THE ROLE OF SEASONALITY AND AGE-RELATED FACTORS IN THE INCIDENCE AND CLINICAL COURSE OF ACUTE RESPIRATORY INFECTIONS IN CHILDREN

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Abstract Acute respiratory infections are among the leading causes of morbidity in children worldwide. Their incidence and clinical course are influenced by seasonal patterns, age-related physiological characteristics, environmental conditions, and the child's general health status. This study aims to assess the relationship between seasonal variations, age, and the incidence and clinical manifestations of acute respiratory infections in children. Particular attention is given to differences in symptom frequency across pediatric age groups, seasonal changes in disease occurrence, and the potential association between age-related factors and clinical severity. Understanding these patterns may help improve epidemiological surveillance, facilitate the early identification of children at increased risk, and support the development of targeted preventive measures. The findings may contribute to improving pediatric healthcare planning and strengthening evidence-based approaches to the prevention and management of acute respiratory infections.

Keywords: acute respiratory infections, children, seasonality, age-related factors, epidemiology, clinical manifestations, disease incidence, prevention.

РОЛЬ СЕЗОННОСТИ И ВОЗРАСТНЫХ ФАКТОРОВ В ЗАБОЛЕВАЕМОСТИ И КЛИНИЧЕСКОМ ТЕЧЕНИИ ОСТРЫХ РЕСПИРАТОРНЫХ ИНФЕКЦИЙ У ДЕТЕЙ

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Аннотация: Острые респираторные инфекции являются одной из основных причин заболеваемости детей во всём мире. Их распространённость и клиническое течение зависят от сезонных закономерностей, возрастных

физиологических особенностей, условий окружающей среды и общего состояния здоровья ребёнка. Цель настоящего исследования — оценить взаимосвязь между сезонными колебаниями, возрастом и частотой возникновения, а также клиническими проявлениями острых респираторных инфекций у детей. Особое внимание уделяется различиям в частоте симптомов среди возрастных групп, сезонным изменениям заболеваемости и возможной связи возрастных факторов с тяжестью клинического течения. Понимание этих закономерностей может способствовать совершенствованию эпидемиологического надзора, раннему выявлению детей с повышенным риском заболевания и разработке целенаправленных профилактических мероприятий. Результаты исследования могут внести вклад в совершенствование планирования педиатрической помощи и укрепление научно обоснованных подходов к профилактике и ведению острых респираторных инфекций.

Ключевые слова: острые респираторные инфекции, дети, сезонность, возрастные факторы, эпидемиология, клинические проявления, заболеваемость, профилактика.

BOLALARDA O‘TKIR RESPIRATOR INFEKSIYALAR TARQALISHI VA KLINIK KECHISHIDA MAVSUMIYLIK HAMDA YOSHGA BOG‘LIQ OMILLARNING O‘RNI

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Annotatsiya: O‘tkir respirator infeksiyalar butun dunyoda bolalar orasida kasallanishning asosiy sabablaridan biri hisoblanadi. Ushbu infeksiyalarning tarqalishi va klinik kechishi mavsumiy o‘zgarishlar, yoshga bog‘liq fiziologik xususiyatlar, atrof-muhit sharoitlari hamda bolaning umumiy salomatlik holatiga bog‘liq. Tadqiqotning maqsadi bolalarda o‘tkir respirator infeksiyalarning uchrash chastotasi va klinik namoyon bo‘lishi bilan mavsumiy o‘zgarishlar hamda yosh o‘rtasidagi bog‘liqlikni baholashdan iborat. Tadqiqotda turli yosh guruhlarida simptomlarning uchrash chastotasi, kasallanishning mavsumiy o‘zgarishlari va

yoshga bog‘liq omillarning kasallik klinik kechishi og‘irligi bilan ehtimoliy aloqasiga alohida e’tibor qaratiladi. Ushbu qonuniyatlarni o‘rganish epidemiologik kuzatuvni takomillashtirish, kasallanish xavfi yuqori bo‘lgan bolalarni erta aniqlash va maqsadli profilaktik choralarni ishlab chiqishga yordam berishi mumkin. Tadqiqot natijalari pediatriya xizmatini rejalashtirishni takomillashtirish hamda o‘tkir respirator infeksiyalarning oldini olish va bemorlarni davolashda ilmiy dalillarga asoslangan yondashuvlarni rivojlantirishga xizmat qilishi mumkin.

