Original Article

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Bacteriological and Radiological Study of Severe Pneumonia in Children at Medical College Hospital & Head Quarter Hospital

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Abstract

Introduction: Acute respiratory infections (ARI) are one of the commonest causes of death in children in developing countries. It is responsible for an estimated 4 million deaths worldwide. Almost all ARI deaths in young children are due to acute lower respiratory tract infections (ALRTI), mostly pneumonia. *Methodology:* Children in the age group of one month to 5 years with clinical features of severe pneumonia as per WHO recommendations for the control ARI were included. A detailed examination of each child including anthropometry was carried out. During the general physical examination, emphasis was laid on assessing general condition of the child, respiratory rate (counted over 1 minute), presence of fever and other signs such as cyanosis and pallor. *Results:* In the present study, radiological findings were present in 80.66% of cases. Bacterial pneumonia was detected in 62.67%, viral pneumonia in 14%. Among bacterial pneumonia, consolidation was seen in 18%, alveolar infiltrate in 24.67% and complications of pneumonia in Complications include empyema, pleural effusion, collapse, and pneumothorax. Chest X –ray was normal in 8 cases. *Conclusion:* Routine hematological investigations and blood culture will not give much information regarding severity or etiology of illness.

Keywords: Acute Respiratory Infections; Pneumonia; Bacteriology.

Introduction

Infections of respiratory tract are perhaps the most common human ailment. While they are a source of discomfort, disability and loss of time for most adults, they are a substantial cause of morbidity and mortality in young children [1].

Acute respiratory infections (ARI) are one of the commonest causes of death in children in developing countries. It is responsible for an estimated 4 million deaths worldwide. Almost all ARI deaths in young children are due to acute lower respiratory tract infections (ALRTI), mostly pneumonia [2].

Modernization, industrialization and urbanization are now posed with the problem of increase in ARI morbidity and mortality. It is clear that future health of children depends on preventing, diagnosing, treating and limiting ALRTI. The utility of simple clinical signs like rapid breathing and chest in drawing to diagnose pneumonia in infants and young children has been well established. The use of these clinical signs in the early detection and treatment of children with pneumonia by primary health care workers forms the basis for the case management strategy formulated by the World health organization (WHO) to control mortality and morbidity [3].

Empirical antibiotic therapy for pneumonia is the commonly accepted practice world wide as the etiology of pneumonia in children is difficult to establish. Clinical and radiological criteria do not accurately reflect the etiology of childhood pneumonia [4].

ARI can be preventable. However socio environmental factors are acting as major obstacles in prevention of ARI. The epidemiological information regarding risk factors and management is scanty. A large gap exists in our knowledge about these factors, which needs to be fulfilled by systematic studies.

The present study is designed to clinically evaluate children with pneumonia, correlate it with radiological bacteriological finding, to identify the

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risk factors and to study the efficacy of various antibiotics that are used routinely in our sector.

Methodology

This was a prospective clinical study of severe pneumonia conducted on 150 children who were admitted to pediatric wards in medical college hospital.

Inclusion Criteria

Children in the age group of one month to 5 years with clinical features of severe pneumonia as per WHO recommendations for the control ARI were included.

Exclusion Criteria

Children with congenital anomalies of heart and lungs, anatomical defects like cleft lip and cleft palate, immunocompromised states like human immuno-deficiency virus infection (HIV) and infants less than one month of age were excluded from the study.

A detailed history of the relevant symptoms such as fever, cough, rapid breathing, refusal of feeds, wheezing etc was taken.

Based on WHO ARI criteria, children were considered tachypnoeic if respiratory rate (RR);

-RR > 60 in < 2 months

-RR > 50 in 2 months-1 yr.

-RR > 40 in 1 yr-5 yrs.

A detailed examination of each child including anthropometry was carried out. During the general physical examination, emphasis was laid on assessing general condition of the child, respiratory rate (counted over 1 minute), presence of fever and other signs such as cyanosis and pallor. Detailed systematic examination of the respiratory, cardiovascular and central nervous system was done. Any associated illness such as septicemia, meningitis and congestive cardiac failure if present was noted. Socio economic history regarding the type of house (Pucca or Kutcha), family size (overcrowding), sanitary facilities and fuel based for cooking (LPG or non LPG) were recorded. Socio economic status was classified according to modified Prasad's classification. Other pertinent information such as immunization status (Immunized, partially immunized or unimmunized), feeding practices and degree of malnutrition (IAP classification) were also recorded.

According to WHO ARI criteria, children were classified into 2 groups: severe pneumonia and very severe pneumonia. For analytic purpose, risk factors were studied amongst severe and very severe pneumonia. Regarding risk factors for mortality, children who died during the course of hospitalization served as cases, while those survived were taken as controls.

Following Investigations were carried out

- Routine Investigations like Hb, TC, DC, ESR was done in all cases.
- Chest X-ray was taken in all patients.
- Blood culture was done in relevant cases.

Based on radiological findings, children were divided into Bacterial (consolidations, alveolar infiltrates) and Viral (interstitial infiltrates, hyper aeration) pneumonias.

Follow up X-rays were taken in relevant cases with bacterial pneumonia, to look for radiological clearance after treatment.

All patients received antibiotics. Supportive care (IV fluids, oxygen, nebulization etc) was given as and when required. Antibiotics that were used:

1. First line antibiotics:-ampicillin with Gentamycin.
2. Second line antibiotics:- amoxicillin clavulunic acid with Amikacin.
3. Others:-Cloxacillin, ceftriaxone/cefotaxime

Majority of patients (except pneumonia with complications) received first line antibiotics. Those children who failed to respond to 1st line antibiotics within 48hrs, received second line antibiotics. cloxacillin was considered in case of empyema/ massive consolidation. Closed tube drainage was considered in cases of empyema. All children were evaluated during the hospital stay and the response to treatment was noted.

