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Original Research Article

A Descriptive Study on Pneumonia and its Clinical Importance in Paediatric Age Group Patients

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Abstract:

Pneumonia is the leading cause of mortality of under-five children in various developing countries, including India**.** This was a study of community acquired pneumonia(CAP)conducted on 100 children in the age group of 1 month to 12 years, with clinical features of tachypnoea with fever and cough as per WHO criteria who got admitted under paediatrics department of Madha Medical College and Research Institute, Chennai during February 2023 to May 2024.Objectives of our study were to study the clinical and bacteriological profile of children admitted with CAP and to determine sensitivity and resistance patterns to various antibiotics to these organisms. Study showed that 71% of the children belonged to the age group of 1month-12months, male to female ratio was 1.22:1. Rapid breathing (100%), cough (100%) and fever (100%) were the most common symptoms. Refusal of feeds was present in 28% cases. Tachypnoea (100%), chest retractions (87%) and crepitations (82%) were the most common signs.65% were breast-fed and 35% were given bottle feeds. In our study, 68 % of patients were malnourished which includes severe acute malnutrition (33%) and moderate acute malnutrition (16%) in the age group of 6 months to 5 years of age and other 19 % undernourished children of more than 5 years of age and infant of 1 month to 6 months of age. Anemia was present in 55%. The conclusion from this study is that incidence of CAP is more common in the infant age group, children who are anaemic, malnourished and have inadequate vaccination coverage. The sensitivity and resistance pattern of antibiotics for isolated organism observed in this study can be used to formulate the antibiotic policy in children with community acquired pneumonia in the study hospital.

Keywords: Pneumonia, WHO criteria, Blood culture, S. Aureus.

Introduction

Infections involving the respiratory tract are perhaps the most common ailment of humans. While they are a source of discomfort, disability and loss of time for most of the adults, they are a substantial cause of morbidity and mortality in younger children.[1] Community acquired pneumonia (CAP) is an acute infection involving the lung parenchyma acquired outside the hospital or other health care settings. It is one of the most common causes of hospitalization in children in developed countries [2] and the major cause of death in children in developing countries [3,4]. The WHO has defined clinical criteria for making the diagnosis of pneumonia in children [5]. The criteria consist of the presence of a fever and cough associated with tachypnea. According to one study, burden of CAP in India is among the top five countries and has over 23% of the global cases [6]. Nowadays, there is an increase in the resistance pattern of drugs due to inappropriate use of drugs. Accurate, and rapid determination of etiology in childhood CAP is important because it would influence individual treatment decisions, antibiotic policy in the community.

Materials and Methods

This was a descriptive clinical study of community acquired pneumonia(CAP)conducted on 100 children in the age group of 1 month to 12 years, with clinical features of tachypnoea with fever and cough as per WHO criteria who got admitted under paediatrics department of Madha Medical College and Research Institute, Chennai during February 2023 to May 2024.Cases were followed up for a period of one month to determine cases of persistent pneumonia. Children with congenital anomalies of heart and lungs, anatomical defects like cleft lip and palate, immunocompromised states like HIV, children on immunosuppressant drugs, children whose symptoms got relieved after three doses of bronchodilator therapy, respiratory distress due to other causes like metabolic, CNS, etc and pneumonia due to COVID-19 infection were

excluded. A detailed history of the relevant symptoms such as fever, cough, rapid breathing, refusal of feeds, wheezing etc was taken. A detailed general examination of each child including anthropometry was carried out. Detailed systematic examination was done. Socio economic history, immunization status, feeding practices and degree of malnutrition were also recorded. Investigations done were chest Xray, CBC, blood culture. Based on radiological findings, children were divided into Bacterial (bronchopneumonia, consolidations, alveolar infiltrates) and Viral (interstitial infiltrates, hyper aeration) pneumonias. Follow up X-rays were taken in relevant cases.

