

Exploring Acute Respiratory Infections in Under-five Children: A Cross-Sectional Study at Burdwan Medical College Immunization Clinic, West Bengal

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Abstract:

Introduction: Acute Respiratory Infections (ARIs) are a significant cause of morbidity and mortality among children under five years of age. ARIs can range from infections in the upper respiratory tract to severe conditions affecting the lungs. According to the WHO, ARI is characterized by rapid or difficult breathing in children. In India, ARIs account for a substantial percentage of child mortality, with prevalence varying across urban and rural areas.

Objective: The primary objective of this study was to estimate the proportion and determinants of Acute Respiratory Infections among children under five years attending the immunization clinic at Burdwan Medical College and Hospital.

Materials & Methods: A cross-sectional descriptive study was conducted at Burdwan Medical College and Hospital. Data were collected from mothers/caregivers of children under five years old using a semi-structured pretested schedule. Convenience sampling was used, with 105 participants who provided informed consent. Data analysis was done using Microsoft Excel, and ethical approval was obtained from the institutional ethics committee.

Results: The study found that 59% of the children had experienced at least one episode of ARI. Males represented 61.9% of the participants. Significant determinants of ARI included smoking in the household (59%), rural residence (57.14%), and exposure to cooking smoke. Fully immunized children constituted 59.04% of the sample, and a majority of children experienced 0-2 episodes of ARI.

Conclusion: The high prevalence of ARI, especially in rural areas and among children exposed to secondhand smoke, highlights the need for targeted interventions to reduce risk factors. Immunization plays a crucial role in mitigating ARI incidence. The study recommends increased public health awareness on ARI risk factors and the importance of full immunization.

Keywords: Acute Respiratory Infection, Immunization Clinic, Under Five Children.

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Introduction

Acute Respiratory Infections (ARIs) are the most common cause of morbidity and mortality in children aged under five years worldwide [1]. They are responsible for approximately 15% of all deaths from childhood, especially in low- and middle-income countries where access to health services may be limited [2].

ARIs range from mild upper respiratory infections, like the common cold, to severe lower respiratory tract infections, such as pneumonia, with a potential to be fatal unless treated. The burden of ARIs is particularly high in India, which carries a substantial proportion of the global childhood morbidity and mortality due to these infections. Factors contributing to high prevalence of ARIs in children include

poor socioeconomic conditions, malnutrition, lack of exclusive breastfeeding, inadequate immunization coverage, and exposure to environmental pollutants such as indoor smoke from biomass fuels [3]. Reduction in ARI-related child mortality requires addressing these determinants through public health interventions.

Burdwan Medical College and Hospital is a major health facility catering to the needs of the rural and semi-urban surroundings. The immunization clinic plays a vital role in the delivery of essential vaccines and healthcare services to children under five years. Understanding the epidemiological profile of ARIs among children visiting this clinic can help inform targeted interventions aimed at reducing the disease

burden. Research indicates that immunization significantly lowers the incidence of severe respiratory infections by protecting against common pathogens like *Haemophilus influenzae* type b and *Streptococcus pneumoniae* [4].

However, despite efforts to improve vaccine coverage under national programs like Mission Indradhanush, immunization gaps persist, contributing to the continued prevalence of ARIs [5]. Given this background, the present study was designed to estimate the proportion of ARIs among children under five attending the immunization clinic at Burdwan Medical College and Hospital and to identify key determinants influencing its occurrence. Moreover, the study aimed to assess the immunization status of these children, recognizing that full immunization coverage is a crucial protective factor against severe ARIs.

This study is expected to offer insights into the epidemiological factors associated with ARIs and provide evidence for policymaking regarding child health programs in the region. Understanding the local context is important for developing targeted interventions that address the social, environmental, and healthcare-related determinants of ARIs [6].

Aims and Objectives

1. To estimate the proportion of Acute Respiratory Infection (ARI) and to assess its determinants among under-five children attending immunization clinic of Burdwan Medical College and Hospital.
2. To assess the immunization status of the study subjects visiting the immunization clinic.

Materials and Methods

The present study is an institutional based descriptive type of observational study with a cross-sectional study design.

Study Area: Immunization Clinic of Burdwan Medical College, Purba Bardhaman, West Bengal.

Study Population: The underfive children who were attending the Immunization Clinic of Burdwan Medical College during the study period.

Study Duration: The study was done. from 1st February to 29th February, 2024.

Inclusion Criteria: The mothers/attendants of the underfive children who were willing to participate.

