

Clinical Profile and Risk Factors of Pneumonia in Children - A Study from Rural Kerala

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ABSTRACT

BACKGROUND

Pneumonia remains an important cause of morbidity and mortality in both industrialized and developing countries. It is one of the leading causes of under-five child death. This study was conducted to assess the clinical profile and to identify the risk factors of pneumonia in children between 2 months and 5 years of age.

METHODS

This is a prospective study conducted among 90 children in the age group of 2 months to 5 years, with clinical features of fast breathing and chest retractions as per ARI control programme who got admitted in paediatric wards of Karuna Medical College and Hospital from January 2018 to September 2019.

RESULTS

2 - 12 months old children were most commonly admitted in the hospital (46.6 %). Bronchopneumonia (75.5 %) was the common diagnosis made at admission clinically. According to ARI control programme, 26.6 % had pneumonia, 62.2 % had severe pneumonia and 11.1 % had very severe pneumonia. Among the risk factors, 86.6 % had malnutrition, 58.8 % had overcrowding. Lower socioeconomic status was found in 92.2 % of patients.

CONCLUSIONS

Childhood pneumonia is one of the important causes of morbidity and mortality. Protein energy malnutrition, overcrowding and low socioeconomic status were found to be the risk factors for pneumonia.

KEYWORDS

Children, Malnutrition, Pneumonia, Risk Factors

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DOI: [10.18410/jebmh/2020/502](https://doi.org/10.18410/jebmh/2020/502)

How to Cite This Article:

Shanmugam S, Kandasamy SK. Clinical profile and risk factors of pneumonia in children- a study from Rural Kerala. J Evid Based Med Healthc 2020; 7(42), 2425-2429. DOI: [10.18410/jebmh/2020/502](https://doi.org/10.18410/jebmh/2020/502)

*Submission 31-07-2020,
Peer Review 10-08-2020,
Acceptance 14-09-2020,
Published 19-10-2020.*

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BACKGROUND

Pneumonia remains an important cause of morbidity and mortality in both industrialized and developing countries. Indeed, it is one of the leading causes of under-five child death in the world. Pneumonia is the single largest infectious cause of death in worldwide. Pneumonia infection alone killed 8,08,694 children under the age of 5 in 2017, accounting for 15 % of all deaths of children under five years old.¹ In addition, socioeconomic and environmental factors like overcrowding, air pollution, passive smoking, practice of bottle feeding etc., contribute to the significant rise in incidence of pneumonia during recent years' Delay in seeking tertiary care facility is another contributing factor for increased mortality in severe pneumonia. In India, acute respiratory tract infections (ARI) accounts for 30 - 50 % of visits to hospital and 20 - 40 % of hospital admissions.³ It is one of the challenges to the health system in developing countries because of high morbidity and mortality.⁴ A large gap exists in the knowledge about the factors responsible for the high morbidity, which needs to be fulfilled by systematic studies. Objective of this study was to assess the clinical profile and identification of risk factors of pneumonia.

METHODS

A prospective study was done among children admitted in Karuna Medical College Hospital with clinical features suggestive of pneumonia from January 2018 to September 2019 after obtaining informed consent from the parents.

Inclusion Criteria

Age group of 2 months to 5 years with clinical features suggestive of pneumonia as per ARI control programme were included.

Exclusion Criteria

1. Cardiac anomalies,
2. Respiratory system anomalies,
3. cleft palate,
4. Immunocompromised states like severe combined immunodeficiency, etc
5. Child less than 2 months of age

Based on ARI criteria, children were considered to have fast breathing if

- Respiratory Rate > 50 in 2 months - 1 yr.
- Respiratory Rate > 40 in 1 yr. - 5 yrs.

Total of 90 children in the age group of 2 months to 5 years, with clinical features of tachypnoea and chest indrawing were included. Each child underwent a detailed history and clinical examination.

Anthropometry and vitals were also recorded systematically. Diarrhoea, meningitis and congestive cardiac failure if present were also noted. In the history taking socio economic history, immunization history, feeding history were given more importance and recorded. X ray chest, blood count, blood culture and other relevant investigations were done. Children were classified into bacterial and viral pneumonia based on the clinical features. All patients were admitted and managed as per the hospital protocol. The study was approved by the Institutional Ethics Committee. (05 – 2020 / 63).

Statistical Analysis

Categorical data was expressed as numbers and percentages. Chi square test was used to determine the significant difference between groups. A p value less than 0.05 was considered as significant.

