Pediatrics

A clinical study of Profile of Acute Lower Respiratory Tract Infections in children

Dr. Durgesh Kannam[*]
Assistant Professor, Department of Pediatrics, Prathima Institute of Medical Sciences, Naganoor, Karimnagar, Telangana, India

Original Research Article

*Corresponding author
Dr. Durgesh Kannam

Abstract: Acute respiratory infections are a leading cause of morbidity and mortality in under-five children in developing countries. Hence, the present study was undertaken to study the various risk factors, clinical profile and outcome of acute lower respiratory tract infections (ALRI) in children aged 2 months to 5 years. Methods: 100 ALRI cases fulfilling WHO criteria for pneumonia, in the age group of 2 months to 5 years were evaluated for potential risk factors, clinical profile and outcome as per a predesigned proforma in a rural medical college. Results: Socio-demographic risk factors like parental illiteracy, overcrowding, partial immunization and low socioeconomic status were potential risk factors; similarly nutritional risk factors like early and late weaning, anemia, and malnutrition were associated with ALRI. Significant environmental risk factors were the use of biomass fuels, inadequate ventilation at home, and lack of separate kitchen. Conclusion: Within the limitations of the present study it can be concluded that early diagnosis and initiation of treatment helps to improve the morbidity and mortality in under- 5 children. There is significant association of ALRI with immunization status; other factors such as parental literacy, low socioeconomic status use of biomass fuel and crowding are important factors in etiology of ALRI.
Keywords: Acute Lower Respiratory Tract Infections [ALRI], children, risk factors.

INTRODUCTION

The WHO Program for ARI Control guidelines define Pneumonia as cough in the presence of tachypnoea (respiratory rate >50/ min in children aged 2 months to 12 months and >40/min in children aged 13 months to 60 months) and Severe and Very Severe Pneumonia as the presence of chest indrawing and central cyanosis, lethargy, convulsions and refusal of feeds of respectively [1].

Tachypnoea and lower chest in drawing when applied by health workers and Pediatricians as a diagnostic tool had the sensitivity of 70% and 81% respectively [2]. Certain risk factors have been implicated in the causation of ALRI in under-5 children. They are: Non-exclusive breastfeeding, Lack of age-appropriate immunization, Malnutrition, Crowding, Low birth weight, Indoor air pollution [3, 4]. Acute Lower Respiratory Tract Infection (ALRI) is the leading cause of under-5 childhood morbidity in the world, with nearly 156 million new episodes each year, of which India accounts for a bulk of 43 million. The mortality burden is 1.9 million per year, out of which India accounts for around four hundred thousand deaths per year4. ARI is responsible for 18% of all deaths in children below five years of age and 8.2% of all disability as measured by disability Adjusted life years [DALY]. On an average, children below 5 years of age about suffer 5 episodes of ARI per child per year, thus accounting for about 238 million attacks. Consequently,

although most of the attacks are mild and self-limiting episodes, ARI is responsible for about 30-50 percent of visits to health facilities and for about 20-40 percent of admissions to hospitals [5]. The above-mentioned risk factors can be countered in the following ways: Training of local health personnel in early recognition, treatment, and referral of sick and at-risk children. Health education for the community is required regarding healthcare practices and harmful effects of biomass fuel usage and overcrowding and the importance of proper ventilation in homes. Effective utilization of pediatric clinics to ensure availability of proper nutrition to combat malnutrition anemia and up to date immunization to for 5 age group children can prevent ALRI. Implementation of the existing National Health Program to improve the health status of under-five children. Early diagnosis and treatment initiation helps improve the morbidity and mortality profile, as evidenced by the relatively low rates of mechanical ventilation and mortality in the present study. The

results of this study may add further knowledge with regard to ALRI risk factors assessment in semi-urban setup. Among all the children diagnosed with ALRI, 7-13% is severe enough to require hospital admission [6]. Of all the children hospitalized with severe pneumonia, 51% require a hospital stay of more than 5 days, 56% need an antibiotic change, 20.5% need mechanical ventilation and the mortality is 10.5% [7]. The present study is a hospital-based prospective study with a sample size of 100.

MATERIALS AND METHODS

This is a prospective study of ALRI in children aged 2 months to 5 years conducted at Prathima institute of Medical Sciences, Karimnagar. Children admitted in our hospital with clinical diagnosis of ALRI as per WHO criteria from January 2015 to august 2016. Inclusion criteria were Children with ALRI from 2 months to 60 months. Exclusion criteria were Children less than 2 months and more than 60 months, Children with any underlying chronic respiratory or cardiac illness. Children in the age group of 2 months to 5 year admitted with ALRI during the study period were enrolled in the study as cases. A case of ALRI is defined as per ARI Control Program as "presence of cough with fast breathing of more than 60/min in less than 2 month of age, more than 50/min in 2 month to 12 month of age and more than 40/min in 12 month to 5 year of age, the duration of illness being less than 30 days". The presence of lower chest wall indrawing was taken as evidence of severe pneumonia. The presence of refusal of feeds, central cyanosis, lethargy or convulsions was taken as evidence of very severe pneumonia. Verbal, informed consent of the child's parent/guardian was obtained. A detailed history and physical examination was done according to a predesigned proforma to elicit various potential risk factors and other relevant history. Age of the child was recorded in completed months and age of parents in completed year.

