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ACUTE RESPIRATORY INFECTIONS AMONG YOUNG CHILDREN: A CONTINUING GLOBAL HEALTH BURDEN

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ABSTRACT

Acute Respiratory Infections (ARIs) continue to pose one of the most pressing public health challenges for children under the age of five, especially in developing countries like India. ARIs, which include both upper respiratory tract infections such as the common cold and tonsillitis, and lower respiratory tract infections such as pneumonia, are responsible for a large proportion of childhood illness, hospital admissions, and premature deaths. Globally, millions of children die each year from ARIs, with the highest burden falling on low- and middle-income countries where environmental risks, poverty, and limited access to healthcare amplify the problem.

This article explores the major causes of ARIs in young children, highlighting the role of poor sanitation, indoor air pollution, overcrowded housing, inadequate ventilation, and malnutrition as critical risk factors. It also sheds light on how social and environmental determinants of health continue to shape outcomes in vulnerable populations. Evidence-based preventive strategies, such as timely vaccination, exclusive breastfeeding, improved nutrition, hand hygiene, proper waste management, and maintaining smoke-free, well-ventilated environments, are shown to significantly reduce the burden of ARIs.

The discussion emphasizes that although ARIs remain a leading cause of childhood morbidity and mortality, they are largely preventable. A comprehensive approach—one that integrates healthcare services, community participation, environmental improvements, and parental awareness—can save countless young lives and contribute to healthier child development.

KEYWORDS : *Acute Respiratory Infections (ARIs); under-five children; pneumonia; public health; child morbidity; child mortality; indoor air pollution; sanitation; overcrowding; prevention strategies; vaccination; breastfeeding; hygiene; nutrition; developing countries.*

ABOUT AUTHORS:

Mrs. Sujata Swain is a researcher and Ph.D. Scholar at Himalayan University, Itanagar, Arunachal Pradesh, India. Her academic journey is marked by a strong commitment to advancing knowledge in her field of study, with a particular focus on contributing innovative insights through her doctoral research.

Dr. Santosh Sharma is a distinguished academician with extensive experience in teaching, research, and mentorship, Dr. Sharma has guided numerous Ph.D. scholars across diverse disciplines, fostering scholarly excellence and innovation. She has published several research articles in reputed national and international journals. Her research contributions span critical areas of health sciences, community well-being, and evidence-based practices, reflecting both academic rigor and societal relevance. As a committed scholar and mentor, Dr. Sharma continues to inspire the next generation of researchers while contributing meaningfully to the advancement of knowledge in her field.

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INTRODUCTION

Acute Respiratory Infection (ARI) is considered as one of the leading causes of morbidity and mortality in children and it incurs upon high economic cost. It is the main reason for utilization of health services for children. Its control is a big public health concern especially in developing countries. It constitutes Upper Respiratory Infection (URI) and Lower Respiratory Infection (LRI). Upper respiratory infection presents mainly with Rhinitis (Common Cold), Tonsillitis, Sinusitis and ear infection while main presentations of LRI is Pneumonia which exhibits with increased respiratory rate.

Acute respiratory tract infection is a major cause of morbidity and mortality in developing and also developed countries. About 13 Million children under 5 years of age die every year in the world, 95% of them in developing countries, one third of total deaths are due to ARI. In the developing countries, out of ten, seven deaths in under 5 years of age group are due to ARI. NFHS -3 revealed that two weeks before the survey 6% of children under age 5 had symptoms of an ARI (cough, short and rapid breathing that was chest related and not due to blocked running nose), out of these children 69% were taken to a health facility or health provider for treatment . Average adult has 2-4 episodes per year and a child has 6-8 episodes per year. It is estimated that at least 300 million episodes of ARI occur in India every year, out of which about 30 to 60 millions are moderate to severe ARI. While every 6 th child in the world is Indian, every 4th child who dies, comes from India. aqARI is responsible for about 30-50 % visits to health facilities and for about 20-40 % admissions to hospital. (WHO (1995). The DALYs lost due to ARI in South East Asia Region are about 3, 30, 26,000.

