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Original Research Article

Current clinical profiles of acute respiratory tract infections in children between 2 months to 5 years

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ABSTRACT

Background: The nascent respiratory tract of infants is highly vulnerable to frequent infections, thereby making acute respiratory infections a major risk factor for under five years morbidity and mortality. The clinical presentation of acute respiratory tract infections (ARTI) is however ambiguous and varied depending on a plethora of factors. The aim was to delineate the respiratory disease profiles of children aged 2 months-5 years in Western Maharashtra.
Methods: The present cross sectional analytical study was conducted on 249 children aged between 2 months-5 years consulting the Pediatric wards and OPD with complaints of fever with cough, cold, breathlessness, and chest pain. A comprehensive medical history was procured, followed by general and systemic examinations. Infections were assessed and x-ray was taken for all the patients. Data was analyzed using statistical software R version 4.0.3 and Microsoft Excel.
Results: The male:female ratio in the study was 137:112. Cold (80.72%) and cough (74.3%) were the most widely experienced symptoms among patients, while chest pain (0.8%) was the least common. Among 249 cases, upper respiratory tract infection (URTI; 60%) was more predominantly noted than lower respiratory tract infections (LRTI; 44.8%). Nasopharyngitis (34.14%) and tonsillopharyngitis (6.83%) were the commonly prevalent types of URTI whereas pneumonia and bronchiolitis were the most recurrent types in the LRTI.
Conclusions: Practitioners must consider the possibility of acute URTI more closely and must not be quick to disregard common symptoms such as cold and cough. Misdiagnosis or delayed diagnosis can severely hamper the prognosis of ARTI in young children. Hence, keeping abreast of the current clinical profiles exhibited by ARTI is of paramount importance for practitioners and the general population in the fight against under 5 mortalities.

Keywords: Nasopharyngitis, Pneumonia, Child, Respiratory tract infections

INTRODUCTION

Acute respiratory tract infections (ARI) account for 30-50% of overall pediatric outpatient consults, 20-30% of pediatric ward admissions, and over one-third of child deaths annually.[1,2] Although ARIs are mostly perceived to be self-limiting, the genesis of debilitating complications due to severe onset is not uncommon and often strains the limited resources of patients and healthcare facilities in developing countries further.1 This is evidenced by the fact that India, Bangladesh, Nepal, and Indonesia constitute 40% of the global burden of ARI related mortality.[3] Although several healthcare policies have brought ARI control strategies into their ambit, its prevalence goes unchecked with 4 million cases of pneumonia, and around 1 million deaths each year.[2]

Recent years have seen an upsurge in respiratory viruses including human metapneumovirus (hMPV), influenza virus (IFV), respiratory syncytial virus (RSV),

parainfluenza virus (PIV), human bocavirus (BoV) and adenovirus (ADV). SARS-Cov-2 or novel coronavirus is the latest entrant that has spiraled into pandemic, by primarily eliciting acute respiratory failure.[4,5] A single type of virus can cause both upper and lower respiratory tract infections as seen in the case of HMPV giving rise to a myriad of symptoms.[5] Viral co-infections were observed in 4-33% of children hospitalized with ARIs, and associated with worsening clinical outcomes. ARI compromises the immunological defenses of the patients thereby opening the door for opportunistic pathogens such as *Haemophilus influenzae*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa* as the disease progresses. This multifarious etiology and presentation of ARI symptoms hinders timely diagnosis and undercuts therapeutic efficacy. The indiscriminate use of antibiotics and the subsequent antibiotic resistance only compound issues.[6]

Previous studies conducted in developing countries postulated that lifestyle conditions such as crowding, nutritional factors, environmental pollution, and parental smoking are significant risk factors.[3] Transition in ARI etiology from gram-positive to gram-negative pathogens is poorly known among health care providers increasing the odds of misdiagnosis.[7] The clinical profiles of ARI are geographically diverse and are often influenced by climate conditions as well.[6,8] Knowledge of these current forms of ARI manifestation not only helps the clinician in the diagnosis and treatment of the patient effectively but also dictates parents' decisions to seek medical care for their children. Hence, this study was undertaken to analyze the current clinical profiles of ARI prevalent among a population residing in western Maharashtra.

METHODS

This prospective study on ARTI in young children was undertaken at a Dr. D. Y. Patil Hospital and Research Institute which is a tertiary healthcare center in Kolhapur, India. Over a span of December 2018 to December 2020, 249 children aged between 2-60 months who were admitted to our pediatric ward with a WHO-recognized clinical diagnosis of ARTI were included in the study. Whereas, children outlying the selected age range and suffering from any underlying chronic respiratory or cardiac illnesses were excluded.[23] The approval from the Institutional Ethics Committee and informed written consent of the child's caregiver was obtained before initiating the study. A detailed history and physical examination were done according to a predesigned proforma to elicit various potential risk factors and other relevant history.

