотрена взаимосвязь между этиологической структурой инфекций, клинической симптоматикой, степенью тяжести заболевания и риском развития осложнений. Освещены современные методы лабораторной и инструментальной диагностики, принципы дифференциальной диагностики и подходы к этиотропной терапии. Проанализировано влияние иммунологических особенностей детского организма, факторов окружающей среды и сопутствующих заболеваний на течение респираторной патологии. Своевременная идентификация возбудителей и объективная оценка клинических проявлений имеют важное значение для повышения эффективности лечения, предупреждения осложнений и снижения заболеваемости среди детского населения.

Ключевые слова: острые респираторные заболевания, дети, этиологические факторы, респираторные инфекции, вирусные возбудители, бактериальные возбудители, клинические проявления, дифференциальная диагностика, иммунный ответ, профилактика, педиатрия.

BOLALARDA ÖTKIR RESPIRATOR KASALLIKLAR: QÖZĞATUVÇILAR VA KLINIK BELGILAR TAHLILI

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Annotatsiya: Mazkur maqolada bolalarda uçraydigan ötkir respirator kasalliklarning etiologik omillari va klinik belgilari kompleks ilmiy jihatdan tahlil qilingan. Respirator infeksiyalarning rivojlanişida virusli va bakterial qözğatuvçilarning örni, ularning patogenetik ta'sir mexanizmlari hamda kasallikning yoşga boğliq keçaş xususiyatlariga alohida e'tibor qaratilgan. Infeksiyalarning etiologik tuzilmasi, klinik simptomlari, kasallikning oğirlik darajasi va asoratlarning rivojlaniş xavfi örtasidagi özaro boğliqlik yoritilgan. Zamonaviy laborator va instrumental taşxislaş usullari, differensial diagnostika tamoyillari hamda etiotrop davolaş yondaşuvlari körib çiqilgan. Şuningdek, bolalar organizmining immunologik xususiyatlari, atrof-muhit omillari va hamroh kasalliklarning respirator patologiyalar keçaşiga ta'siri tahlil etilgan. Kasallik qözğatuvçilarini öz vaqtida aniqlash va klinik belgilarni obyektiv baholaş davolaş samaradorligini oşiriş, asoratlarning oldini oliş hamda bolalar orasida kasallaniş darajasini kamaytirişda muhim ilmiy-amaliy ahamiyat kasb etadi.

Kalit sözlar: ötkir respirator kasalliklar, bolalar, etiologik omillar, respirator infeksiyalar, virusli qözğatuvçilar, bakterial qözğatuvçilar, klinik belgilar, differensial diagnostika, immun javob, profilaktika, pediatriya.

Introduction. Acute respiratory diseases (ARDs) represent one of the most common groups of infectious diseases affecting children worldwide and constitute a major public health concern in pediatric practice. Their high prevalence, diverse etiological structure, variable clinical manifestations, and potential complications contribute significantly to childhood morbidity and hospitalization. Children, particularly infants and those of preschool age, are more susceptible to respiratory infections because of the anatomical and physiological characteristics of their respiratory system and the functional immaturity of their immune defense mechanisms. The etiological spectrum of acute respiratory diseases includes numerous viral and bacterial pathogens. Respiratory syncytial virus (RSV), influenza viruses, parainfluenza viruses, adenoviruses, rhinoviruses, human metapneumovirus, and seasonal coronaviruses are among the most frequently implicated viral agents. Bacterial pathogens, including *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Mycoplasma pneumoniae*, and *Staphylococcus aureus*[1], may cause primary respiratory infections or contribute to secondary bacterial complications. The clinical manifestations of acute respiratory diseases vary considerably depending on the causative agent, the child's age, immune status, underlying medical conditions, and environmental factors. Common symptoms include fever, cough, nasal congestion, rhinorrhea, sore throat, fatigue, tachypnea, and respiratory distress. In severe cases, respiratory infections may progress to bronchitis, bronchiolitis, pneumonia, respiratory failure, and systemic complications requiring specialized medical intervention. The increasing availability of molecular diagnostic technologies has improved the identification of respiratory pathogens and expanded scientific understanding of their epidemiological and clinical characteristics. Polymerase chain reaction (PCR), multiplex molecular testing, antigen detection, and microbiological culture contribute to more accurate etiological diagnosis when appropriately indicated. Nevertheless, distinguishing viral infections from bacterial diseases remains a significant challenge because of overlapping clinical manifestations. Early identification of causative agents, comprehensive assessment of clinical symptoms, and appropriate evaluation of disease severity are essential for developing effective therapeutic strategies and preventing unnecessary antibiotic administration. Furthermore, understanding the relationship between pathogen-specific characteristics and clinical outcomes may contribute to the optimization of pediatric respiratory care. The aim of this study is to comprehensively analyze the principal causative agents of acute respiratory diseases in children, investigate their characteristic clinical manifestations, and evaluate contemporary diagnostic and therapeutic approaches aimed at reducing disease severity and preventing complications.

