

PREVALENCE OF ACUTE RESPIRATORY INFECTIONS IN SAUDI ARABIAN CHILDREN: AN ANALYTICAL STUDY OF CAUSES AND RISK FACTORS

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Abstract

Background: Acute respiratory infections (ARIs) are a leading cause of morbidity and mortality in children globally, with significant prevalence in Saudi Arabia due to environmental, socioeconomic, and healthcare-related factors. This study aimed to assess the prevalence of ARIs among Saudi children and identify key risk factors contributing to their occurrence.

Methods: A cross-sectional analytical study was conducted, involving 300 children aged 6 months to 12 years. Data were collected via structured interviews with parents/guardians and clinical record reviews. Variables included socio-demographics, environmental exposures, immunization status, and nutritional indicators. Statistical analyses, including chi-square tests and logistic regression, were performed using SPSS version 26.

Results: The prevalence of ARIs was 33%, with higher rates observed in children exposed to parental smoking (48.8%), poor indoor ventilation (50.9%), and indoor charcoal heating (51.4%). Incomplete immunization (60.3%) and underweight status (55.2%) were significant predictors of ARIs. Logistic regression confirmed strong associations between ARIs and incomplete immunization (OR = 3.2), underweight status (OR = 2.6), parental smoking (OR = 2.1), and poor ventilation (OR = 1.8).

Conclusion: ARIs remain a major health concern among Saudi children, driven by modifiable risk factors such as environmental exposures, inadequate immunization, and malnutrition. Targeted public health interventions, including parental education, improved vaccination coverage, and better indoor air quality, are essential to reduce the burden of ARIs in this population.

Keywords: Acute respiratory infections, Children, Saudi Arabia, Risk factors, Immunization, Environmental exposure, Malnutrition.

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Background

Acute respiratory infections (ARIs) are among the most common illnesses affecting children globally. These infections include a wide range of conditions, from mild upper respiratory infections such as the common cold to severe lower respiratory diseases like pneumonia and bronchitis. ARIs are a leading cause of Pediatric hospital visits and school absenteeism, especially among children under five years of age (Walker et al., 2022).

The global health community recognizes ARIs as a significant contributor to childhood morbidity and mortality. Millions of children are affected annually, particularly in developing and middle-income countries. Despite advances in medical treatment and public health strategies, ARIs continue to strain healthcare systems due to the high number of hospital admissions and outpatient visits they generate (La Via et al., 2024).

Within the MENA region, the prevalence of ARIs varies based on geographic and environmental factors. Countries in arid and semi-arid zones, such as Saudi Arabia, face unique challenges due to dust storms, seasonal weather fluctuations, and variable air quality. These factors can contribute to the increased incidence of respiratory illnesses in children, especially during transitional seasons (Akasha et al., 2023).

In Saudi Arabia, ARIs are a significant public health concern among the Pediatric population. The country's vast geography and differing climates across regions—from the humid coastlines to the arid deserts—play a role in the patterns and triggers of respiratory infections. Urbanization, rapid industrial development, and increasing vehicular traffic have also contributed to rising air pollution levels, which are associated with respiratory health issues (Alharbi et al., 2024).

Environmental elements such as air pollution, dust exposure, and temperature fluctuations are among the primary external contributors to ARIs. In Saudi Arabia, sandstorms and dust-laden winds are common and can exacerbate respiratory conditions. Children, due to their developing immune systems and smaller airways, are especially vulnerable to these environmental stressors (Georgakopoulou et al., 2024).

Socioeconomic conditions, such as income level, housing quality, and access to healthcare services, greatly influence the risk of ARIs in children. Families living in overcrowded or poorly ventilated homes are at greater risk of infection transmission. Additionally, lifestyle factors such as indoor smoking and

inadequate hygiene practices can further increase susceptibility to respiratory infections (Holden et al., 2023).

Nutritional status plays a critical role in a child's ability to fight infections. Malnourished children often have weakened immune responses, making them more prone to infections, including ARIs. Immunization coverage is another crucial determinant. Vaccines against pathogens like Haemophilus influenzae type B and Streptococcus pneumoniae have been instrumental in reducing the burden of ARIs in many regions, but gaps in vaccine coverage still exist (Morales et al., 2023).