Results

In this study total of 100 patients were enrolled as per inclusion criteria. Among 100 patients, 55 were male and 45 were female children with a male to female ratio of 1.22:1. A total of 71(71%) patients were in the age group of 1-12 months 23(23%) patients were in the 13-59 months of age group and 6 (6%) patients were >5 years in age with the mean age of presentation of 18.2 months. 57 (57%) were from the rural area, 43 (43%) were from urban area (Table 1).

Table 1: Age, Sex, Geographical distribution of study patients

Parameter	N	%
Age		
1-12 months	71	71
13-59 months	23	23
>5 years	6	6
Sex		
Male	55	55
Female	45	45
Geographical distribution		
Rural	57	57
Urban	43	43

Fever, cough, fast breathing were the most common presenting complaints present in 100% while an refusal of feeds was present in 28% of the patients.

Table 2: Symptomatology

Symptoms	Present
Fever	100%
Cough	100%
Rapid breathing	100%
Refusal of feeds	28%

Tachypnoea (100%), chest retractions (87%) and crepitations (82%) were the most common signs. In this study, 51% were completely immunised and 49% were partially immunised. 65% were breast-fed and 35% were given bottle feeds. In our study, 68% of patients were malnourished those are including severe acute malnutrition (33%) and moderate acute malnutrition (16%) in the age group of 6 months to 5 years of age and other 19 % undernourished children of more than 5 years of age and infant of 1 month to 6 months of age. Anemia was present in 55%. Majority (62%) were from poor socioeconomic status (grade 3, 4 and 5 modified kuppusamy classification). 62% lived in ill ventilated, kutcha house and 29% of houses were overcrowded. 50% did not have good sanitary facilities and 23% used fuel other than LPG for cooking. On investigation, 63% had leucocytosis. Neutrophilia was seen in 70% and lymphocytosis in 12% of cases. ESR was elevated in 69% of cases. Bacterial pneumonia was detected radiologically in 69% and viral pneumonia in 21% of cases. Chest X-ray was normal in 10% of cases. Among bacterial pneumonias, bronchopneumonia was the most common form.78% of cases showed complete radiological resolution after treatment. 3 cases showed persistence of radiological features even after 4 weeks and was termed as persistent pneumonia

Table 3: Radiological findings

Diagnosis	No.	Percentage
Bacterial Pneumonia	69	69%
A) Bronchopneumonia	36	36%
B) Lobar consolidation	15	15%
C) Alveolar Infiltrates	10	10%
D) Complications	08	8%
Viral Pneumonia	21	21%
Normal	10	10%

Total 84% of patients among the 100 enrolled in the study did not isolate any organism in the blood culture and 16% of patients had isolated the organism in the blood culture. Staphylococcus Aureus (7%) is the most frequently isolated organism in the blood culture followed by Klebsiella spp. which isolated in 4% of the patients. E. coli and coagulase-negative Staphylococcus (CONS) each isolated in 2% patients. Pseudomonas spp. was isolated in 1% of patients (Table 4).

Table 4: Distribution of organism isolated in blood culture

Organism	N (%)
No organism	84(84)
Staphylococcus Aureus	7(7)
Klebsiella	4(4)
E.Coli	2(2)
CONS	2 (2)
Pseudomonas spp.	1 (1)

Table 5: Organism and antibiotics sensitivity

Organism Isolated	Antibiotic sensitivity
Staphylococcus aureus	Linezolid, Vancomycin, gentamycin, amoxiclav, erythromycin.
E. coli	Piperacillin-tazobactam, amikacin, meropenem, levofloxacin
Coagulase negative staphylococci	Vancomycin, Linezolid, clindamycin, Cefoxitin
Pseudomonas spp.	Piperacillin-tazobactam, cefepime, meropenem, levofloxacin
Klebsiella spp.	Meropenem, ceftazidime, Piperacillin-tazobactam, Levofloxacin, ceftriaxone

As per the antibiotic sensitivity pattern observed in the isolated organism in blood culture and sensitivity, more common antibiotics sensitive are mentioned .(Table 5).

Discussion

Pneumonia continues to be the leading cause of mortality and morbidity of children in developed and developing countries inspite of improvement in immunization, socioeconomic status, early diagnosis and treatment. Antimicrobial-resistant bacterial species have been evolved due to various factors like the widespread and sometimes inappropriate use of antimicrobial agents and the increase in regional and international travel with which antimicrobial-resistant bacteria cross geographical barriers [7].

