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A Study to Evaluate the Etiology of Community Acquired Pneumonia in Hospitalized Children

[1]Dr. Mansiha Singaria, Resident Doctor, Department of Pediatrics, S.M.S. Medical College, Jaipur
[2]Dr. Yatindra Singh, Resident Doctor, Department of General Surgery, Dr. S.N.Medical College, Jodhpur
[3]Dr. Manoj Nogia, Resident Doctor, Department of Pediatrics, S.M.S. Medical College, Jaipur
[4]Dr.Monika Saini, Resident Doctor, Department of Microbiology, S.M.S. Medical College, Jaipur
[5]Dr. Tejpal Mahawat, Resident Doctor, Department of Pediatrics, S.M.S. Medical College, Jaipur

Corresponding Author: Dr. Yatindra Singh, Resident Doctor, Department of General Surgery, Dr. S.N. Medical College, Jodhpur

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Abstract

Background: Community acquired pneumonia (CAP) refers to an infection of the lung by a variety of microorganisms acquired outside the hospital setting, resulting in inflammation of the lung tissue. It is typically associated with fever and respiratory symptoms such as cough and tachypnoea, but symptoms may be non-specific in young children. Radiographic changes may be useful to confirm the diagnosis.

Methods: We conducted a descriptive observational study at Sir Padampat Mother and Child Health Institute, Jaipur (J.K. Lone Hospital).

Results- We conducted a study on 100 hospitalized children with pneumonia. Out of those etiological agents could be identified in 31 subjects (11 had viral pneumonia and 20 had bacterial pneumonia & 2 had mixed infection).

Conclusion: The viral pathogen most commonly identified among them was influenza B virus and bacterial pathogen isolated was staphylococcus aureus. The most common age group affected by community acquired pneumonia was below 5 years of age and disease severity was more in children below 2 year of age with male predominance.

Keywords: Community acquired pneumonia, Respiratory, Etiology.

Introduction

Pediatric respiratory diseases remains an important cause of morbidity in both the developing and the developed world. It has become the most common reason parents cite for taking their children to see the general practitioner, and for attendance to the emergency department with a pediatric medical problem[1].

Pneumonia is one these diseases and is leading infectious cause of death globally among children under 5year, accounting for an estimated 920,000 deaths each year. Pneumonia mortality is closely linked to poverty and more than 99% of these deaths occur in low and

middle income countries, with the highest pneumonia mortality rate occurring in poorly developed countries in Africa and South Asia[2].

Pneumonia, a pandemic killer is an inflammation of the parenchyma of the lungs. Although most cases of pneumonia are caused by microorganisms, noninfectious causes include aspiration of food or gastric contents, foreign bodies, hydrocarbons, lipoid substances and drug or radiation induced pneumonia[3].

Community acquired pneumonia (CAP) refers to an infection of the lung by a variety of microorganisms acquired outside the hospital setting, resulting in inflammation of the lung tissue. It is typically associated with fever and respiratory symptoms such as cough and tachypnoea, but symptoms may be non-specific in young children. Radiographic changes may be useful to confirm the diagnosis[4].

People with infectious pneumonia often have a productive cough, fever accompanied by shaking chills, shortness of breath, sharp or stabbing chest pain during deep breaths, and an increased rate of breathing. In elderly people, confusion may be the most prominent sign.[5]

The typical signs and symptoms in children under five are fever, cough, and fast or difficult breathing. Fever is not very specific, as it occurs in many other common illnesses and may be absent in those with severe disease, malnutrition or in the elderly. In addition, a cough is frequently absent in children less than 2 months old. More severe signs and symptoms in children may include blue-tinged skin, unwillingness to drink, convulsions, ongoing vomiting, extremes of temperature, or a decreased level of consciousness.[6,7]

The groups at highest risk of long term morbidity and mortality include infants (especially low birth weight or premature), those who are immune compromised, and those who have other underlying conditions such as malnutrition or congenital heart disease.

Early diagnosis of CAP is essential to reduce the total burden of the disease. CAP can be diagnosed by history and physical examinations and clinical findings. However, in a significant number of children, CAP remains a diagnostic challenge mainly because a number of viral respiratory diseases, which require a different therapeutic approach, as they mimic the clinical manifestations of CAP[8]. Despite pneumonia being a condition commonly encountered by clinicians, uncertainty remains over the diagnosis, investigation, and treatment of the condition.

We are performing this study to know the etiological agents causing Pneumonia in local population and to rationalize the use of antimicrobial agents as per aetiology.

