

Original Research Article

A study on distribution pattern of lower respiratory tract infections in children under 5 years in a tertiary care centre

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ABSTRACT

Background: Respiratory infections are the leading cause of mortality in children below 5 years in India as well as worldwide. 16% mortality in children below 5 years is attributed to lower respiratory tract infection. Various factors influence the occurrence of the disease like environmental factors, lack of immunization, malnutrition. Present study was conducted to know the distribution pattern of lower respiratory tract infections, common pathogens associated with respiratory infections and risk factors associated with it.

Methods: This study was conducted in Department of Pediatrics, KIMS Bangalore for a period of 1 year from January 2016 to December 2016. Total of 172 children admitted to ward and ICU with history suggestive of respiratory infection were included in the study after excluding congenital heart problems, congenital lung problems and immunodeficiency state.

Results: In the present study, male predominance (59.3%) was observed. The incidence of respiratory tract infection was 17.5%. The common pathogen isolated was streptococcus pneumoniae. Most common respiratory infections included bronchopneumonia followed by bronchiolitis, croup, and lobar pneumonia. The common symptoms were cough, fever and hurried breathing. Anemia was observed in majority of them.

Conclusion: Respiratory infections if timely managed, the mortality associated with it can be reduced. Pneumonia is a major killer disease in children below 5 years in India. Understanding the symptoms and signs and time of referral to tertiary centre not only reduces the mortality but it also reduces morbidity. So, it is important to create awareness among the health care personnel regarding common age of presentation of various types of respiratory infection and warning sign.

Keywords: Anemia, Lower respiratory tract infections, Pneumonia

INTRODUCTION

Acute lower respiratory tract infection is the leading cause of mortality and one of the common causes of morbidity in children under-five years of age. Respiratory infections are heterogeneous and complex group of diseases caused by wide range of pathogens-virus, bacteria or fungi. Lower respiratory tract includes the trachea, bronchi, bronchioles and alveoli. Pneumonia killed 9,20,136 children under 5 in 2015, accounting for 16% of all deaths of children under 5-year old.¹

In paediatric patients, respiratory infections can be life threatening if not treated. The incidence of acute respiratory infection is high in developing countries than in developed countries.² The higher incidence is attributed to crowding, HIV burden, low birth weight and the lack of pneumococcal and measles immunization.³⁻⁶ Also zinc and vitamin A deficiency, poor maternal education, and living in polluted areas are the other contributing factors. Though etiology is often undetermined in a clinical

situation, the most common agents causing pneumonia in children are *Streptococcus pneumoniae*, *Hemophilus influenzae* and to some extent *Staphylococcus aureus*. Bronchiolitis is also a leading cause of mortality in children. RSV is implicated in most of the cases. The other viruses include parainfluenza virus 1, 2 and 3, adenovirus and influenza virus.

Studies have shown the importance of social factors for ARI mortality and morbidity, like family size, education level, and density in the residence.⁷⁻⁹ Thus it's very important to focus on social factors while considering preventive measures. It has been reported that problem of ARI is more in urban areas, slums than compared to rural areas.¹⁰ Costs attributable to lower respiratory tract infection in both outpatient and inpatient settings are an important burden on national healthcare budgets.

It is important to emphasize on modifiable risk factors like breast feeding, overcrowding, undernutrition, delayed weaning and prelacteal feeding while approaching cases of LRTI. Further IMNCI has classified as no pneumonia, pneumonia, severe pneumonia, very severe pneumonia based on respiratory rate according to age, presence or absence of chest retraction and general status of the patient. Treatment option includes oral antibiotics, sick cases needs hospital admission, IV antibiotics and other supportive care measures like oxygen/ventilator support, ICD drainage.

Respiratory infections are major concern in children and adolescents. Frequent chest infections are not only economic burden to parents, it also adds to missing school days. This study was undertaken to know the distribution pattern of lower respiratory tract infection and associated risk factor along with identification of bacterial agents associated with it.

METHODS

This is a prospective observational hospital-based study conducted in the Department of Paediatrics, Kempegowda Institute of Medical Sciences, Bangalore between January 2016 and December 2016. Children aged between 1 month to 5 years who presented with symptoms and signs of Lower respiratory tract infection and chest x ray findings consistent with lower respiratory infection were included in this study. Further those children with known congenital heart disease, congenital lung diseases, immunodeficient states, neuromuscular or skeletal disorders were excluded from the study. Consent was taken from parents/guardians. Totally 172 cases met our inclusion criteria.