Materials and methods. The present article was designed as a narrative literature review focusing on the etiological structure, clinical manifestations, diagnostic approaches, and management principles of acute respiratory diseases in pediatric populations. The methodological framework incorporated comparative

[1] Daminov T.O., Xalmatova B.T., Boboyeva Ö.R. Bolalar kasalliklari. Darslik. Toşkent. 2013.

analysis, descriptive evaluation, clinical interpretation, and qualitative synthesis of scientific knowledge concerning respiratory infections in children. Particular attention was directed toward the biological characteristics of infectious agents, mechanisms of disease development, age-related susceptibility, clinical presentation, and factors associated with unfavorable outcomes. The analysis was organized according to the following criteria:

- Etiological classification of viral and bacterial respiratory pathogens;
- Age-related characteristics of respiratory infections;
- Clinical manifestations and severity of respiratory diseases;
- Pathogen-associated complications[2];
- Laboratory and instrumental diagnostic approaches;
- Principles of etiological treatment and preventive interventions.

The comparative approach was used to identify similarities and differences between respiratory infections associated with various pathogens. Clinical characteristics were evaluated in relation to the anatomical localization of infection, systemic inflammatory responses, respiratory dysfunction, and the potential development of complications. Diagnostic approaches considered in the review included molecular testing, rapid antigen detection, microbiological examination, complete blood count, inflammatory biomarkers, pulse oximetry, and chest radiography when clinically indicated.

Comparative etiological and clinical characteristics of major respiratory pathogens in children

Causative agent	Etiological category	Principal clinical manifestations	Potential complications	Diagnostic methods
Respiratory syncytial virus (RSV)	Viral	Cough, wheezing, tachypnea, respiratory distress	Bronchiolitis, pneumonia, respiratory failure	RT-PCR, antigen testing
Influenza virus	Viral	Sudden fever, headache, myalgia, cough, fatigue	Pneumonia, secondary bacterial infection	RT-PCR, rapid molecular testing
Adenovirus[3]	Viral	Prolonged fever,	Pneumonia, severe lower	PCR, antigen detection[5]

[2] Qoraxöjayev B. Bolalar kasalliklari propedevtikasi. Darslik. Toşkent: Yangi asr avlodi, 2006. 437 b.

[3] Aşurov D.T. Bolalar kasalliklari propedevtikasi. Darslik. Toşkent, 2018. 476 b.

[5] Turdieva Ş.T., Nasirova G.R. Pediatriya amaliyotida ötkir respirator infeksiyalarni antibiotiklar bilan davolaşning zamonaviy strategiyasi // International Journal of Scientific Pediatrics. 2025. № 4(4). 1036-1040.

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		pharyngitis, conjunctivitis[6]	respiratory infection	
Rhinovirus	Viral	Rhinorrhea, sneezing, nasal congestion, cough	Asthma exacerbation, otitis media	RT-PCR
Parainfluenza virus	Viral	Hoarseness, barking cough, inspiratory stridor	Croup, airway obstruction	RT-PCR
Human metapneumovirus	Viral	Fever, cough, wheezing, dyspnea	Bronchiolitis, pneumonia	RT-PCR
Streptococcus pneumoniae[7]	Bacterial	Fever, productive cough, tachypnea, chest pain	Pneumonia, pleural effusion, sepsis	Culture, molecular testing
Haemophilus influenzae	Bacterial	Fever, cough, respiratory discomfort	Pneumonia, invasive infection	Culture, PCR
Mycoplasma pneumoniae	Bacterial	Persistent cough, fatigue, headache, fever	Atypical pneumonia, extrapulmonary complications	PCR, selected serological testing
Staphylococcus aureus	Bacterial	High fever, respiratory distress, systemic inflammation	Necrotizing pneumonia, empyema, sepsis	Culture, antimicrobial susceptibility testing[8]

