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Clinical evaluation of prevalence of respiratory tract infection in childrens from Bihar region

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Abstract
Childhood acute respiratory infection (ARI) is a significant public health problem especially in developing countries. Robust epidemiological data is not available on its incidence in India. As per World Health Organization estimates, ARI causes 3.9 million deaths throughout the world every year. It is one of the important priority area for the concerned stakeholders in health sector especially in developing countries including India. The occurrence of ARI is determined by the exposure to various risk factors. Air pollution is a risk factor for both acute and chronic respiratory disease. One half of the world's population is exposed to high concentrations of solid fuel smoke that are produced by inefficient open fires, mainly in the rural areas of developing countries. Solid fuel smoke possesses the majority of the toxins found in tobacco smoke and has also been associated with a variety of diseases including ARI in children. Hence the present study was planned for Clinical Evaluation of Prevalence of Respiratory Tract Infection in Childrens from Bihar Region.
The study was conducted in Department of Paediatrics, ANMMCH, Gaya, Bihar from Sept 2016 to Aug 2018. Total 100 cases of the childrens attending to our hospital found positive for the respiratory tract infections were evaluated in the present study. In case of children <10 years, parents were contacted in their houses and the information was sought from them. Data on socio-demographic characteristics and associated risk factors that include family history of allergic disorder and asthma, fuel used for cooking, smoke outlet in the house were collected and discussed as below.
The data generated from the present study concludes that indoor environmental pollution (use of cooking-fuel other than LPG) and nutritional factors (lack of breast-feeding, severe malnutrition) are modifiable major risk factors for severe pneumonia. Appropriate measures to reduce exposure of children to indoor environmental pollutants like smokes produced due to use of biomass may help to reduce severe ARTI.

Keywords: Respiratory Tract Infection, Bihar, childrens, prevalence, etc

1. Introduction
Acute respiratory infection is a serious infection that prevents normal breathing function. It usually begins as a viral infection in the nose, trachea (windpipe), or lungs. If the infection is not treated, it can spread to the entire respiratory system. Acute respiratory infection prevents the body from getting oxygen and can result in death. Person suffering from this condition needs medical assistance immediately. Also, acute respiratory infections are infectious, which means they can spread from one person to another. The disease is quite widespread. It is particularly dangerous for children, older adults, and people with immune system disorders. According to the World Health Organization (WHO), acute respiratory infections kill an estimated 2.6 million children annually every year worldwide.
Respiratory tract infection (RTI) refers to any of a number of infectious diseases involving the respiratory tract. An infection of this type is normally further classified as an upper respiratory tract infection (URI or URTI) or a lower respiratory tract infection (LRI or LRTI). Lower respiratory infections, such as pneumonia, tend to be far more serious conditions than upper respiratory infections, such as the common cold.
Although some disagreement exists on the exact boundary between the upper and lower respiratory tracts, the upper respiratory tract is generally considered to be the airway above the glottis or vocal cords. This includes the nose, sinuses, pharynx, and larynx. Typical infections of the upper respiratory tract include tonsillitis, pharyngitis, laryngitis, sinusitis, otitis media, certain types of influenza, and the common cold [1]. Symptoms of URIs can include cough, sore throat, runny nose, nasal congestion, headache, low grade fever, facial pressure and sneezing.
The lower respiratory tract consists of the trachea (wind pipe), bronchial tubes, the bronchioles, and the lungs. Lower respiratory tract infections are generally more serious than upper respiratory infections. LRIs are the leading cause of death among all infectious diseases [2]. The two most common LRIs are bronchitis and pneumonia [3]. Influenza affects both the upper and lower respiratory tracts, but more dangerous strains such as the highly pernicious H5N1 tend to bind to receptors deep in the lungs [4].
A 2014 systematic review of clinical trials does not support using routine rapid viral testing to decrease antibiotic use for children in emergency departments [5]. It is unclear if rapid viral testing in the emergency department for children with acute febrile respiratory infections reduces the rates of antibiotic use, blood testing, or urine testing [5]. The relative risk reduction of chest x-ray utilization in children screened with rapid viral testing is 77% compared with controls [5]. In 2013 researchers developed a breath tester that can promptly

diagnose lung infections [6, 7].