Material And Methods

Study Design: Descriptive observational Study

Duration of Study: May 2018 to December 2019

Study Population: 2 months to 144 months

Study Place: Sir Padampat Mother and Child Health Institute, Jaipur (J.K. Lone Hospital)

Sample Size: Sample size calculated at 95% confidence level in alpha error of 0.05 assuming 82.2% specimens showing organisms under multiplex PCR and blood culture in children suffering from pneumonia as per the reference article.

At 8% absolute allowable error in the presence of multiple organisms the required sample size will be 92 cases which is rounded of to 100 children suffering from pneumonia.

Inclusion Criteria

- Children aged 2 months to 144 months coming with complaint of fever or cough or both as per

ARI Control Programme definition of community acquired pneumonia

- Children with rapid breathing* but no retractions- pneumonia
- Children with rapid breathing* and retractions- severe pneumonia
- Children with rapid breathing* and any other systemic signs like cyanosis, dullness, seizure -very severe pneumonia

Rapid breathing

>60 breath/min in <1 month of age

>50 breath/min in 2 months to 12 months of age

Exclusion Criteria

- Duration of illness should not be more than 7 days
- No prior admission within 1 month.
- Children with co-morbid conditions like cardiac disorders, pulmonary tuberculosis, immuno suppression, and any other chronic respiratory disease.
- Children with wheeze who received single dose of bronchodilator (salbuta mol 0.15 mg/kg by nebulization) whose symptoms recovered.

Procedures

Children were included as per inclusion criteria of the study and blood ,nasal aspirate samples were withdrawn with parental consent. X- ray chest were done for child included in the study with consent of parents.

The blood samples collected were sent for blood culture and antibiotic sensitivity testing and nasopharyngeal aspirate samples were sent for its culture and antibiotic sensitivity and RT-PCR for bacterial and virus isolation. All samples were taken with proper aseptic precautions.

Blood sample were collected with proper aseptic precautions. Venipuncture site were cleaned with spirit and povidone iodine for 2 minutes. 1-3 ml of blood was collected in culture bottles (brain heart infusion medium) to be incubated for 72 hours at 37degree Celsius.

The growth in culture were viewed after 72 hours and those showing bacterial growth were put for antibiotic sensitivity testing and if no growth were seen then those sets were sub-cultured for next 48 hours on Macconkey and blood agar culture plates and reviewed again, and if positive were placed for antibiotic sensitivity

>40 breath/min in 12 to 60 months of age

>30 breath/min in 60-144 months of age

Nasopharyngeal aspirate was taken by introducing disposable suction catheter into child nostril after keeping neck in semi extended position and by applying suction pressure if 70-80psi. The secretions were collected and the suction catheter was flushed with normal saline to make a final solution of 2 ml, of which 1 ml was sent for culture and 1 ml was sent for viral PCR in viral transport media.

Nasopharyngeal aspirate for bacterial culture were transported as such on room temperature and were then allowed to grow on MacConkey agar, blood agar and Thiogycollate medium and were viewed after 48 hours. If any growth were seen, then they were put down for antibiotic sensitivity and those who did not show any growth were sub cultured again for next 24 hours on above mentioned media. If after 72 hours of incubation any growth is present it is identified and then antibiotic sensitivity testing were done.

1 ml of separate nasopharyngeal sample taken for viral PCR was transported in viral transport media at room temperature within 2 hours of sample collection. The

media is stored at 2-8degree Celsius temperature and can be kept at room temperature only for 2 hours. The sample when sent to laboratory for viral isolation through PCR.

The automated EASYMAG machine was used for detection of virus by RT PCR method at microbiology lab, SMS Medical College, Jaipur.

All the samples were tested for following viruses: RSV, PIV-1, PIV-2, PIV-3, Influenza A and Influenza B by RT PCR method.

Observation And Results

In this study 100 cases of community acquired pneumonia were selected over a period of 19 months that attended Sir Padampat Mother and Child Hospital attached to SMS Medical College, Jaipur.

Table 1: Age according distribution of children with community acquired pneumonia.

Age (month)	No. of patients	Percentage
2-6	28	28.00
6-12	34	34.00
12-60	34	34.00
60- 44	4	4.00
Total	100	100.00

In this study, 28% were in 2-6 months age group, 34% in 6-12 months,34% in 12-60 months and 4 % in 60-144 months of age.

Table 2: Distribution of children with community acquired pneumonia according to gender

Gender	No. of patients	Percentage
Male	76	76.00
Female	24	24.00
Total	100	100.00

In this study out of 76 out of 100 children enrolled were male child, and 24 % were female children.

Table 3: Distribution of children with community acquired pneumonia as per immunization status

Immunization	No. of patients	Percentage
Completely	62	62.00
Partially	31	31.00
Not immunized	7	7.00
Total	100	100.00

Out of 100 children those who were enrolled 62% were completely immunized, 31% were partially immunized and 7% children were not immunized.