RESULTS

Characteristics	Frequency (N=90)	Percentage
Age		
2 m - 12 months	42	46.7
1 yr. - 3 yr.	28	31.1
3 yr. - 5 yr.	20	22.2
Sex		
Males	42	46.7
Females	48	53.3

Table 1. Basic Characteristics

Characteristics	Frequency	Percentage
Cough (n = 90)	84	93.3 %
Fever (n = 90)	86	95.5 %
Fast breathing (n = 90)	90	100 %
Refusal of feeds (n = 90)	12	13.3 %
Convulsions (n = 90)	03	3.33 %
Cyanosis (n = 90)	02	2.22 %
Chest retraction (n = 90)	70	77.7 %
Crepitations (n = 90)	18	20 %
Rhonchi (n = 90)	12	13.3 %
Crepitations and rhonchi (n = 90)	76	84.4 %
Abnormal breath sounds (n = 90)	30	33.3 %

Table 2. Symptoms and Clinical Signs

Risk factors	Frequency	Percentage
Breast feeding (n = 90)		
Given	65	72.2 %
Not given	25	27.7 %
IAP PEM Classification (n = 90)		
Normal	12	13.3 %
Grade - I (Mild PEM)	37	41.1 %
Grade - II (Moderate PEM)	33	36.6 %
Grade - III (Severe PEM)	8	8.88 %
Grade - IV (Very severe PEM)	--	--
Immunisation status (n = 90)		
Complete	50	55.5 %
Incomplete	31	34.4 %
Not immunized	9	10 %
Overcrowding (n = 90)		
Present	53	58.8 %
Absent	37	41.1 %
Socio Economic Class (n = 90)		
CLASS 3	7	7.77 %
CLASS 4	34	37.7 %
CLASS 5	49	54.4 %

Table 3. Distribution of Risk Factors

In the present study 90 children in the age group of 2 months to 5 years were included. Children belonged to the age group of 2 m - 12 m (46.6 %) were most commonly affected followed by 1 yr. to 3 yrs. age group children with

31.1 %. Female children outweighed male children with a female to male ratio of 1.14 : 1. (Table 1).

Fast breathing (100 %), cough (93 %) and fever (95 %) were the commonly noticed symptoms. Refusal of feeds was present in 13.3 % cases. In this study, fast breathing was present in all cases (100 %), chest retractions were present in 77.7 % cases, both crepitations and rhonchi were seen in 84.4 % cases. Crepitations alone was heard in 20 % cases, rhonchi alone was heard in 13.3 % cases and abnormal breath sounds was heard in 33.3 % of cases (Table 2).

72.2 % of children were breastfed for the period of 6 months. 41.1 % of children belonged to grade 1 malnutrition and 36.6 % children belonged to grade 2 malnutrition, 8.8 % children belonged to grade 3 malnutrition. 34.4 % were incompletely immunized and 10 % of children were not received any immunization. In 58.8 % of families overcrowding was noticed. Majority of children belonged to low socioeconomic group i.e. 37.7 % in upper low class and 54.4 % in lower class according to modified Kuppuswamy classification. Factors like protein energy malnutrition, overcrowding and low socioeconomic class were highly associated with pneumonia. (Table 3)

Risk Factors	Severity of Disease		Chi-Square Value	P-Value
	Pneumonia	Severe Pneumonia		
PEM				
Present	17	61	7.1001	0.007 P < 0.05
Absent	7	5		
Socioeconomic Class				
Class III	4	3	3.6145	0.164 P > 0.05
Class IV	8	26		
Class V	12	37		
Over Crowding				
Present	16	37	0.8178	0.365 P > 0.05
Absent	8	29		

Table 4. Association of Risk Factors with Severity of Diseases

On investigation, 70 % had leucocytosis and 66 % had anaemia. Clinical diagnosis of pneumonia was confirmed by x-ray in 90 % of pts. Blood culture was positive in 12 % of cases. Pneumococcus (10 cases) was the commonest organism cultured followed by *Klebsiella pneumoniae* and then others. Case fatality rate observed was 4 % in our study. Most of the deaths occurred were within one day of presentation to hospital. Among the risk factors studied protein energy malnutrition was found as a significant risk factor for getting severe pneumonia. (Table 4)

Classification	Frequency	Percentage
Pneumonia	24	26.6 %
Severe pneumonia	56	62.2 %
Very severe pneumonia	10	11.1 %
Clinical Diagnosis		
Bronchopneumonia	68	75.5 %
Lobar pneumonia	16	17.7 %
Pneumonia with complication	06	6.66 %

Table 5. Classification and Clinical Diagnosis

According to WHO ARI programme, 26.6 % had pneumonia, 62.2 % had severe pneumonia and 11.1 % had very severe pneumonia. Most of the cases (75.5 %) were diagnosed as having bronchopneumonia clinically (Table no 5). Acute gastroenteritis (7 %), meningitis (3 %) and Congestive cardiac failure (1 %) were the associated illness.