Kalit so‘zlar: o‘tkir respirator infeksiyalar, bolalar, mavsumiylik, yoshga bog‘liq omillar, epidemiologiya, klinik belgilar, kasallanish darajasi, profilaktika.

RELEVANCE OF THE STUDY Acute respiratory infections are among the most common diseases affecting children and remain a major public health concern because of their high incidence, recurrent occurrence, and potential to cause serious complications. The spread of these infections is influenced by several factors, including the child's age, seasonal variations, environmental conditions, and general health status. According to the World Health Organization (WHO), respiratory syncytial virus (RSV) is an important cause of lower respiratory tract infections in children. The circulation of this virus demonstrates seasonal patterns in many countries. In temperate climates, RSV activity generally increases during late autumn and winter, whereas seasonal patterns may differ in tropical and subtropical regions.

Age is an important factor influencing both the incidence and clinical course of acute respiratory infections. Infants and young children may be particularly vulnerable to certain respiratory infections because their immune systems are still developing. In addition, underlying medical conditions, inadequate nutritional status, and indoor air pollution may contribute to an increased risk of severe respiratory complications.

Investigating the interaction between seasonal variations and age-related characteristics is essential for improving the prevention, early detection, and clinical management of respiratory infections. Assessing these factors may help identify periods of increased disease incidence, determine which age groups require closer medical observation, and support the effective planning of preventive measures.

AIM OF THE STUDY

The aim of this study is to investigate the role of seasonal variations and age-related factors in the incidence and clinical course of acute respiratory infections in children, identify differences in disease occurrence across pediatric age groups and seasons,

and assess their potential association with clinical manifestations and disease severity. The study also aims to provide an evidence-based foundation for improving early detection, epidemiological surveillance, and preventive strategies for acute respiratory infections in children.

OBJECTIVES OF THE STUDY

To achieve the aim of the study, the following objectives have been established:

1. To analyze the incidence and epidemiological characteristics of acute respiratory infections in children across different age groups.
2. To investigate seasonal variations in the occurrence of acute respiratory infections and identify periods of increased disease incidence.
3. To assess age-related differences in the clinical manifestations and frequency of respiratory symptoms in children.
4. To evaluate the relationship between seasonal patterns and the clinical course of acute respiratory infections.
5. To identify potential risk factors associated with an increased incidence and more severe clinical manifestations of respiratory infections in children.
6. To assess the potential influence of environmental conditions and underlying health status on the incidence and clinical course of acute respiratory infections.
7. To develop evidence-based recommendations for improving preventive measures, early detection, and clinical management of acute respiratory infections in pediatric practice.

RESULTS OF THE STUDY The analysis of published scientific literature indicates that seasonal variation and age-related characteristics are important factors in the epidemiology of acute respiratory infections in children. Evidence from systematic reviews and meta-analyses demonstrates that respiratory syncytial virus (RSV) is a major cause of acute lower respiratory tract infections, particularly among infants and children younger than five years.

A systematic review and meta-analysis published in 2024 included 47 studies investigating risk factors for RSV-associated acute lower respiratory infections in children under five years of age. The findings identified indoor air pollution as a potential risk factor for community-acquired RSV-associated lower respiratory infection, with an odds ratio (OR) of 1.45 (95% confidence interval [CI]: 1.10–1.90). Other factors associated with an increased risk of hospitalization included prematurity, low birth weight, exposure to tobacco smoke, household characteristics, and underlying medical conditions [1].

Age-related differences in disease severity were further demonstrated by a systematic review and meta-analysis of risk factors for poor outcomes in children with RSV-associated acute lower respiratory tract infections. Children younger than three months had higher odds of poor clinical outcomes (OR: 4.91; 95% CI: 1.64–14.71), while children younger than six months also demonstrated an increased risk (OR: 2.02; 95% CI: 1.73–2.35). Underlying comorbidities were associated with increased odds of poor outcomes (OR: 2.69; 95% CI: 1.89–3.83), and congenital heart disease was associated with an OR of 3.40 (95% CI: 2.14–5.40) [2].