Total 71 (71%) patients were reported in the age group of 1-12 months, 23 (23%) were reported in the age group of 13 months to 59 months and 6(6%) were >5 years of age. This is in accordance with a study done by shekhawat et al where majority of patients, 65.8% belonged to the age group 2-11 months followed by 34.2% belonging to the 12-59 age group [8]. Low immunity, smaller and narrower airways and frequent exposure to infection, poor nutritional status as well as more susceptibility of infants to viral and general infections are several factors that attribute to more occurrence of pneumonia cases in children less than one year of age. In our study, male was more affected than female children (55 % vs. 45%) with a male to female ratio of 1.22:1. This is similar to a study done by Singh MK et al where the male (54.7%) outweighs the females (45.3 %), with a male:female ratio of 1.21 [9]. In the current study, cough (100%), fever (100%), fast breathing (100%), chest retraction (87%), crepitations (82%), refusal of feeds (28%), and vomiting (27%) were the common clinical features while 31% were received in severe respiratory distress. In a similar study common clinical features were cough (90.7%), fever (88%), difficulty in breathing (81.3%), and refusal to feed (41.3%) [9].In another study done in 2017 in Odisha cough, tachypnoea, and chest in- drawing were present in 100% of studied cases, fever in 97.16%, severe respiratory distress in 40.42% and inability to take food or refusal to food in 40.42% cases[10].

In our study,51% were completely immunised whereas 49% were partially immunised.52.3% of

children were completely immunized and 19.2% children were partially immunized in a western Rajasthan-based study[8].In our study, 68 % of patients were malnourished those are including severe acute malnutrition (33%) and moderate acute malnutrition (16%) in the age group of 6 months to 5 years of age and other 19 % undernourished children of more than 5 years of age and infant of 1 month to 6 months of age. Malnutrition was associated with 48.7% of cases in the study done by shekhawat et al [8]. Malnutrition was the most common co-morbidity associated with CAP. This was in coordination with other studies that show malnutrition to be the significant risk factor associated with pneumonia [11]. Severely malnourished children have a higher incidence and severity of infections due to deterioration of immune function and decreased functional capacity of all cellular components of the immune system. These factors increase the risk of fatal outcomes in children with pneumonia who have co- morbidity of severe acute malnutrition, increasing the fatality significantly when compared to those who do not have severe acute malnutrition.

In our study chest x-ray showed radiological changes consistent with pneumonia in 90% of cases. This was in comparison with CDC EPIC study (89%) [2]. Evidence of bacterial infection was found in 69% and viral in 21% of cases. The reasons for higher incidence of radiologically detected bacterial pneumonia in our study may be due to high incidence of bacterial pneumonia in developing countries like ours. Also there may be variations in intra observer and inter observer agreement on the radiographic features used for interpreting the radiogram.In our study, follow up radiographs were taken in 56% of cases; 78% showed complete resolution after treatment and 22% partial resolution. Heaton P et al, in their study on utility of chest radiography in the follow up of pneumonia, has found that 90.2% had normal chest radiographs after treatment [12]. They also concluded that in cases of uncomplicated pneumonia, follow up chest radiography is not indicated if symptoms and signs are absent. In the current study, Staphylococcus Aureus (7%) was the most frequently isolated organism in the blood culture followed by Klebsiella spp. which was isolated in 4% of the patients. E. coli and coagulase-negative Staphylococcus (CONS) each isolated in 2% patients. Pseudomonas spp. was isolated in 1% of patients. This was in comparison with study done by G R Karambelkar et al (17%) with most common organism being isolated being S. aureus [13].

Conclusion

The incidence of CAP is more common in the infant age group, children who are anaemic, malnourished and have inadequate vaccination coverage. The sensitivity and resistance pattern of antibiotics for isolated organism observed in this study can be used to formulate the antibiotic policy in children with community acquired pneumonia in the study hospital.

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