Despite superior filtration capability of N95 filtering facepiece respirators measured in vitro, insufficient clinical evidence has been published to determine whether normal surgical masks and N95 filtering facepiece respirators are equivalent with respect to preventing respiratory infections in healthcare workers [8]. There is another form of respiratory tract infections' prevention when managing adults in intensive care units, it is recommended to use both topical and systematic antibiotics as prophylaxis against the infection and the overall mortality [9]. However children under 5 years are a high-risk group too, there is no sufficient evidence recommends the antibiotic use as a prophylaxis against the possible suppurative complications of any RTI of unknown cause [10].

Upper respiratory tract infection (URI) represents the most common acute illness evaluated in the outpatient setting. URIs range from the common cold—typically a mild, self-limited, catarrhal syndrome of the nasopharynx—to life-threatening illnesses such as epiglottitis. Details of the patient's history aid in differentiating a common cold from conditions that require targeted therapy, such as group A streptococcal pharyngitis, bacterial sinusitis, and lower respiratory tract infections. Clinical manifestations of these conditions, as well as allergy, show significant overlap.

Upper respiratory tract infection (URI) represents the most common acute illness evaluated in the outpatient setting. URIs range from the common cold—typically a mild, self-limited, catarrhal syndrome of the nasopharynx—to life-threatening illnesses such as epiglottitis. Viruses account for most URIs (see Etiology). Appropriate management in these cases may consist of reassurance, education, and instructions for symptomatic home treatment. Diagnostic tests for specific agents are helpful when targeted URI therapy depends on the results. Bacterial primary infection or superinfection may require targeted therapy.

The upper respiratory tract includes the sinuses, nasal passages, pharynx, and larynx, which serve as gateways to the trachea, bronchi, and pulmonary alveolar spaces. Rhinitis, pharyngitis, sinusitis, epiglottitis, laryngitis, and tracheitis are specific manifestations of URIs. Further information can be found in the Medscape Reference articles Acute Laryngitis, Acute Sinusitis, Allergic Rhinitis, Bacterial Tracheitis, Croup, Epiglottitis, Pharyngitis, and Viral Pharyngitis.

URIs involve direct invasion of the mucosa lining the upper airway. Inoculation of bacteria or viruses occurs when a person’s hand comes in contact with pathogens and the person then touches the nose or mouth or when a person directly inhales respiratory droplets from an infected person who is coughing or sneezing. Adenoids and tonsils contain immune cells that respond to pathogens. Humoral immunity (immunoglobulin A) and cellular immunity act to reduce infections throughout the entire respiratory tract. Resident and recruited macrophages, monocytes, neutrophils, and eosinophils coordinate to engulf and destroy invaders.

A host of inflammatory cytokines mediates the immune response to invading pathogens. Normal nasopharyngeal flora, including various staphylococcal and streptococcal species, help to defend against potential pathogens. Patients with suboptimal humoral and phagocytic immune function are at increased risk for contracting a URI, and they are at increased risk for a severe or prolonged course of disease.

Inflammation (chronic or acute) from allergy predisposes to URI. Children with allergy are particularly subject to frequent URIs. Person-to-person spread of viruses accounts for most URIs. Household and child care settings can serve as reservoirs for infection. Bacterial infections may develop de novo or as a superinfection of a viral URI. Viral agents occurring in URIs include a vast number of serotypes, which undergo frequent changes in antigenicity, posing challenges to immune defense. Pathogens resist destruction by a variety of mechanisms, including the production of toxins, proteases, and bacterial adherence factors, as well as the formation of capsules that resist phagocytosis.

Incubation times before the appearance of symptoms vary among pathogens. Rhinoviruses and group A streptococci may incubate for 1-5 days, influenza and parainfluenza may incubate for 1-4 days, and respiratory syncytial virus (RSV) may incubate for a week. Pertussis typically incubates for 7-10 days, or even as long as 21 days, before causing symptoms. Diphtheria incubates for 1-10 days. The incubation period of Epstein-Barr virus (EBV) is 4-6 weeks. Most symptoms of URIs—including local swelling, erythema, edema, secretions, and fever—result from the inflammatory response of the immune system to invading pathogens and from toxins produced by pathogens.