Occurrence of cough in conjunction with fast breathing exceeding 60 /min within 2 months of nascence, 50 /min in those who are 2- 12 months of age, and over 40 /min in 1-5-year-olds, with the illness lasting for less than 30 days, was the definition of ARTI considered by this study. Severe pneumonia was characterized by the indrawing of the lower chest wall, while refusal of feeds, lethargy, central cyanosis, and convulsions were noted as signs of very severe pneumonia. A comprehensive medical history of pertinent symptoms such as cough, rapid breathing, nasal flaring, nasal discharge, congestion, chest retraction, and adventitious auscultatory findings like crepitations, rhonchi, bronchial breathing were noted. Furthermore, information on the immunization milestones achieved, history of breastfeeding and weaning was recorded. Respiratory rate and heart rate were determined when the child was in a compliant state. An anthropometric evaluation was conducted and followed up with a malnutrition profile created as per the classification provided by the Indian Academy of Paediatrics classification.[9] A chest X-ray was taken in all cases to differentiate the acute lower respiratory infections (ALRI) into clinical entities and detect underlying complications, if any. Routine follow-ups were conducted for all patients to assess the progression of the disease.

Data was analyzed using statistical software R version 4.0.3 and Microsoft Excel. Categorical variables given in the form of frequency tables.

RESULTS

Data contains measurement on 249 children with age ranging from 2 months to 5 years. Table 1 summarizes different variables. Among 249 cases, upper respiratory infection was more predominantly noted than lower respiratory infections. Nasopharyngitis (34.14%) and tonsillopharyngitis (6.83%) were the commonly prevalent types of upper respiratory infections whereas pneumonia and bronchiolitis were the most recurrent types in the lower respiratory tract.

Table 1: Summary of different variables.

Variables	Sub-category	Number of patients N (%)
Age (years)	0-1	103 (41.37)
	1-2	48 (19.28)
	2-3	32 (12.85)
	3-4	21 (8.43)
	4-5	14 (5.62)
	5-6	31 (12.45)
Gender	Female	112 (44.98)

Continued.

Variables		Sub-category	Number of patients
		Male	137 (55.02)
Complaints	Fever	Absent	27 (10.84)
		Mild	39 (15.66)
		Predominant	44 (17.67)
		Present	139 (55.82)
	Cough	Absent	38 (15.26)
		Predominant	26 (10.44)
		Present	185 (74.3)
	Cold	Absent	48 (19.28)
		Present	201 (80.72)
	Breathlessness	Absent	230 (92.37)
		Present	19 (7.63)
	Chest pain	Absent	247 (99.2)
		Present	2 (0.8)
	Sore throat	Absent	219 (87.95)
		Present	30 (12.05)
	Sinus tenderness	Absent	241 (96.79)
		Present	8 (3.21)
Condition		Bronchiolitis	27 (10.84)
		Croup	8 (3.21)
		Epiglottitis	3 (1.2)
		Nasopharyngitis	85 (34.14)
		Nasopharyngitis+pneumonia	23 (9.24)
		Nasopharyngitis+sinusitis	2 (0.8)
		Pleuritis	2 (0.8)
		Pneumonia	35 (14.06)
		Pneumonia+sinusitis	6 (2.41)
		Sinusitis	8 (3.21)
		Tonsillitis	4 (1.61)
		Tonsilopharyngitis	17 (6.83)
		Tonsilopharyngitis+pneumonia	5 (2.01)
		Wheeze associated lower respiratory infection (Walri)	24 (9.64)

DISCUSSION

Numerous risk factors predispose young children to develop ARTI, however, most of these risk factors are controllable. Children in developing countries are particularly vulnerable due to their low birth weight, malnutrition, environmental factors and housing standards.[10] India's Reproductive and Child Health programme since 1992 has entailed provisions for the prevention and control of ARI.[2] However, the one-size-fits-all approach does not augur well for ARI management strategies. Hence, knowing the incidence, clinical profile of ARI in a tertiary care hospital reflects the burden in the community which will further help to identify the risk factors for mortality and morbidity in the children aged 2 months to 60 months and will help in proper utilization of available resources and ensure adequate management of these children.

Facilities for identifying the organism are limited in a developing country like India, so focus must be on fine tuning the clinical examinations and also adopting international best practices recognised by WHO. For proper management of the cases and ensuring better clinical outcome, accuracy in identifying the offending organism and its sensitivity to the antimicrobial medications need to be achieved.