Table 4: Disease severity

Severity	No. of patients	Percentage
Pneumonia	65	65.00
Severe pneumonia	17	17.00
Very severe pneumonia	18	18.00
Total	100	100.00

18 out for 100 children with CAP had very severe pneumonia, 17 out of 100 had severe pneumonia, rest 65 children had pneumonia.

Table 5: Viral PCR

Nasopharyngeal aspirate PCR	No. of patients	Percentage
Influenza-A	3	27%
Influenza-B	6	54%
Parainfluenza-3	1	9%
RSV-A	1	9%
Total	11	100.0%

11 out of 100 PCR were positive, most common pathogen identified was influenza B 6 (54%). Followed by influenza A 3 (27%), respiratory syncytial virus 1 (9%), parainfluenza virus 1 (9%).

Table 6 : Aetiology of bacterial pneumonia

Blood Culture	No. of patients	Percentage
Acinetobacter species	3	15.00
Cons	3	15.00
E. coli	1	5.00
Enterobacter clocae	1	5.00
Klebsiella species	2	10.00
Pseudomonas aeroginosa	1	5.00
Staphylococcus aureus	7	35.00
Streptococcus pneumoniae	2	10.00
Total	20	100.00

Total 20 out of 100 blood cultures were positive of which maximum cultures were positive for staphylococcus aureus 7 (35%) followed by Acinetobacter species (15%), CONS (15%), Klebsiella (10%), Streptococcus pneumonia (10%), E. Coli (5%), Enterobacter cloacae (5%), pseudomonas (5%)

Discussion

CAP is a very common and stressing disease in pediatric population both for parents and pediatrician as there is no clear cut means of diagnosis of its aetiology. Various studies had been done to look for aetiology of CAP. This study was done to evaluate the aetiology of CAP in hospitalized children in local population. The above mentioned study was performed at J. K. Lone hospital, Department of Pediatrics, SMS group of hospital, a tertiary level hospital.

This study enrolled 100 children of which 76% were male and 24% were female. Most common age group affected was below 24 months which accounted for about 68%. Out of 100 cases enrolled 62 (62%) children were completely immunized and 31 (31 %) were partially immunized and 7 (7%) were not immunized. In our study 100% enrolled children had tachypnea, 80% children had fever and 72% children had cough and 41% had coryza as presenting complaint.

18% out of 100 children developed very severe, pneumonia, 17% had severe pneumonia and rest had pneumonia. Most common age group associated with the severe disease was among 2 months to 6 months of age (14%) followed by 6-12 months (3%). Severity was also more in unimmunized children 28% were under category of very severe pneumonia although disease presentation was variable in immunized children i.e.60% were under category of pneumonia, 16% in category of severe pneumonia and 24% were in category of very severe pneumonia. There was no mortality seen among enrolled children.

P Drummond et al (2000) studied 122 children and a pathogen was identified in 60%. 37% implicated viral infection with RSV virus in 65%. In 19% children bacterial pathogen were identified and 7% of which showed group a streptococcus, 4% streptococcus pneumoniae. One case of mixed infection was seen. Most common age group affected in this study was below 2 year. There was no correlation seen between chest x ray findings with pneumonia aetiology or severity.[7]

Our study showed 11% viral pathogen and 20% showed bacterial in blood culture and 36% in nasopharyngeal culture, most common viral

pathogen isolated was influenza B (54%).and most common bacterial pathogen identified in **our study** was staphylococcus aureus (35%) there were 2 cases of mixed infection. The most common age group affected was below 2 year of age.

Our study was in agreement with above study in relation to the age group of affected population but was discordant in relation to etiological agent. Their study showed S. pneumoniae to be most common bacterial pathogen and RSV as most common viral pathogen. And also the number of children showing viral isolation was more i.e.37% as opposed to 11% in our study.

D Gendrel et al (1997) studied 104 children amongst which potential pathogen were identified in 87 children. 29% children had viral infection and most common organism isolated was RSV (10 children) and 55% had bacterial infection. Of the bacterial infection most common organism isolated was mycoplasma (41%) followed by streptococcus pneumonia. Mixed pathogen was identified in 7% children.[8]

Conclusion

The viral pathogen most commonly identified among them was influenza B virus and bacterial pathogen isolated was staphylococcus aureus. The most common age group affected by community acquired pneumonia was below 5 years of age and disease severity was more in children below 2 year of age with male predominance.

Improvement in diagnostic facilities would go a long way in making an accurate etiological diagnosis of community acquired pneumonia and thereby will enable us to rationalize the use of antimicrobial agents and will curb the emergence of drug resistant bugs.

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