Childhood acute respiratory infection (ARI) is a significant public health problem especially in developing countries. Robust epidemiological data is not available on its incidence in India [5]. As per World Health Organization estimates, ARI causes 3.9 million deaths throughout the world every year [6]. It is one of the important priority area for the concerned stakeholders in health sector especially in developing countries including India. The occurrence of ARI is determined by the exposure to various risk factors. Air pollution is a risk factor for both acute and chronic respiratory disease [7]. One half of the world's population is exposed to high concentrations of solid fuel smoke that are produced by inefficient open fires, mainly in the rural areas of developing countries. Solid fuel smoke possesses the majority of the toxins found in tobacco smoke and has also been associated with a variety of diseases including ARI in children [8]. Hence the present study was planned for Clinical Evaluation of Prevalence of Respiratory Tract Infection in Childrens from Bihar Region.

Methodology

The study was conducted in Department of Paediatrics, ANMMCH, Gaya, Bihar from Sept 2016 to Aug 2018. Total 100 cases of the childrens attending to our hospital found positive for the respiratory tract infections were evaluated in the present study. In case of children <10 years, parents were contacted in their houses and the information was sought from them. Data on socio-demographic characteristics and associated risk factors that include family history of allergic disorder and asthma, fuel used for cooking, smoke outlet in the house were collected and discussed as below.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion criteria: Children with ALRTI aged 1 month to 5years.

Exclusion criteria

- Children less than 1 month and more than 5 years of age.
- Children with any underlying chronic respiratory illness.
- Children with any underlying chronic cardiacillness.

Results & Discussion

In the present study, 100 ALRTI cases were studied for the risk factors whose association can result in progression of pneumonia into severe pneumonia. Acute lower respiratory tract infections (ALRTI) are the commonest causes of morbidity and mortality among children under 5 years of age, especially in developing countries.

Parental literacy may extend a protective effect on children and thus guard against ALRTI by increasing awareness about preventive practices and early medical consultation. Savitha *et al*. [9] with 63.46% maternal illiteracy showed strong association between the mother's illiteracy and the occurrence of LRTI. In the present study 31% of mothers were illiterate, and this result was similar to the studies by Yousif *et al*. [10] and Broor *et al.* [11] which showed maternal illiteracy of 16.2% & 34.8% respectively. Children of illiterate mothers had (odds ratio 8.30) 8.30 times of risk of having severe pneumonia compared to children of literate mothers.

The difference between incidence of ARI and sex was statistically significant. Similar finding was noted by Chhabra. P et.al. [12] Children who were nourished well had lower incidence as compared to malnourished children. (1.60 Vs Gr I-1.81, Gr II-1.89, Gr III-2.0).Similar results were observed by Chhabra. P et. al., Shah Hemangini Kishore and Tupsi. T. E et.al. [12-14] In the present study incompletely immunized children had higher incidence as compared to date immunized children. In the present study, it was observed that highest incidence of ARI was found in winter season followed by rainy season. Similar results were also obtained in study conducted by Reddiah VP and Kapoor SK [15].

Environmental Factors: In the present study, the families which were using both kerosene as well as solid fuel for cooking, such children had higher number of ARI episodes as compared to those who were using only solid fuel and it was found to be statistically significant. The kerosene lamps used are a potential source of emissions of harmful particulate matter like polycyclic aromatic hydrocarbons, aliphatic hydrocarbons, nitrated hydrocarbons etc, which they are inhaled deep into lungs, leading to greater sensitivity of illness. Similar findings were observed by Savitha MR, Mitra NK, and others [12, 16].

Table 1: Socio-demographic variables

Variables	Acute lower respiratory tract infection
Age (months)	
Less than 12	65
More than 12	36
Sex:	
Male	74
Female	26
Mother’s age (years):	
Less than 20	58
More than 20	42
Father’s age (years):	
Less than 30	72
More than 30	28
Mother’s education:	
Illiterate	31
Upto 10th class	39
More than 12th class	30
Fathers education:	
Illiterate	37
Upto 10th class	25
More than 12th class	38
Immunization:	
Complete for age	35
Incomplete for age	65
Upper respiratory tract infection (URTI)	
Mother:	
Yes	20
No	80
Father:	
Yes	3
No	97
Sibs:	
Yes	22
No	78
Grand Parents: Yes No	 9 91
Family history of LRTI:	
Yes	21

No	79
No of children at home:	
Less than 2	40
More than 2	60

Table 2: Various Nutritional variables

Variables	No. of Cases
Pallor	
Severe	15
None-mild	85
Breast-feeding	
No	29
Upto 4 months	40
More than 4 months	31
Malnutrition	
Severe	61
Mild/None	39
Caloric Intake	
Inadequate	36
Adequate	64