A detailed history of relevant symptoms like fever, cough, rapid breathing, chest retraction, refusal of feeds, lethargy, wheezing etc. was taken. Past history of similar complaints was also taken. History of immunization was elicited from parents and verified by checking the documents wherever available. History of breastfeeding and weaning was recorded. Dietary intake of child prior to current illness was calculated by 24 hr dietary recall method. History of upper respiratory tract infection in the family members in the preceding 2 weeks was recorded. History of smoking by various family members and details of cooking fuel used was recorded. Details of the housing conditions were also obtained. Socioeconomic status grading was done according to Modified Kuppuswamy's classification [7]. A detailed examination of each child was done. Respiratory rate and heart rate were measured for one minute, when the child was quiet. A detailed anthropometry was done and malnutrition was graded according to Indian Academy of Paediatrics classification [8]. Severity of respiratory distress was assessed in each child. Pallor and other signs of vitamin deficiencies were recorded. A detailed systemic examination was done in both cases and controls. Routine hematological investigations were done in all cases to know the degree of anemia and blood counts; chest X-ray was done in all cases to categories the ALRI into clinical entities and to detect complications, if any. Other specific investigations were done as per requirement in individual cases and all the cases were treated as per the standard protocol depending on the type of ALRI.

RESULTS

The present study was conducted on 100 children aged 2 months to 5 years with ALRI to evaluate Risk factors, clinical profile, laboratory profile and outcome. Among the 100 cases of ALRI, 57% were observed to be males and 43% were female No significant association of sex with ALRI was found. Of the ALRI cases in the study, 22% had illiterate fathers and the majority of fathers (49%) were educated till primary or middle school. Significant association was found between ALRI severity and paternal literacy. Overcrowding was 70% among the 100 ALRI cases. No significant association of overcrowding with ALRI severity was found.

Table 1: Age wise distribution of cases involved in the study

Age	Mild Pneumonia	Severe pneumonia	Very severe pneumonia	Total (%)
2 – 12 months	10	34	17	61
13 – 60 months	6	26	7	39
Total	16	60	24	100

Overcrowding was 70% among the 100 ALRI cases. No significant association of overcrowding with ALRI severity was found. Among the 100 ALRI cases studied, 52% belonged to families falling under Low Socioeconomic status (class 4 and 5). Significant association was found between socioeconomic status and ALRI severity. Among the 100 ALRI cases, only 16% were reported to have had low birth weight, and for 30%, the birth weight was not remembered by the parents.

Table-2: common Symptom present in the patients

Symptom	Number [percentage]
Fever	90
Cough	100
Breathlessness	96
Chest indrawing	80
Vomiting/diarrhea	11
Running nose	69
Wheeze	13
Refusal of feed	24
convulsion	2

Table-3: Immunization status of the individuals involved in the study

Immunization	Mild Pneumonia	Severe pneumonia	Very severe pneumonia	Total (%)
Complete for the age	16	22	12	50
Incomplete for the age	0	38	12	50
Total	16	60	24	100

Table-4: Birth weight of the patients

Birth weight in Kg	Number
< 2.5 kg 16	16
>2.5 kg 54	54
Not known 30	30
Total	100

Among the 100 ALRI cases, 40% were found to be living in houses with inadequate ventilation. No significant association was found between ALRI severity and ventilation. Among the 100 ALRI cases, 25% were living in households with at least one smoker family member. No significant association was found between smoking in the family and ALRI severity. Of the 100 ALRI cases, 30% had history of at least one family member having or having had a URI in the preceding 2 weeks. No significant association was found between family history of URI and ALRI severity.

Table 5: Results of Blood culture test done in patients

Blood culture	Mild Pneumonia	Severe pneumonia	Very severe pneumonia	Total (%)
Positive	0	1	7	8
Negative	16	59	17	92
Total	16	60	24	100