DISCUSSION

Age is an important prognosticator of morbidity and mortality of childhood pneumonia. In our study, majority (46.6 %) were less than 1 year of age among the children admitted. In a study by Champatiran J et al, 84 % of pneumonia was reported in the age group of 2 m - 12 months.⁵ The reason for occurrence of pneumonia in age group less than 12 months could be due to smaller airways, frequent exposure to infection and poor nutritional status. In our study female children (53.3 %) were more affected when compared to male children. This is similar to other study conducted by Hamid M et al in which females are affected at a higher rate than males.⁶

As per the ARI programme tachypnoea is the must sign to classify the child under pneumonia. In our study also tachypnoea was observed in all patients. Cough (93 %) and fever (95 %) were present in most of the cases. In the present study, tachypnoea was seen in 100 % and chest retractions were found in 77.7 % and these two were the very important signs for making a diagnosis of pneumonia. Bacterial pneumonia should be considered in children when there is persistent or repetitive fever >38.58 °C together with chest recession and a raised respiratory rate.^{7,8} Tachypnoea occurs due to stimulation of an inflammatory mediators induced by an organism that alters exchange of gas at the level of alveoli and capillaries; when it is uncompensated, it evolves to chest wall recessions, signs of cardiovascular collapse and respiratory failure. Spooner and Levental, confirmed the chest wall recessions and fast breathing as diagnostic signs for pneumonia as established by the WHO.^{9,10}

Creptitations and rhonchi together found in 84.4 % of children and bronchial breath sound was also heard in 33 % of children. Reddaiah et al, have reported in his study that creptitations and rhonchi were found in 76 % of patients with pneumonia.¹¹ In this study the most common diagnosis made at admission (75.5 %) was bronchopneumonia followed by lobar pneumonia (consolidation) in 17.7 %. Similarly in a study conducted by Reddaiah et al, bronchopneumonia was diagnosed in 64 % and lobar pneumonia was found in 6.4 % of children.¹¹

In this study risk factors for pneumonia in children were studied. Protein energy malnutrition, low socio economic status and overcrowding were analysed as risk factors for pneumonia. Protein energy malnutrition was significantly (p < 0.05) associated with development of severe and very severe pneumonia. The risk factors for deaths due to pneumonia vary between countries and regions. Frequently studied risk factors are young age, low birth weight, protein energy malnutrition, anaemia, lack of parental education, over-crowding, bottle feeding, not receiving measles vaccination, presence of congenital cardiac and lung anomalies and severity at presentation to hospital.¹²⁻¹⁸ Sriram G et al and Shah N et al also reported the similar findings.^{19,20} In our study 44.4 % children with pneumonia have not received immunization properly. But a study done by Broor et al, showed that inadequate immunization for age was significantly associated with acute lower respiratory infections (ALRI).²¹ In the present study, overcrowding was

noticed in 58.8 % of patients. In a study done by Savitha et al, showed that overcrowding was significantly related to the occurrence of ARI in under five children.²²

Of the 90 patients, blood culture was positive only in 12 % of cases. The blood culture positivity was very low in most of the studies including study by Oberoi et al, which was 22 %.²³ *S. pneumoniae* was the commonest organism isolated among the 12 % of cases. Similarly in a study by Nagesh Kumar T C et al, the *S. pneumoniae* was isolated from blood culture only in 5.7 % of the cases.²⁴ *S. pneumoniae* is a vital cause of morbidity and mortality causing maximum deaths than any other infectious disease as shown in the study done by Henriques et al.²⁵ Actual number of pneumonia cases will come down when the pneumococcal vaccine is introduced in the National Immunization Programme.

CONCLUSIONS

Bronchopneumonia is the principal form of presentation in paediatric population. Symptoms and clinical findings like cough, high temperature, fast breathing, chest retractions and crepitations which are mentioned in the ARI control programme were highly sensitive to diagnose pneumonia in children. Blood culture will not give much information regarding aetiology of pneumonia. Protein energy malnutrition, low socioeconomic status, and overcrowding were found to be the important risk factors for pneumonia. Protein energy malnutrition was found to be a significant risk factor for development of severe pneumonia. Actual number of pneumonia cases will come down when the pneumococcal vaccine is introduced in the National Immunization Programme.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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