Table 3: Environmental variables

Other fuel		
	Other than LPG	**38**
	LPG	62
Type of Home		
	Thatched	11
	Cemented	89
Smoking		
Mothers		
	Smoking	3
	Not smoking	97
Fathers		
	Smoking	35
	Not smoking	65
Grandparents		
	Smoking	15
	Not smoking	85

A study from South India reported the prevalence of allergic rhinitis among school children as 18.5% [17-18]. A study in Jaipur city among children aged 5-15 years found that recurrent cough was 16.4% and wheezing was 8.4% in last 12 months period and family history of allergy and asthma was present in 3.1% and 10.9% of the subjects respectively [19]. The prevalence of ARI was similar in both sexes. It was comparatively more among younger age groups similar to another study [20].

Cardosa MR *et al*. [24] in his study also showed that overcrowding appeared to be associated with two fold increase in the incidence of ARI. Barton *et al*16 found the significant association between ARI in children living in poorly ventilated and overcrowded houses. Higher ARI risk in children living in houses with combined kitchen and using cooking fuel other than LPG shows relationship of domestic microenvironment with ARI, an important factor usually not stressed or addressed during routine counseling of children. Kitchen in our society, especially in rural set-up is an important source of indoor pollution particularly the smoke from the chullas. Use of biomass fuel (wood, crop residues and animal dung) was a predominant contributor to the indoor air pollution. The biomass fuel burns with incomplete combustion generating a lot of toxic products that adversely affect the specific and non-specific local defenses of respiratory tract [25]. The risks of respiratory infections is highest for children due to longer stay indoors and close proximity during cooking. Mishra V *et al*18 observed that children under three years of age living in households using wood or animal dung as their primary cooking fuel have one third higher risk of ARI than do the children living in households which uses cleaner fuel. S. Broor *et al*. [26] in his study confirms similar observations.

Although our study found that prevalence of ARI is more among those who use firewood, we could not find any association with it. But, prevalence was found significantly more among those who live in houses without smoke outlets and windows in living rooms similar to another study. Studies showed that there was a significant association between the prevalence of wheezing and the presence of smokers in the family. Haryana study in India found that factors associated with presence of symptoms of asthma were passive smoking and pets at home in contrast to our study. This difference may be due to non-quantification of types of pets and smoking behavior among the household members. Family history of allergic disorders and asthma was found to be a risk factor similar to other study. Prevalence of asthma was found to be higher in children having allergy or atopy than in children with no allergy or atopy.

Parental literacy showed inverse relationship with the ARI prevalence with much greater odds of acquiring respiratory disease in children if both parents' are illiterate or mother only is illiterate. The probable reason for this greater risk is related to better caring and rearing of children by literate mothers besides being more aware on health seeking behavior in childhood morbidity. The result runs in conformity with the study conducted by S. Broor *et al*. [27] However, D'Souza RM *et al* [28] did not observe maternal education a risk factor for ARI in his study. Lack of exclusive breastfeeding, adhering to early or delayed weaning up-to 2 years and overall moderate to severe malnutrition among children were also observed as independent risk factors for ARI in children. Shah N *et al* [29] showed that improper weaning and lack of exclusive breastfeeding was associated with increased risk of severe ARI in children. Azizi *et al*. [30] confirmed that breastfeeding for at least 4 months was an independent protective factor against ARI. Thus the findings reinforce the need to strengthen the promotion of exclusive breastfeeding in the first year with appropriate and correct weaning practices with nutritionally balanced foods. As expected children who were completely immunized for age were less likely to suffer from ARI compared to those incompletely immunized. The findings remain consistent with studies by Deb SK *et al*. [31] others. Significantly greater risk of ARI episodes were noted by Nilanjan Kumar *et al*. [32] among children who were not fully immunized (Risk Ratio=2.76) thereby stressing the need to complete timely immunization in children.

Conclusion

The data generated from the present study concludes that indoor environmental pollution (use of cooking-fuel other than LPG) and nutritional factors (lack of breast-feeding,

severe malnutrition) are modifiable major risk factors for severe pneumonia. Appropriate measures to reduce exposure of children to indoor environmental pollutants like smokes produced due to use of biomass may help to reduce severe ARTI.

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