Sample size calculation: All mothers/primary attendants of the under five children attending immunization clinic, were approached for interview. Those who gave written consent to be a part of the study and can be available for at least 30 minutes for the whole interview process, were included in the study. Interviews were taken from the mothers/primary

attendants of a total 105 children. Final sample size was 105.

Data Collection Tool: A predesigned and pre tested semi structured schedule was used for data collection. It consists of Socio- demographic characteristics, Environmental characteristics and Child's characteristics.

Data Collection Technique: Interview of mother/ caregiver of the study subjects and Record/register review are used to collect the data.

Data Analysis: The collected data was entered and organized in MS EXCEL 2024. It was analyzed by using principles of descriptive statistics and represented by bar diagrams, pie charts, tables etc.

Ethical Considerations: Informed consent was taken from mothers/caregiver of the study subjects prior to interview. Confidentiality and anonymity was maintained.

Results

In sociodemographic profile, the majority of participants were mothers or caregivers of children aged 0-2 years, accounting for 42.85% of the subjects. The sample predominantly consisted of males, representing approximately 61.91% of the participants. The study population was predominantly Hindu, comprising 59.04% of the subjects. Geographically, 58.89% of the families resided in urban areas. According to the Modified BG Prasad classification for October 2023, most families were categorized as belonging to the upper class (52.38%). Among the total of 105 study subjects, 62 (children have experienced Acute Respiratory Infections (ARI), resulting in a prevalence rate of 59.04%) and the majority of these children (75.8%) experienced 0-2 episodes of ARI. (Table: 1).

The assessment of environmental characteristics in this study revealed that a significant proportion of participants, specifically 59%, had family members with a history of smoking (Figure: 1). For cooking purposes, the predominant energy source was gas cylinders, utilized by 60.95% of the households.

Furthermore, a majority of the subjects, 87%, resided away from industrial zones, suggesting a potentially lower exposure to industrial pollutants. In terms of hygiene practices, nearly three-quarters (77%) of mothers reported consistent hand washing habits, highlighting a positive behavioural aspect that may contribute to the health of the children in this study. (Table: 2)

Among the children in the study, only 3 (2.85%) of those classified as underweight (weighing less than 2.5 kg) experienced more than four episodes of Acute Respiratory Infections (ARI). The mean of birth weight of the study subjects was 2.63 ± 0.31 ,

indicating that the majority of children fell within a normal birth weight range, and the mean of present weight was 11.59 ± 3.79 . In this study, a significant 63.80% of the subjects were born in Public /Government institutional settings, with the majority (62%) delivered via Caesarean section.

Most of the children (63%) got exclusive breastfeeding for a period of 6 months (Table: 3) additionally, 62 (59.04%) of the children were reported to be immunized up to the date of assessment (Figure: 2).

This finding is consistent with the immunization rate among children who experienced ARI, as 48(77.42%) (Figure: 3). These results highlight the importance of institutional births and immunization in promoting the health and well-being of children, suggesting that access to medical facilities and vaccination programs plays a crucial role in reducing health risks in early childhood. (Table: 3)

Table 1: Distribution of study subjects according to Socio Demographic profile and episodes of ARI (n=105)

Category	Subcategory	Frequency (n)	Percentage (%)
Age Distribution	0-2 years	45	42.86
	2-4 years	34	32.38
	>4 years	26	24.76
Gender	Male	65	61.90
	Female	40	38.09
Religion	Hindu	62	59.04
	Islam	43	40.95
Residency Type	Urban	60	58.89
	Rural	45	41.11
Socio-economic Status	Upper Class	55	52.38
	Upper Middle Class	30	28.57
	Middle Class	10	9.53
	Lower Middle Class	7	6.67
	Lower Class	3	2.85
Total episodes of ARI excluding below one year children(n=105)		62	59.04
Episodes of ARI excluding below one year children (n=62).	0-2 times	47	75.80
	2-4 times	12	19.35
	>4 times	3	4.85
	Total	62	100

Table 2: Environmental Characteristics and their Association with Acute Respiratory Infections (ARI) Among Study Subjects. (n= 105)

Category	Number of Subjects	Percentage (%)	Additional Information
History of Smoking in 24 hours (secondhand smoking) among the family members.			
Yes	62	59	The family members of most of the study subjects have history of smoking.
No	43	41	
Type of cooking gas			
Gas cylinder	64	60.95	Mostly Gas cylinder is used in the household for cooking purpose.
Oil stove	27	25.71	
Both	14	13.34	
Presence of any factory (having chimney) within 100 m radius of home			
Yes	14	13%	Majority of subjects stay away from industrial zone.
No	91	87%	
Habit of washing hands by mother/caregiver before handling the baby			
Yes	81	77%	Almost 3/4 th of mothers have hand washing habit.
No	24	23%	

Table 3: Characteristics of Children Infected with Acute Respiratory Infections (ARI).