Out of the OPD cases, about 150 were suffering from URTI and had clinical features of fever, sore throat, cold associated with nasal discharge, and were treated symptomatically on OPD basis whereas about 30 cases were suffering from LRTI but did not require in patient department admission. Males (54.84%) were seen to be more affected by ARI in comparison to their female counterparts. This finding is in concurrence with observations made by Choube et al who reported 50.51% prevalence rate among boys and others who have reported a statistically significant relation between gender and ARI.[10-13]

Among the total number of cases, children in the age group of 2 months to 1 year constituted the largest proportion with 57.66%. Swamy et al also found higher

prevalence of respiratory pathogens among infants aged <1 year with heightened predilection to RSV A/B and *S. pneumonia*.[1] This is in accordance with previous studies, where infants with acute respiratory infections constituted about 62.5% and 38.40% respectively.[3,15] This age group is susceptible because of waning of the maternally conferred immunity towards the latter half of infancy.

Both severe pneumonia and very severe pneumonia are more common among infants with 60% of total severe pneumonia cases and 62% of very severe pneumonia are also from infants. A slew of previous studies have elucidated a similar pattern of decreasing ARI rate with increasing age.[15-17] A community-based study carried out in a rural area of Delhi by Mishra et al also reported the prevalence of ARI of 12.1% among under-fives that declined with increasing age. Mishra et al found that the prevalence of viral URI and LRI differed across age groups, with URIs primarily affecting children aged 1 year and above while LRIs were more common in infants of less than 1 year of age.[18]

According to our study, URTI was seen in about 66.8% cases whereas LRTI was seen in 48.6% cases. Some patients had concomitant upper and lower respiratory tract infection. A cross-sectional study by Islam et al reported that ARI in children under-five years was 25.6%, among which 76.4% had upper and 23.6% lower respiratory infections; no associations in respect to nutritional status.[3] A study by Savitha et al on modifiable risk of ARI among children, reported prevalence of lower respiratory tract infection was 25%.[14]

Among the upper respiratory tract infections, nasopharyngitis accounted for 65.8% of the diagnoses, meanwhile tonsillopharyngitis and sinusitis were observed in 19% and 9% of the cases respectively. About 20 cases had two or more conditions overlapping. Similar studies by Duarte et al on the clinical profile in children under five year old with ARI inferred nasopharyngitis to be the most common upper respiratory tract infection. Among lower respiratory tract infections, pneumonia accounted for 51% of the diagnoses, followed by wheeze associated lower respiratory tract infection (WALRI) and bronchiolitis. About 8 cases had two or more conditions overlapping. In a study conducted by Ekalaksananan et al pneumonia was found in 75.7% cases, croup in 16.2% cases and bronchiolitis in 8% cases which suggests that pneumonia is more common as a LRTI in children.[19]

The most common symptom seen was cold (80.72%) associated with nasal discharge and nasal congestion followed by cough (74.3%) and fever (55.82%). In the clinical examination, tachypnoea was present in 130 (52%) cases. Crepitations were present in about 72 (29%) cases and wheeze was present in about 60 (21.1%) cases. Clinically, majority of the children had an increased respiratory rate which is a reliable marker. These findings are in harmony with a Bham et al study, which stated presence of cough in 40% cases, fever in 34% cases.[20] Ramagopal et al conducted a study on demographic, clinical and haematological profile of children with bronchiolitis.[21] Study showed 50% of cases are RSV positive and 50% cases are non RSV. The age group affected was infants with mean age of 7.3 years with cough and respiratory distress as the most prominent symptoms.[21]

In the current study, majority of the children had respiratory rate more than 50 cycles/min which formed a reliable clinical marker and can be easily assessed by health worker. Taylor et al conducted study on development of a symptom score to identify children with a documented viral upper respiratory tract infection.[22] Parental perception of a child developing cold and other respiratory symptoms was a moderately accurate predictor of a viral URI. The use of this symptom score as an analytic criterion can expedite timely diagnosis and care for children.

The main strength of the current study was that it was done over a period of two and a half years and thereby excluding the seasonal variations and was done as an observational prospective study.

CONCLUSION

Over the years, there has been a gradual transition from higher prevalence of lower respiratory infection, as upper respiratory infection has highly increased over the period of time. ARI was found to be more prevalent among children aged between 2 months to 5 years as compared to 1 to 5 years of age. Clinically, majority of the children has a respiratory rate more than 50 per minute, which formed the reliable marker. Most of the subjects were diagnosed with nasopharyngitis that is predominantly viral in nature. Clinical profile suggests cold with either nasal congestion or nasal discharge along with eye congestion as the most common symptoms, out of which wheezing was seen in 60 subjects and crepitation were seen in 72 subjects. These clinical patterns provide salient clues to which respiratory infection is more common and how the clinical profile of the respiratory infection is changing over a period of time thus enabling early diagnosis and timely intervention in these subjects.

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