In each case presenting complaints like fever, cough, hurried breathing was documented. Examination finding including signs of respiratory distress like tachypnoea, nasal flaring, chest retraction, oxygen requirement and presence of crackles/decreased breath sounds were noted. Each of this signs and symptoms were followed till

recovery or death. Those with signs of severe respiratory distress were admitted to PICU and followed there accordingly. A detailed history was taken, with a special focus on past history, family history, diet history, immunization status of the child and socio-economic status. A detailed examination was done once child stabilized for protein malnutrition and vitamin deficiencies.

Basic blood test like complete blood counts, CRP and chest X ray was done in all cases. Results were tabulated and analyzed. Other investigation pertaining to respiratory system like throat swab for culture and sensitivity, sputum/gastric aspirate for gram stain/AFB stain, pleural fluid for routine analysis, culture and sensitivity were sent. Other test like Mantoux test, CT Thorax, BAL fluid for analysis sent in selected cases.

All cases were followed till recovery or death. Data was entered in a Microsoft excel spread sheet and data was analyzed accordingly.

RESULTS

Out of 172 cases, 97 cases (56.4%) were boys, 75 cases (43.6%) were girls. There is a slight male predominance observed as shown in Figure 1. Figure 2 represents age wise distribution of study subjects, 31 cases (18%) between 1 month and 6 months, 83 cases (48%) were between 6 months and 2 years, 58 cases (34%) were between 2 years and 5 years. As we can observe in Figure 2, majority of cases in our study were between 6 months and 2 years.

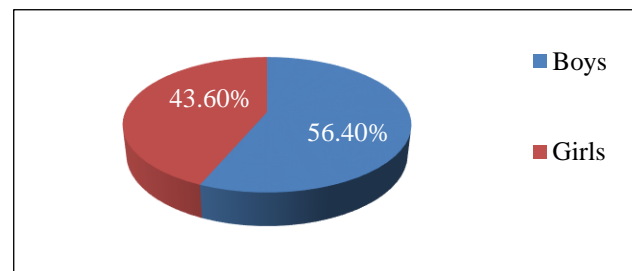


Figure 1: Sex wise distribution.

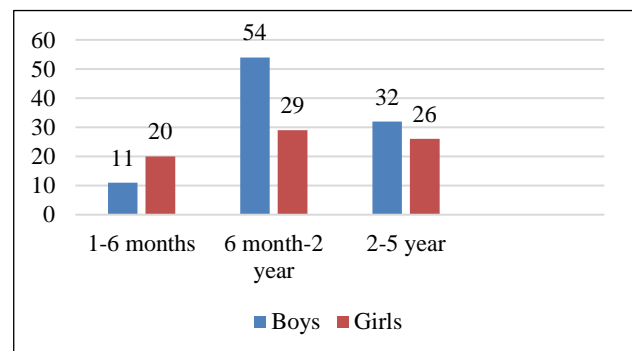


Figure 2: Age wise distribution.

Table 1 shows symptom wise distribution of cases with respect to age groups. 90% of the cases in the age group below 6 months had hurried breathing followed by not feeding (87%), fever (81%). In children between 6 months and 2 years, 96% cases had fever followed by hurried breathing (90%), cough (65%), breathlessness (61%), not feeding (41%). Children between 2 and 5 year had fever and cough in all cases followed by hurried breathing (77%), breathlessness (50%).

Table 1: Symptom wise distribution of ARI.

Symptoms	1 to 6 months	6 months to 2 year	2-5 year
Fever	25 cases (81%)	80 cases (96%)	58 cases (100%)
Cough	2 cases (6%)	54 cases (65%)	58 cases (100%)
Hurried breathing	28 cases (90%)	75 cases (90%)	45 cases (77%)
Not feeding well	27 cases (87%)	34 cases (41%)	02 cases (3.4%)
Chest indrawing	20 cases (64%)	51 cases (61%)	29 cases (50%)

Table 2 shows signs of Acute lower respiratory tract infection, majority of the children in our study had respiratory distress (94%) i.e., tachypnoea, nasal flaring, intercostal retractions followed by pallor (78%), hepatomegaly (44%), altered conscious (6%) due to hypoxia, cyanosis was observed in 3% of cases.

Table 2: Distribution of signs in study subjects.