DISCUSSION

Pneumonia is the leading cause of mortality under 5 years' age group. The incidence of pneumonia is more than tenfold higher and the number of childhood related deaths from pneumonia 2,000 fold higher in developing than in developed countries. In India during the year 2011 about 26.3 million cases of ARI were reported which gives an incidence rate of about 2,179 cases per lakh population. The common infectious agents causing ALRI in under-five children are bacteria and viruses other pathogens contribute to a lesser degree. [8-10] Droplet size plays a major role in determining the level of the respiratory system reached by inhaled bacteria. Invasion of lung parenchyma (bacterial, viral or chemical) causes destruction of respiratory epithelium with migration of polymorphonuclear cells resulting in inflammation, finally causing narrowing of airways with fibrin formation [11-13]. Contrast to upper airway obstruction, lower airway obstruction produces more expiratory symptoms than inspiratory. Children with bacterial pneumonia are more likely to appear ill, anxious, or distressed; have a higher incidence of and more severe fever; and have physical signs attributable to respiratory tract infection. In the present study we found 100% cases presenting with cough and 90% presenting with fever. In a similar study by P Rijal *et al.* found the most common presenting symptoms were fever observed in 90.4%, cough in 71.2% and fast breathing in 34.2% children [14]. The WBC count was high in 47.9% children, out of which 43.8% had pneumonia and 4.1% had bronchiolitis. Increased neutrophil count in 36.9% and increased ESR in 50.7% seen in patients only with pneumonia. In other study like Thameer K [15], Yousif *et al*. [16] 93.5 also fever was a predominant feature. But in the study by Kapil

Goel *et al.* [17] and Roy v *et al*; [18] fever was found only in 30% and 45% respectively. At admission and during hospitalization 100% were having cough which was similar to studies done by Kapil Goel *et al.* [17] 91%, Thameer *et al.* [15] 93% Yousif *et al.* [16] 92.9% but the study done by Roy V *et al.* [18] cough was present only in 50.5% of cases. In present study dyspnea at admission and during hospitalization was 96% but in other study like Kapil Goel *et al*; [17], Roy v *et al.* [18] have dyspnea found in16% and 1.5% cases respectively these indicate pneumonia was severe form. In present study chest indrawing in 80% other studies by Thameer K *et al;* [15] Yousif *et al.* [16] and Key *et al.* [18] chest retractions found in 13%, 1% and 35% respectively. Wheeze was uncommon finding in lower respiratory tract infection in present study cases but in Roy V *et al.* [18] and Key *et al.* [18] studies wheeze was found in higher proportion of cases [73%]. Tachypnea was also found in significant proportion of cases 74% similar observations was seen in Key *et al.* [18] study but in Roy V *et al.* [18] study tachypnea was found in only 19% of their cases. Refusal of feeds was present in 24% cases and was the commonest criteria for classifying as very severe pneumonia. Diarrhoea was observed in 11% cases and Convulsions were present in 2% of cases. Of the 100 cases included in the study, 16% were classified as pneumonia, 60 % as severe pneumonia and 24% as very severe pneumonia according to the ARI Control Program guidelines. However, in the study by Savitha *et al.* [20] 12.51% were graded as pneumonia, 82.69% as severe pneumonia and 4.8 % as very severe pneumonia. Yousif *et al.* [16] graded 23.4% as no pneumonia, 48.2% as pneumonia, 19.6% as severe pneumonia and 8.8% as very severe pneumonia. Of these cases, the final diagnosis were as follows: 40% were diagnosed as Bronchopneumonia, 25% as lobar pneumonia, 19% as bronchilolitis, 10% as WALRI (wheeze associated lower respiratory infection), 5% as acute laryngotracheobronchitis (croup) and 1% as empyaema thoracis. Elevated total leukocyte counts for age were observed in only 22% of cases. Out of these, 3% were graded as pneumonia, 9% as severe pneumonia and 10% as very severe pneumonia. However, significant association was found between leukocytosis and ALRI severity. Based on the final diagnosis, bronchopneumonia and lobar pneumonia constituted 81% of the cases with leukocytosis. Leukocytosis has been considered as an important, although it may non-specifically correlate of ALRI, particularly those of bacterial etiology. In the present study Positive blood culture was obtained in only 8% of cases; however, significant association was found between blood culture and ALRI severity. The most common organism was Staphylococcus aureus. The reason why this was the most common isolate in this study might be because the majority of children with bacteraemia were severely malnourished and Staphylococcus aureus bacteraemia is commonly associated with malnutrition.

Of the 100 cases studied, 84% required oxygen supplementation at any time during the hospital stay. Among those cases graded severe pneumonia and higher, 97.6% required oxygen supplementation. Mechanical ventilation was required in 8% cases; all classified as very severe pneumonia. This constituted 33% of the very severe pneumonia cases and 9.5% of the cases graded severe pneumonia and higher. The study by Tiewsoh *et al.* [21] 7 reported higher rates of ventilation among children with severe pneumonia (20.5%). There was one death among the 100 cases, and the other 99 recovered and were discharged uneventfully. The complication rate was 1% in this study. The mortality rate among severe pneumonia and higher grades was 1.2%, which was lower than that reported by Tiewsoh *et al.* [21] 7 (10.5%) and the study by Nantanda *et al.* 130 in children with severe pneumonia, who reported a mortality of 15.3% and complications in 1.9% of cases.

CONCLUSION

Within the limitations of the present study it can be concluded that early diagnosis and initiation of treatment helps to improve the morbidity and mortality in under- 5 children. There is significant association of ALRI with immunization status; other factors such as parental literacy, low socioeconomic status use of biomass fuel and crowding are important factors in etiology of ALRI. This can be tackled by effective health education of the community and effective training of peripheral health personnel.

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