From an estimated 5.4 million under-five children that died in 2017—roughly half of those deaths occurred in sub-Saharan Africa and ARIs contributed to the highest number of deaths ARIs are among the leading causes of morbidity and mortality among children under-five years worldwide [Accinelli RA et al 2017].

Mortality due to ARI is significantly varied across regions. In 2010, global burden disease reported that more than 12 million children with severe ARI were admitted to hospitals every year worldwide. ARI accounts for up to 50% of visits of children to health facilities globally [West T et al 1999].

Pneumonia accounts for the death of approximately 2400 under-five years children a day. ARIs are responsible for approximately 70% of under-five years of childhood morbidities in developing countries [Selvaraj K et al 2014]. A study conducted to assess the prevalence of acute lower respiratory infections (ALRIs) among children under-five years from 28 sub-Saharan African countries revealed the overall prevalence of ARI for all the countries was 25.3% [Seidu A-A et al 2019].

The first scientific study on the potential damage of atmospheric pollution was reported in 1930. Hundreds of people presented with laryngeal irritation, retrosternal pain, coughing fits and 'dyspnoeic breathing characterized by paroxysms and slowed expiration, such as asthma', with 60 incident deaths. (Nemery B et al 2001)

There are other subsequent descriptions, such as the 1952 epidemic in London, with approximately 4000 excess deaths occurring, primarily assigned to bronchitis and pneumonia, among other causes.(Abercrombie GF 1953); (Logan WP 1953)

In 1931, the report on the effect of air pollution on health published by the Committee on Public Health Relations of the New York Academy of Medicine (New York Academy of Medicine. 1931) mentioned 'the nuisance of smoke is present wherever fuel, rubbish, and gasoline are burned', along with the observation that humans spend more than 90% of their time indoors. (Calderón-Garcidueñas L et al 2015)

In developed countries, tobacco is the main contributor to indoor pollution. However, in developing countries,(De Koning HW,et al 1985) the solid fuels used for cooking are the prevailing source of indoor pollution (Fullerton DGet al 2008) and globally household air pollution is the third highest global risk factor for burden of disease, while it remains the first in South Asia. (Lim SS et al 2010)

CAUSES OF ACUTE RESPIRATORY INFECTIONS AMONG UNDER-FIVE CHILDREN

Environmental Factors:

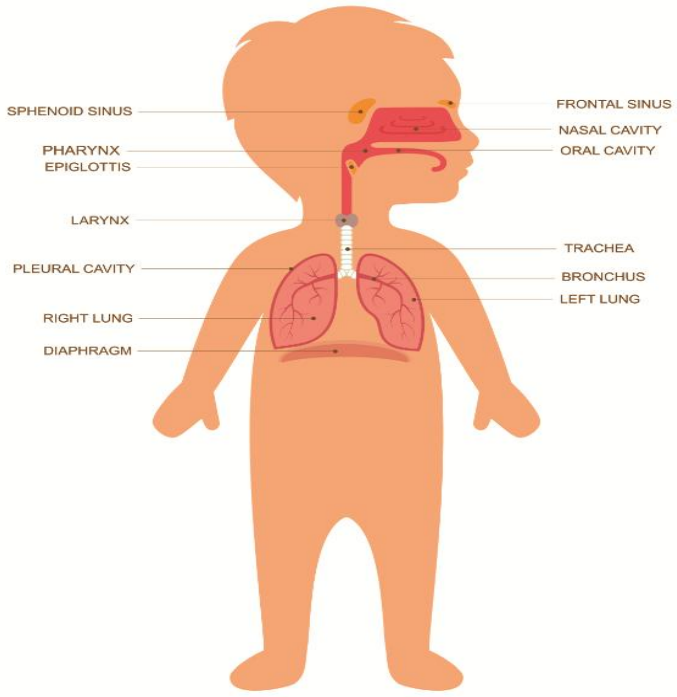
- Poor sanitation and hygiene: Inadequate access to clean water, poor waste management, and lack of proper toilet facilities contribute to the spread of infections. Poor sanitation and hygiene significantly contribute to acute respiratory infections (ARIs) in under-five children. Inadequate access to clean water, improper waste disposal, and poor toilet facilities facilitate the spread of pathogens. This environment increases children's exposure to bacteria and viruses, heightening the risk of respiratory infections. Research emphasizes that improving sanitation and hygiene practices can reduce ARI incidence in young children. Effective interventions

include promoting handwashing with soap, safe water storage, and proper waste management to mitigate the risk of ARIs in vulnerable populations.