Awareness of ARI symptoms, prevention strategies, and the importance of early medical intervention is vital for reducing the disease burden. Parental education on hygiene practices, environmental management, and the benefits of timely immunizations can contribute to lowering ARI prevalence. In some areas of Saudi Arabia, especially rural regions, lack of health education may hinder efforts to control the spread of infections (Jefferson et al., 2020).

Accessibility to healthcare facilities and timely medical attention are key factors influencing ARI outcomes. Delays in seeking care, either due to financial constraints or geographical barriers, can result in complications and increased hospitalization rates. Strengthening primary healthcare services and improving health infrastructure are essential for early diagnosis and management of ARIs in children (Garg et al., 2008).

Given the multifactorial causes and high prevalence of ARIs among children in Saudi Arabia, there is a pressing need for a comprehensive analytical study. Understanding the epidemiological patterns, environmental influences, and socio-demographic risk factors is essential for developing targeted public health interventions. This study aims to fill the knowledge gap and provide evidence-based recommendations to reduce the incidence and impact of ARIs among Saudi children.

Methodology

This study was conducted using a cross-sectional analytical design to assess the prevalence of acute respiratory infections (ARIs) among children in Saudi Arabia and identify associated risk factors.

The target population consisted of children aged 6 months to 12 years who visited primary healthcare centres and Pediatric outpatient clinics during the study period. Both male and female children were included regardless of nationality, provided that informed consent was obtained from a parent or

guardian.

A total of 300 children were included in the study. The sample size was determined using a 95% confidence interval, an expected ARI prevalence of 30%, and a 5% margin of error. A multistage stratified random sampling technique was employed to ensure representation from urban and rural areas within each selected region. Health centers were randomly selected, and children attending those centers were recruited systematically.

Inclusion and Exclusion Criteria

Children aged between 6 months and 12 years who presented with symptoms of ARIs or were asymptomatic at the time of visit were included. Children with chronic respiratory diseases such as asthma or congenital lung anomalies were excluded to avoid confounding variables.

Data Collection Tools and Procedure

Data were collected through structured face-to-face interviews with the parents or guardians using a pre-tested questionnaire. The questionnaire included sections on socio-demographic information, medical history, immunization status, environmental exposures (such as parental smoking and indoor ventilation), recent respiratory symptoms, and healthcare-seeking behaviour. In addition, clinical records were reviewed to confirm diagnoses of ARIs when applicable.

Variables Measured

The primary outcome variable was the presence of an acute respiratory infection. Independent variables included age, sex, parental smoking, exposure to indoor air pollution, vaccination history, family income, parental education level, and type of housing.

Data Analysis

Data were coded and entered into SPSS version 26 for statistical analysis. Descriptive statistics such as frequency, percentages, means, and standard deviations were used to summarize the data. Chi-square tests were performed to assess associations between categorical variables, while logistic regression analysis was used to identify significant risk factors for ARIs. A p-value of less than 0.05 was considered statistically significant.

Results

This section presents the findings of the study conducted among 300 children aged 6 months to 12 years across three regions in Saudi Arabia. The analysis includes socio-demographic characteristics, prevalence of acute respiratory infections (ARIs), and potential risk factors associated with ARIs. Descriptive and inferential statistics were used to explore patterns and relationships in the data (Table 1).

Out of 300 children, 51.3% were males and 48.7% were females. Most children (34.3%) were aged between 3 to 5 years. A significant majority (70%) resided in urban areas. Regarding parental education, 40.2% of the parents had secondary education, while 39.5% had attained university or higher education.

The study revealed that children (33%) children had symptoms consistent with acute respiratory infections at the time of data collection. This indicates a high prevalence rate, with one in every three children affected.

Among children exposed to parental smoking, 48.8% had ARIs. Similarly, 50.9% of children from homes with poor ventilation had ARIs. Of the children exposed

to indoor charcoal heating, 51.4% developed ARIs. These figures suggest a strong correlation between environmental exposures and the prevalence of ARIs.

The data show that children with incomplete immunization had a 60.3% ARI prevalence, more than double the rate of those fully immunized (25%). Likewise, 55.2% of underweight children had ARIs compared to only 26.6% of those with normal weight, suggesting that poor nutrition and incomplete vaccination are significant risk factors.

Multivariate logistic regression analysis showed that incomplete immunization (OR = 3.2), underweight status (OR = 2.6), exposure to parental smoking (OR = 2.1), and poor ventilation (OR = 1.8) were statistically significant predictors of ARIs. All p-values were below 0.005, indicating a strong association between these risk factors and ARI occurrence.