The comparative classification presented in Table 1 demonstrates that respiratory pathogens exhibit considerable diversity in their clinical manifestations and potential complications. Viral agents frequently affect the upper respiratory tract but may also cause severe lower respiratory tract disease, particularly in infants. Bacterial pathogens are important causes of pneumonia and other serious respiratory complications. The methodological approach emphasizes the importance of integrating clinical observations with laboratory findings rather than relying exclusively on individual symptoms. This approach supports accurate differential diagnosis and

[6] Karimjanov I.A., Iskanova G.X., Yusupova G.A., Israilova N.A. Neonatologiya. Öquv qöllanma. Toşkent, 2021.
[7] Boymurodov X., Örinov A. Ötkir respirator virusli infeksiyalarda ratsional taşxis va davolaş tamoyillari // Yoş olimlar. 2026. № 4(67). 35-39.
[8] Yusupova G.A., Israilova N.A. Erta yoşdagi bolalarda respirator-sintitsial virusli infeksiyaning klinik-laborator xususiyatlari // Özbekiston tibbiyot ilmi. 2025. № 4(2). 48-50.

facilitates the selection of appropriate therapeutic interventions[9]. As this article is a narrative review, no original patient cohort, experimental intervention, or independently collected clinical dataset is presented. The comparative findings are qualitative rather than statistically derived from patient-level observations.

Discussion. The etiological diversity of acute respiratory diseases in children reflects the complex interaction between infectious pathogens, host immune responses, physiological characteristics, and environmental conditions. Viral infections account for a substantial proportion of pediatric respiratory illnesses, whereas bacterial pathogens remain important contributors to severe pneumonia, secondary infections, and hospitalization[10]. Respiratory syncytial virus is particularly significant in infants and young children because of its association with bronchiolitis and lower respiratory tract infections. The inflammatory response induced by RSV may lead to mucosal edema, excessive mucus production, and obstruction of small airways. These pathological changes contribute to impaired ventilation, wheezing, tachypnea, and, in severe cases, hypoxemia. Influenza viruses are characterized by relatively pronounced systemic manifestations, including fever, muscular pain, weakness, and headache. In pediatric patients, influenza may also be accompanied by gastrointestinal symptoms and neurological complications. Damage to the respiratory epithelium during influenza infection can increase susceptibility to secondary bacterial pneumonia, particularly infections associated with *Streptococcus pneumoniae* and *Staphylococcus aureus*. Rhinoviruses are commonly associated with upper respiratory tract infections. However, their clinical significance extends beyond uncomplicated common colds, as they may contribute to bronchial hyperreactivity and exacerbations of asthma. Children with underlying allergic diseases or chronic respiratory conditions may experience more pronounced clinical manifestations. Adenoviral infections frequently present with prolonged fever, pharyngitis, and conjunctivitis. Certain adenovirus types may cause severe pneumonia, especially in immunocompromised children. Parainfluenza viruses, in contrast, are strongly associated with acute laryngotracheitis, which is characterized by a barking cough, hoarseness, and inspiratory stridor.

Bacterial respiratory infections require particular clinical attention because of their potential association with invasive disease and severe complications. *Streptococcus pneumoniae*[11] remains an important bacterial cause of community-acquired pneumonia in children. Pneumococcal infections may progress to pleural effusion, empyema, bacteremia, and systemic inflammatory responses. *Mycoplasma pneumoniae* is particularly relevant among school-aged children and adolescents. Its clinical presentation often includes persistent cough, gradual symptom development, fatigue, and headache. The absence of a bacterial cell wall distinguishes this

[9] Rustamov M.R., Ibragimova M.F., Xusainova Ş.K. Bolalarda mikoplazma pnevmoniyasining klinik-diagnostik mezonlari xususiyatlari // Xalqaro ilmiy pediatriya jurnali. 2023. № 2(2). B. 40-43.
[10] Abrieva N.X., Şoyikramov Ş.Ş., Axmataliyeva M., Safarov Z.F., Şaripov A.M. Erta yoşdagi bolalarda şifoxonadan taşqari pnevmoniyaning klinik, laborator va immunologik xususiyatlari hamda uning oğir keçaşi markerlari // Özbekiston tibbiyot ilmi. 2025. № 4(6). 148-153.
[11] Kudratova G.N., Xolmuradova Z.E. Erta yoşdagi bolalarda şifoxonadan taşqari pnevmoniyada klinik-anamnestik özgarişlar // Eurasian Journal of Academic Research. 2023. № 3(2). 39-42.