- Indoor air pollution: Use of unclean fuels for cooking, such as biomass or solid fuels, increases the risk of ARIs. Indoor air pollution significantly contributes to acute respiratory infections (ARIs) in under-five children. Exposure to pollutants like particulate matter, nitrogen oxides, and carbon monoxide from cooking fuels, heating systems, and tobacco smoke increases the risk of ARIs. Research highlights that indoor air pollution can impair lung development, compromise immune defenses, and increase susceptibility to respiratory infections. Using clean energy sources, improving ventilation, and reducing exposure to pollutants can help mitigate this risk. A study found that exposure to biomass smoke increases ARI incidence in children under 5 in developing countries (Santri, 2023)

- Overcrowding: Living in overcrowded conditions increases the chance of close contact with infected individuals. Overcrowding is a significant risk factor for acute respiratory infections (ARIs) among under-five children. Living in crowded conditions increases the chance of close contact with infected individuals, facilitating the transmission of respiratory pathogens. Research indicates that overcrowding is associated with an increased risk of pneumonia and other ARIs in young children (Jackson et al., 2023). Reducing household crowding and promoting physical distancing can help mitigate the risk of ARIs in vulnerable populations.

Poor ventilation: Inadequate ventilation in homes can lead to increased exposure to respiratory pathogens. Poor ventilation is a significant contributor to acute respiratory infections (ARIs) among under-five children. Inadequate ventilation in homes can lead to the accumulation of airborne pathogens, increasing the risk of respiratory infections. Research highlights that poor ventilation can exacerbate the spread of viral and bacterial pathogens, particularly in crowded or poorly maintained environments (Simonsen et al., 2022). Improving ventilation through proper airflow and air exchange can help reduce the concentration of airborne pathogens and mitigate the risk of ARIs in young children.



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PREVENTION OF ACUTE RESPIRATORY INFECTIONS AMONG UNDER-FIVE CHILDREN

Preventing acute respiratory infections (ARIs) among under-five children requires a multi-faceted approach. Here are some effective strategies:

1. Vaccination: Ensure children receive recommended vaccinations, such as pneumococcal conjugate vaccine (PCV) and Haemophilus influenzae type b (Hib) vaccine. Vaccination plays a crucial role in preventing acute respiratory infections (ARIs) among under-five children. Vaccines like pneumococcal conjugate vaccine (PCV) and Haemophilus influenzae type b (Hib) vaccine protect against common bacterial causes of pneumonia and other ARIs. Research confirms that vaccination significantly reduces the incidence of ARIs, hospitalizations, and mortality in young children (Madhi et al., 2021). By immunizing children against major respiratory pathogens, vaccination helps prevent infections and reduces the burden of ARIs in this vulnerable population.

2. Breastfeeding: Exclusive breastfeeding for the first six months can help boost a child's immune system. Breastfeeding plays a significant role in preventing acute respiratory infections (ARIs) among under-five children. Research suggests that breastfeeding reduces the frequency and severity of ARIs, particularly those caused by respiratory syncytial virus (RSV). Exclusive breastfeeding for 4-6 months significantly lowers hospitalization rates, length of stay, and supplemental oxygen demand. Breast milk contains immunoglobulins, antimicrobial peptides, and immunomodulatory factors that protect against respiratory viruses. A study found that breastfeeding decreased RSV-associated ALRI episodes and hospitalization rates among infants under 12 months (Jang et al., 2020).