Signs	No. of cases (%)
Pallor	135 (78%)
Respiratory distress	162 (94%)
Hepatomegaly	76 (44%)
Altered conscious	10 (6%)
Cyanosis	6 (3%)

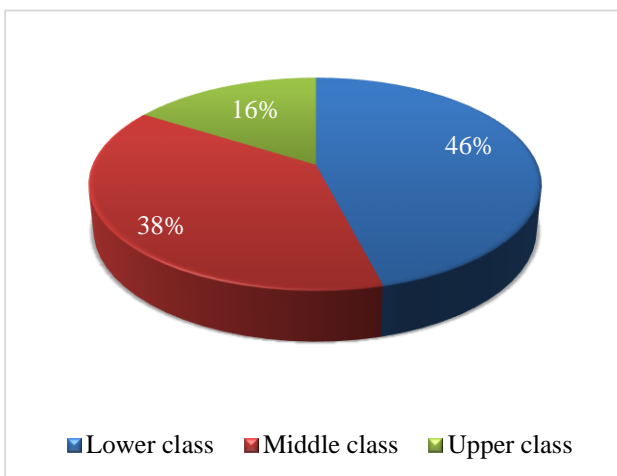


Figure 3: Socioeconomic status.

Figure 3 showing socioeconomic status of the family indicating majority of the children (46%) presented with ALRTI belongs to lower socioeconomic group which includes 79 cases, followed by middle class 65 cases (38%), only 28 cases (16%) belonging to upper class were observed in the present study.

Table 3: Nutritional status of study subjects.

	No. of cases (%)		
	Boys	Girls	Total
Normal	52	46	98 (57%)
PEM-1	19	22	41 (24%)
PEM-2	10	13	23 (13%)
PEM-3	03	08	11 (6%)
PEM-4	None	None	None

Table 3 shows the nutritional status of children, 98 cases showed no signs of protein energy malnutrition (PEM), 41 cases had Grade 1 PEM, 23 cases had Grade 2 PEM, 11 cases had Grade 3 PEM. Majority of the children with PEM belongs to low socioeconomic status. Exclusive breast feeding was found in 121 cases (70%), remaining cases either baby was on formula feeds along with EBM or on formula feeds only. Delayed weaning observed in 18% of the cases.

Table 4: Immunization status of children.

Immunisation status	No.of cases(%)
BCG	172 (100%)
DPT	172 (100%)
Measels/MR/MMR	172 (100%)
PCV-10	10 (6%)
PCV-13	25 (15%)
No vaccination	Nil

Table 4 shows the immunization status of the children, all cases received vaccine according to National immunization schedule. We also elicited vaccination status regarding pneumococcal vaccine. 10 cases received PCV-10 and 25 cases received PCV-13.

Table 5 shows the distribution pattern of Acute Respiratory infection (ARI), 73 cases of bronchopneumonia were reported, 28 cases of bronchiolitis, 22 cases of croup and lobar pneumonia each were seen. 9 cases of pneumonia with parapneumonic effusion, 11 cases of wheeze associated LRTI, 4 cases of empyema thoracic and 3 cases of tuberculosis were noted our study. Different types of LRI presenting at various ages also shown in Table 5.

Table 6 shows investigations, anaemia noted in 135 cases (78.5%), further grading of anaemia done according to WHO guidelines. 53% of cases found to have mild anaemia, 31% of cases moderate anaemia and 16% of the cases severe anaemia. Further total WBC count listed as shown in Table-6, 50% of cases had total count between

5000 and 10000 cells/cumm, 29% of cases had counts more than 15000 cells/cumm, 21% of cases had counts below 5000 cells/cumm. Further tuberculin test was done in selective cases and was positive in 57% of cases.

Table 5: Distribution pattern of Acute Respiratory Infection (ARI).

Types of LRTI	1 to 6 months	6 month - 2 years	2-5 year	Total (%)
Croup	03	13	06	22 (14%)
Bronchopneumonia	19	35	19	73 (42%)
Lobar pneumonia	Nil	11	11	22 (14%)
Bronchiolitis	09	16	03	28 (17%)
Tuberculosis	Nil	01	02	03 (1%)
WALRTI	Nil	04	07	11 (6%)
Pneumonia with effusiom	Nil	02	07	09 (5%)
Empyema thoracis	Nil	01	03	04 (1%)

Table 6: Distribution of study subjects on basis of investigations.

Anaemia	No. of cases (%)
Mild	71 (53%)
Moderate	42 (31%)
Severe	22 (16%)
Total count (cells/cumm)	
Less than 5000	37 (21%)
5000-15000	86 (50%)
More than 15000	49 (29%)
Tuberculin test	% of cases
Positive	57%
Negative	43%

Among the organisms isolated, the most common pathogen was *streptococcus pneumonia* followed by *klebsiella*. The other organisms were *staphylococcus aureus* and *H. influenza*. 3 cases of Tuberculosis diagnosed from gastric aspirate sample sent for gene x pert. Out of 4 cases of empyema thoracis, pleural fluid analysis showed staphylococcus in 2 cases, streptococcus in 1 case and klebsiella species in 1 case. Majority of cases were sensitive to amoxicillin-clavulanic acid, piperacillin-tazobactam and vancomycin.