Category	Number of Subjects	Percentage (%)	Additional Information
Place of birth of children			
Public /Government Hospital	67	63.80%	Most of the study subjects are found to be institutionally born
Private Hospital	38	36.20%	
Home	nil		
Others	nil		
type of delivery of child			
Caesarian section	65	62%	Caesarian section was found to be mode of delivery for most of the children
Normal	40	38%	
Exclusive breastfeeding of child for 6 months excluding 0 to 6 months children (n=91)			
Yes	57	63%	Most of the child got exclusive breastfeeding for a period of 6 months
No	34	37%	
child's immunization history (n=62)			
Fully Immunized	48	77.42%	Majority of subjects got fully immunized till date.
Not Fully Immunized	14	22.58%	
child's immunization history			
Immunized upto date	62	59.05%	Majority of subjects got immunized till date
Not Immunized till date	43	40.95%	

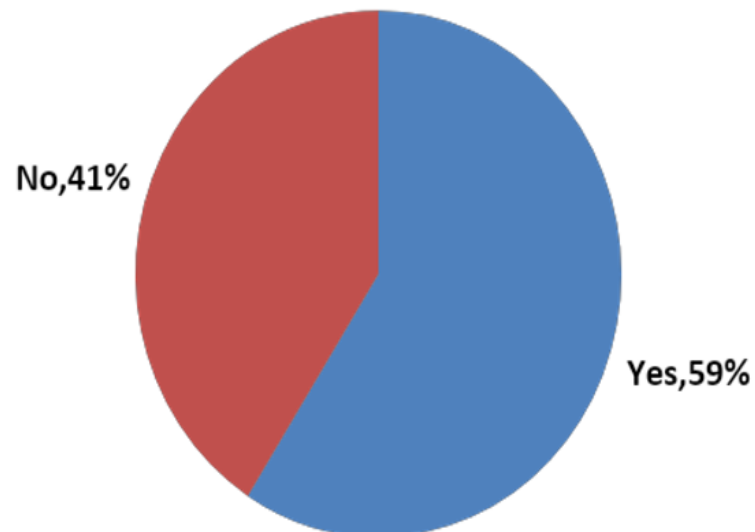


Figure 1: Pie diagram representing history of Smoking in 24 hours (second hand smoking) among the family members of the study subjects (n=105).

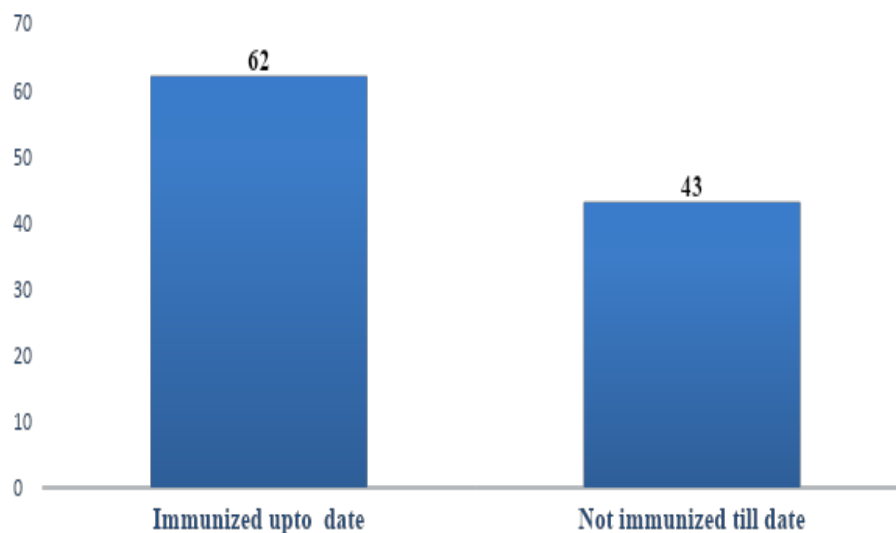
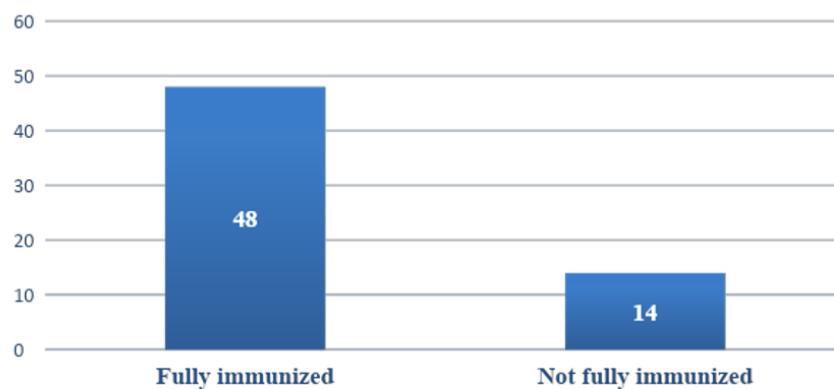