3. Good hygiene: Promote handwashing with soap, especially after coughing or sneezing, before eating, and after using the toilet. Good hygiene practices play a crucial role in preventing acute respiratory infections (ARIs) among under-five children. Frequent handwashing with soap, especially after coughing or sneezing, before eating, and after using the toilet, can significantly reduce the transmission of respiratory pathogens. Research confirms that hand hygiene interventions can decrease the incidence of ARIs in young children (Rabie & Curtis, 2019). By promoting good hygiene habits, caregivers can help protect children from respiratory infections and reduce the risk of complications.

4. Improved ventilation: Ensure good airflow in homes to reduce the concentration of airborne pathogens. Improved ventilation is a crucial prevention strategy for acute respiratory infections (ARIs) among under-five children. Adequate airflow and air exchange can reduce the concentration of airborne pathogens, decreasing the risk of transmission. Research highlights that well-ventilated environments can lower the incidence of ARIs in young children (Escombe et al., 2018). By ensuring good ventilation in homes, childcare centers, and other settings, caregivers can help protect children from respiratory infections and promote a healthier environment.

5. Avoid exposure to smoke: Reduce exposure to tobacco smoke, cooking fuels, and other pollutants. Avoiding exposure to smoke is a crucial prevention strategy for acute respiratory infections (ARIs) among under-five children. Exposure to tobacco smoke and other pollutants can impair lung function, increase susceptibility to infections, and exacerbate respiratory symptoms. Research confirms that reducing exposure to smoke can lower the risk of ARIs in young children (Klein et al., 2017). By creating a smoke-free environment, caregivers can help protect children from respiratory infections and promote healthier lung development.

6. Nutrition: Provide a balanced diet rich in fruits, vegetables, and whole grains to support immune function. Adequate nutrition plays a vital role in preventing acute respiratory infections (ARIs) among under-five children. A balanced diet rich in fruits, vegetables, whole grains, and essential micronutrients like vitamin A and zinc can boost the immune system and reduce the risk of ARIs. Research confirms that nutritional interventions can decrease the incidence and severity of ARIs in young children (Bhutta et al., 2016). By ensuring optimal nutrition, caregivers can help support children's immune function and protect them from respiratory infections.

7. Avoid overcrowding: Reduce household crowding to minimize the risk of transmission. Avoiding overcrowding is a crucial prevention strategy for acute respiratory infections (ARIs) among under-five children. Overcrowding increases the chance of close contact with infected individuals, facilitating the transmission of respiratory pathogens. Research confirms that reducing household crowding can lower the risk of ARIs in young children (Baker et al., 2015). By ensuring adequate living space and reducing exposure to crowded environments, caregivers can help protect children from respiratory infections and promote a healthier environment.

8. **Proper waste management**: Ensure safe disposal of waste and maintain a clean environment. Proper waste management is essential in preventing acute respiratory infections (ARIs) among under-five children. Poor waste disposal can lead to the spread of pathogens, increasing the risk of respiratory infections. Research highlights that effective waste management practices, such as safe disposal of household waste and proper sewage systems, can reduce the incidence of ARIs in young children (Prüss-Ustün et al., 2014). By maintaining a clean environment through proper waste management, caregivers can help protect children from respiratory infections and promote overall health.

CONCLUSION

Acute Respiratory Infections (ARIs) remain one of the most significant public health challenges affecting under-five children worldwide, particularly in developing countries like India. They contribute substantially to morbidity, mortality, and health care utilization, with pneumonia being the leading cause of death among affected children. Multiple factors such as poor sanitation, indoor air pollution, overcrowding, inadequate ventilation, and malnutrition exacerbate the risk of ARIs in this vulnerable age group.

However, ARIs are largely preventable through evidence-based interventions. Strategies such as timely vaccination, exclusive breastfeeding, improved nutrition, good hygiene practices, smoke-free environments, proper ventilation, and safe waste management play a pivotal role in reducing the incidence and severity of these infections. Addressing environmental determinants and strengthening public health programs can significantly lower ARI-related morbidity and mortality.

Therefore, a comprehensive, multi-sectoral approach that combines health education, preventive interventions, and improved living conditions is essential to safeguard under-five children from ARIs and promote healthier childhood development.

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