The incidence of LRTI in the present study found to be 17.5%. Out of 172 cases, only 1 case died because of sepsis with pneumonia being the focus. The culture

isolates showed staphylococcus aureus organism in this case.

DISCUSSION

Childhood respiratory infections are of major concern in developing countries. The incidence of respiratory infection in our study was 17.5%. Another study done by Paramesh et al reported 12.85% incidence in their study.¹¹ Various factors contribute to incidence like age group selection for a study, seasonal variation and presence of risk factors in a community. There was slight male predominance observed in our study. The study done by Udaya et al which includes children less than 18 years also showed male predominance.¹² Other study done by Savitha et al, Yosif et al, Broor et al also showed male predominance in their study. The higher incidence in boys is probably attributed to early seeking of medical advice.¹³⁻¹⁵

The most common age group in this study was 6 months to 2 years followed by 2 to 5year. Whereas China AS et al reported 2 months to 1 year as common age group in their study.¹⁶ Similarly Varhanophas et al reported 1 to 5 year as most common age group in their study.¹⁷ The most common presenting symptom varied with different age group, below 6 months infants mostly presented with hurried breathing followed by not feeding well and fever. However, in the age group between 6 months and 2-year, fever, hurried breathing and cough was observed and between 2 year and 5 years, fever and cough were predominant. This is comparable with other studies where Kabra et al, Kumar et al showed cough and fever as predominant symptom.^{18,19} Other study done in Nepal by Rijal P et al reported fever and cough as predominant symptom.²⁰

In our study, pallor, respiratory distress was the predominant sign followed by hepatomegaly. These findings are inconsistent with Kumar AMK et al, they reported tachypnoea and chest retraction are the predominant sign.²¹ Ramkrishna and Harish showed anaemia is a risk factor for LRTI Anaemia was found in 78.5% of cases.²² LRTI was predominant in low socioeconomic status in our study. This can be probably attributed to overcrowding, malnutrition, lack of hygiene, educational status. Munagala VK et al also reported higher number of cases in low economic status.²³ PEM-1 is observed in 24% of the cases. Mungala VK et al reported 35% of grade-1 PEM in their study.²³ Contrary to this Sonogo M reported Grade-3 PEM as a major risk factor.²⁴

Exclusive breast feeding reported in 70% of the cases. Lack of breast feeding is an independent risk factor for pneumonia. Exclusive breast feeding and continuation till 24 months are critical in reducing burden of pneumonia.²⁵⁻²⁷ Savitha et al and Broor et al reported early weaning before 4 months of age in 37.5% and 39.4% of children were significantly associated with

LRTI. The immunisation status is very important. Lack of immunisation coverage is a risk factor for developing pneumonia and its consequences.^{13,15} All cases in the present study were received vaccines as per national immunisation schedule. However, only a few cases received pneumococcal vaccine either PCV-10/PCV-13. This probably attributed to low socioeconomic group participated in our study. Madhi et al reported PCV is effective in preventing pneumonia in children.²⁸

Among LRTI in children, most of the cases were bronchopneumonia followed by bronchiolitis, croup and lobar pneumonia. This is comparable with the study done by Reddaiah et al where they reported bronchopneumonia as major LRTI.²⁹ Mungala VK et al also reported bronchopneumonia as commonest LRTI in their study.²³ The gastric aspirate yield is less sensitive in children. However most common organism isolated in the present study was *streptococcus pneumoniae* followed by *Klebsiella*. On contrary to this Baranwal AK et al and Joshi S et al reported *Klebsiella* as major pathogen.^{30,31} The most common organism isolated in empyema thoracis is *Staphylococcus aureus*. This is comparable with Baranwal AK et al.³⁰

CONCLUSION

Acute Respiratory infection in children is the major burden especially in developing countries. It's a leading killer disease in children below 5 years. Understanding the profile of respiratory tract infection is very important. Steps should be taken to combat the various modifiable risk factors of malnutrition, emphasis laid on exclusive breast feeding. Effective implementation of immunization and national health programs. And also training of health personnel at subcentre level in early recognition, treatment and referral to higher centre plays a pivotal role in reducing the morbidity and mortality associated with LRTI.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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