Seasonality is another important epidemiological characteristic of respiratory viral infections. Research indicates that changes in temperature, humidity, indoor environmental conditions, and human behavior may influence viral transmission and seasonal disease patterns. In temperate regions, several respiratory viruses show increased circulation during colder months, although the timing and intensity of seasonal peaks vary by virus and geographical location [3].

Taken together, the published evidence supports the importance of age-specific assessment, seasonal epidemiological surveillance, and the identification of underlying risk factors in pediatric respiratory infections. However, the magnitude of these associations may vary across populations and healthcare settings. Local epidemiological studies are therefore necessary to establish seasonal patterns and age-specific disease rates in the population under investigation.

The available evidence suggests that preventive strategies should prioritize infants and young children, particularly those born prematurely or living with underlying medical conditions. Reducing exposure to tobacco smoke and indoor air pollution, improving early recognition of respiratory symptoms, and strengthening preventive healthcare may help reduce the burden of severe respiratory infections in children.

Epidemiological and Statistical Findings

A systematic review and meta-analysis published in 2024 included 47 studies examining risk factors for respiratory syncytial virus (RSV)-associated acute lower respiratory infections in children younger than five years. Indoor air pollution was associated with increased odds of community-acquired RSV-associated acute lower respiratory infection (OR = 1.45; 95% CI: 1.10–1.90). Other reported risk factors for RSV-associated hospitalization included prematurity, low birth weight, exposure to tobacco smoke, household characteristics, and underlying medical conditions [1].

The global burden of RSV-associated acute lower respiratory infections was quantified in a systematic analysis published in *The Lancet* in 2022. For 2019, the investigators estimated 33.0 million episodes (uncertainty range: 25.4–44.6 million), 3.6 million hospital admissions (2.9–4.6 million), and approximately 101,400 RSV-attributable deaths (84,500–125,200) among children aged 0–59 months worldwide [2]. Infants aged 0–6 months accounted for an estimated 6.6 million episodes and

1.4 million hospital admissions, emphasizing the importance of age-specific surveillance and prevention.

The World Health Organization reports that RSV circulation is seasonal in most countries. In temperate climates, epidemics tend to occur in late autumn and winter, whereas tropical and subtropical regions may demonstrate different seasonal patterns [3]. These findings support the importance of evaluating seasonal variation alongside age and clinical characteristics when investigating respiratory infections in children.

CONCLUSION

Seasonality and age-related characteristics are important epidemiological factors influencing the incidence and clinical course of acute respiratory infections in children. Evidence from international studies indicates that respiratory syncytial virus (RSV) contributes substantially to the global burden of pediatric respiratory disease. In 2019, an estimated 33.0 million RSV-associated acute lower respiratory infection episodes, 3.6 million hospital admissions, and 101,400 RSV-attributable deaths occurred among children younger than five years worldwide [1]. These estimates highlight the considerable public health impact of RSV-associated disease.

Infants, particularly those younger than six months, represent a population at increased risk of severe RSV infection and adverse clinical outcomes. Global estimates indicate that approximately 1.4 million RSV-associated hospital admissions occurred among infants aged 0–6 months in 2019 [1]. These findings emphasize the importance of age-specific clinical assessment, early recognition of respiratory complications, and timely medical intervention.

Seasonal patterns also play an important role in respiratory virus transmission. In temperate climates, RSV circulation generally increases during late autumn and winter, while tropical and subtropical regions may demonstrate different seasonal patterns [2]. Therefore, epidemiological surveillance should consider local climatic conditions and seasonal variations when planning preventive measures and healthcare resources.

In conclusion, evaluating seasonal trends together with age-related characteristics and individual risk factors may improve the early identification of children vulnerable to severe respiratory infections. Strengthening epidemiological surveillance, promoting appropriate preventive interventions, reducing exposure to indoor air pollution and tobacco smoke, and ensuring timely access to healthcare are important components of pediatric respiratory disease prevention. Further population-based studies using verified clinical and epidemiological data are needed to determine local seasonal patterns and establish the independent predictors of severe disease in children.

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