microorganism from many other bacterial pathogens and influences the selection of appropriate antimicrobial therapy. Age-related physiological characteristics play an essential role in determining the severity of respiratory infections. Infants have relatively narrow airways, limited respiratory reserves, and developing immune defense mechanisms. Consequently, even moderate inflammation and mucus accumulation may produce clinically significant airway obstruction and respiratory dysfunction. Environmental and socioeconomic factors also influence the incidence and clinical course of respiratory diseases. Exposure to tobacco smoke, atmospheric pollution, overcrowded living conditions, inadequate ventilation, nutritional deficiencies, and limited access to preventive healthcare may increase susceptibility to respiratory infections and contribute to unfavorable clinical outcomes. An important challenge in contemporary pediatric practice is the differentiation between viral and bacterial respiratory infections. Clinical symptoms alone do not always provide sufficient evidence for determining the causative agent. Although inflammatory biomarkers such as C-reactive protein and procalcitonin may contribute to diagnostic assessment, their results should be interpreted in combination with clinical findings and other diagnostic investigations. Molecular diagnostic technologies have considerably expanded opportunities for identifying respiratory pathogens. Multiplex PCR assays allow the simultaneous detection of several viral and bacterial agents, facilitating the recognition of mixed infections. Nevertheless, the detection of microbial genetic material does not necessarily establish active infection, and laboratory findings must be interpreted within the broader clinical context. Rational antibiotic administration represents another important aspect of pediatric respiratory disease management. Unnecessary antibiotic use in uncomplicated viral infections contributes to antimicrobial resistance, adverse drug reactions, and increased healthcare expenditures[12]. Therefore, antimicrobial treatment should be based on clinical indications, suspected or confirmed bacterial etiology, disease severity, and relevant clinical guidelines. Preventive strategies should incorporate vaccination, adequate nutrition, breastfeeding during infancy, appropriate hygiene practices, reduction of environmental risk factors, and early recognition of respiratory symptoms. Immunization against influenza, pneumococcal infection, pertussis, and *Haemophilus influenzae* type b plays a significant role in reducing the burden of vaccine-preventable respiratory diseases. Overall, an integrated approach combining etiological diagnosis, clinical risk assessment, individualized treatment, and preventive interventions is essential for improving respiratory health among children. Further prospective clinical investigations are needed to clarify pathogen-specific risk factors, evaluate mixed infections, and develop more effective predictive models for severe pediatric respiratory diseases.

Conclusion. Acute respiratory diseases in children constitute a heterogeneous group of infectious conditions characterized by diverse etiological factors, variable clinical manifestations, and different degrees of severity. Viral pathogens represent a major component of the etiological structure of pediatric respiratory infections, while

[12] Agzamova Ş.A., Abdurashidova X.B. Bolalarda obstruksiyali bronxopulmonal yalliğlaniş kasalliklari böyiça zamonaviy qaraşlar // Özbekiston tibbiyot ilmi. – 2025. № 4(6). 4-11.

bacterial agents remain particularly important in the development of pneumonia, invasive infections, and serious complications. The clinical course of respiratory diseases is influenced by the biological characteristics of causative agents, age-related physiological features, immune status, environmental exposures, and underlying medical conditions. Early recognition of respiratory dysfunction and accurate assessment of disease severity are essential for preventing unfavorable clinical outcomes. The integration of modern molecular diagnostic methods with comprehensive clinical assessment contributes to improved etiological identification, more effective differential diagnosis, and rational therapeutic decision-making. Particular attention should be paid to reducing unnecessary antibiotic administration and preventing the emergence of antimicrobial resistance. Strengthening vaccination programs, improving environmental conditions, promoting healthy nutritional practices, and increasing parental awareness are fundamental components of respiratory disease prevention in children. In conclusion, a comprehensive, evidence-based, and individualized approach to the diagnosis, treatment, and prevention of acute respiratory diseases is essential for reducing pediatric morbidity, minimizing hospitalization, preventing complications, and improving long-term respiratory health outcomes. Further clinical and epidemiological research is necessary to optimize diagnostic algorithms and develop effective strategies for managing respiratory infections across different pediatric age groups.

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