Figure 2: Bar diagram representing child's immunization history according to mother in the study (n=105).



History of child's immunization

Figure 3: Bar diagram representing immunization history of children experienced ARI according to mother in the study (n=62).

Discussion

The determinants of occurrence for Acute Respiratory Infections (ARIs) are the multifactorial influencing variables in children less than five years of age who come for immunization at the clinic of Burdwan Medical College and Hospital. A prevalence rate of ARIs of 59.04% is found within the study conducted, implying the high prevalence of these cases within this population, comparable to prior research studies carried out in other such settings [7].

Sociodemographic factors such as age, gender, and socioeconomic status were found to play critical roles in ARI occurrence. The majority of the study participants were children aged 0-2 years, a group particularly vulnerable to respiratory infections due to immature immune systems and higher exposure to pathogens [8]. The male predominance-61.91 percent-exhibited is in fact true as biological and social influences over such activities would imply that healthcare-seeking behaviour coupled with health outcomes would not have been different for such boy children [9].

Family smoking history and residential proximity to industrial zones were significant contributors to environmental exposures. About 59% of the households had a family history of smoking, which was significantly associated with increased ARI cases due to exposure to second-hand smoke [10].

The fact that 87% of the families lived away from industrial areas indicates decreased exposure to industrial pollution, thus pointing out the effect of domestic environments over external pollutants [11]. Nutritional and delivery-related factors were also involved in ARI incidence. Infants who were born weighing less than 2.5 kg had repeated attacks of ARI; there is an established connection between low birth weight and infection susceptibility through compromised immunity [12]. Average birth weight and present weight were found to be around 2.63 ± 0.31 kg and 11.59 ± 3.79 kg, which would imply good nutrition in most children, reducing severe episodes of ARI. Exclusive breastfeeding for six months, as reported by 63% of the study subjects, would have most likely contributed to enhanced immunity and reduced infection rates. Breastfeeding provides essential antibodies and nutrients crucial for developing a child's immune defenses [13].

This finding aligns with the WHO's recommendation for exclusive breastfeeding as a critical intervention for child health [14]. The immunization coverage in this study was 59.04%, reflecting national trends in India, though still below desired targets. Importantly, 77.42% of children with ARIs were up-to-date on immunizations, suggesting that while vaccination reduces severe ARIs, it does not entirely prevent mild infections [15]. Institutional deliveries

(63.80%) and Caesarean sections (62%) were common, ensuring better neonatal care and timely immunizations, which are vital for preventing infectious diseases [16]. Overall, this study underlines the interplay of sociodemographic, environmental, nutritional, and healthcare-related factors in determining ARI prevalence. Strengthening public health initiatives focusing on reducing domestic smoke exposure, improving maternal education on nutrition and hygiene, and enhancing immunization coverage could substantially reduce ARI-related morbidity and mortality among children under five.

Limitations

The study's limitations include its cross-sectional design, which may prevent establishing causality. The survey was conducted with a limited sample size due to time constraints and some caregivers' reluctance to share personal information. The study was restricted to a single immunization clinic, limiting the generalizability of findings.

Recommendation

To decrease ARI prevalence, public health efforts should emphasize the risks of secondary smoking exposure and encourage smoke-free home environments. Additionally, mother's education related to hygiene, nutrition, and on-time immunizations is paramount. Improving healthcare coverage and multicentric research should be initiated to better delineate disease epidemiology to guide the targeted interventions appropriately

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