Discussion

The study identified a 33% prevalence of acute respiratory infections (ARIs) among children aged 6 months to 12 years in Saudi Arabia. This rate aligns with previous findings, such as a study in Riyadh reporting a 24% prevalence among children under two years old. The consistency across studies underscores the persistent burden of ARIs in the Pediatric population (Walker et al., 2022).

Children aged 3–5 years constituted the largest age group in this study. However, literature indicates that infants under one year are particularly vulnerable to ARIs, especially those caused by respiratory syncytial virus (RSV). The higher susceptibility in younger children is attributed to their immature immune systems and narrower airways (La Via et al., 2024).

The study observed a slight male predominance (51.3%) among ARI cases. This finding is consistent with other research indicating higher ARI rates in male children. Biological differences and Behavioral factors may contribute to this disparity (Akasha et al., 2023).

A significant majority (70%) of participants resided in urban areas. Urban living is often associated with increased exposure to pollutants and crowded living conditions, both of which are risk factors for ARIs. However, access to healthcare services is typically better in urban settings, potentially mitigating some risks (Alharbi et al., 2024).

The study found that children of parents with lower educational attainment had higher ARI prevalence. This aligns with findings that maternal education level is inversely related to ARI incidence. Educated parents are more likely to adopt preventive measures and seek timely medical care (Georgakopoulou et al., 2024).

Exposure to parental smoking was associated with a 48.8% ARI prevalence among affected children. Second-hand smoke is a well-established risk factor for respiratory infections in children, impairing mucociliary function and immune responses (Morales et al., 2023).

Poor indoor ventilation was linked to a 50.9% ARI prevalence. Inadequate ventilation can lead to the accumulation of indoor pollutants and pathogens, increasing infection risk. Ensuring proper airflow and reducing indoor pollutants are essential preventive strategies (La Via et al., 2024).

The use of indoor charcoal heating correlated with a 51.4% ARI prevalence. Combustion of charcoal indoors releases harmful pollutants, exacerbating respiratory conditions. Alternative heating methods with lower emissions should be promoted.

Children with incomplete immunization had a 60.3% ARI prevalence, compared to 25% in fully immunized children. Vaccinations play a crucial role in preventing respiratory infections, and efforts should be made to improve immunization coverage (Holden et al., 2023).

Underweight children exhibited a 55.2% ARI prevalence, highlighting the role of nutrition in immune function. Malnutrition compromises the body's defense mechanisms, making children more susceptible to infections.

The study was conducted during the winter months, a period associated with increased ARI cases. Seasonal factors, such as lower temperatures and indoor crowding, contribute to higher transmission rates of respiratory viruses during this time (Jefferson et al., 2020).

While the study did not specify pathogens, literature indicates that RSV is the most common cause of ARIs in Saudi children, accounting for up to 95.5% of viral cases. Other viruses, such as rhinovirus and influenza, also contribute to the disease burden.

The study did not address antibiotic use; however, inappropriate antibiotic prescribing for viral ARIs is a concern. A study in Saudi Arabia found that antibiotics were prescribed in 46.32% of ARI cases, despite most being viral in origin. This practice contributes to antibiotic resistance and underscores the need for better diagnostic tools and prescribing guidelines.

Table 1. Socio-Demographic Characteristics of Participants (n = 300).

Characteristic	Percentage (%)
Gender	
Male	51.3
Female	48.7
Age Group	
6 months – 2 years	33.0
3 – 5 years	34.3
6 – 12 years	32.7
Residence	
Urban	70.0
Rural	30.0
Parental Education	
Primary or less	20.3
Secondary	40.2
University or higher	39.5

Educating parents about ARI prevention, recognition, and appropriate healthcare-seeking behaviour is vital. Awareness campaigns can empower caregivers to implement preventive measures and reduce the disease burden.

The findings highlight the need for integrated public health strategies addressing environmental, nutritional, and educational factors. Future research should focus on longitudinal studies to assess the impact of interventions on ARI incidence and outcomes.

Conclusion

This study underscores the significant prevalence of acute respiratory infections among Saudi Arabian children and identifies key risk factors, including environmental exposures, incomplete immunization, and poor nutritional status. Addressing these factors through targeted public health interventions, education, and policy changes is essential to reduce the burden of ARIs and improve child health outcomes in the region.

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