Results

Table 1: Distributions of cases according to sex

Sex	Number of cases	Percentage
Male	89	59.33
Females	61	40.67
Total	150	100%

In the present study, majority of cases (59.33%) were males. Male: female ratio was 1.45

Table 2: Clinical Diagnosis

Diagnosis	No.	Percentage
Bacterial pneumonia (%)	46	30.67
A] Lobar consolidation	37	24.67
B] Alveolar Infiltrates	11	7.33
C] Complications	27	18
Viral pneumonia	21	14
Normal	08	5.33

In the present study, majority of the cases were diagnosed as Bronchopneumonia(66.67%), Lobar pneumonia was diagnosed in 18.6% of cases and pneumonia and its complications in 9.3% of cases.

Table 3: Radiological findings

Diagnosis	No.	Percentage
Bronchopneumonia	100	66.66
Lobar pneumonia	28	18.6
Pneumonia and its complications	14	9.3
Post MeaslesBronchopneumonia	08	5.3

In the present study, radiological findings were present in 80.66% of cases. Bacterial pneumonia was detected in 62.67%, viral pneumonia in 14%. Among bacterial pneumonia, consolidation was seen in 18%, alveolar infiltrate in 24.67% and complications of pneumonia in Complications include empyema (8), pleural effusion (3), collapse (2), and pneumothorax (2). Chest X –ray was normal in 8 cases.

Table 4: Showing clinical data in comparison with radiological findings

Clinical data	No.	Radiological findings	
		Positive findings	Normal
Tachypnoea	150	121(80.8)	29(19.2)
Chest retractions	150	121(80.8)	29(19.2)
Crepitations only	37	28(76.9)	9(23.1)
Crepitations +ronchi	75	67(89.3)	8(10.7)
Ronchi only	02	1(50)	1(50)
Abnormal breath sounds	22	22(100)	78(100)

In the present study, tachynoea, chest retractions, crepitations alone and crepitations with ronchi correlated well with positive radiological findings.

Table 5: Laboratory findings in comparison with radiological findings

Findings	Total (150)	Bacterial	Viral	Sensitivity (%)	Specificity (%)	+ve predictive value (%)
WBC>1500/m^3	150	60	21	63.16	61.82	74.07
DC Neutrophilia	150	84	23	88.42	58.18	78.50
ESR >20mm/hr	150	93	18	97.89	67.27	83.78

In the present study, among bacterial pneumonias defined radiologically,63.15% had elevated WBC count 88.42% had neutrophilia 67.27% had elevated ESR. There was no correlation of laboratory findings with bacterial and viral pneumonia defined radiolagically (low sensitivity and specificity).

Table 6: Blood Culture

	Number
Culture sent	150
Not sent	00
No growth	107
Positive	14
Contaminated	29

In the present study, culture was positive in only of cases. S. pneumonia was the most common organism isolated (5 cases) followed by S. aureus (5 cases) and Klebsiella (4 case).

In the present study, all patients received

antibiotics and supportive care.

In the present study, antibiotics were given in all cases 95.33% Received first line antibiotics 16% received second line antibiotics 13.33%. Antibiotics were changed from first to second line in cases.

Antibiotics were added in 08 cases and oral antibiotics were used at discharge in 60.67% cases. Closed tube drainage was considered in cases of empyema (11 cases).

In the present study, majority received antibiotics for a period of 10-14 days. Mean duration of antibiotics was 14.08±2.2 days.

Table 7: Antibiotics:

Antibiotics	No.	Percentage
First line	143	95.33
Second line	24	16
Changed from 1st to 2nd	20	13.33
Antibiotics added	12	08
Oral antibiotics at discharge	91	60.67

Table 8: Duration of antibiotics

Duration (days)	1st line	2nd line
7	33	14
10	68	12
14	36	10
>14	13	6

Discussion

In our study Bronchopneumonia was the most common diagnosis made at admission (60.6%), Lobar pneumonia in 18.6%, pneumonia with complications in 9.3% and post measles Bronchopneumonia in 5.3% of cases. Complications of pneumonia includes empyema (5.3%), pleural effusion (2%), collapse (1.3%) and pneumothorax (1.3%).

In a study conducted by Reddaiah V.P et al [5], Bronchopneumonia was diagnosed in 64%, Lobar pneumonia in 6.4% and post measles bronchopneumonia in 4.0% of cases.

Although clinical symptoms and signs are helpful indicators of the presence of disease as well as etiology, radiographic investigation is often used to confirm a clinical diagnosis and to help sort out whether or not antibiotics or more extensive work up is necessary.

In our study Chest X-ray showed radiological changes consistent with pneumonia in 80.6% of cases. Evidence of bacterial infection was found in 78.0% and viral in 14.0% of cases.

In a study conducted by Virkki R et al [6], it was found that radiological changes were seen in 85%, with evidence of bacterial infection in 64% and viral in 36% of cases.

Macintyre C.R. et al [7] have also reported radiological confirmation in 85% of cases of pneumonia.

The reasons for higher incidence of radiologically detected bacterial pneumonia in our study may be due to high incidence of bacterial pneumonia in 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 60% of cases; 80% showed complete resolution after treatment and 20% partial resolution.

Heaton P et al [8], 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. They also concluded that in cases of uncompleted pneumonia, follow up chest radiography is not indicated if symptoms and signs are absent.

Clinical symptoms and signs can help the clinician determine the need for chest radiography.

In our study, we compared the clinical data with radiological findings and found that tachypnoea (80.8%), chest retractions (80.8%), crepitations (76.9%), crepitations with ronchi (89.3%) and abnormal breathe sounds (Bronchial breathing, diminished breath sounds) correlated well with positive radiological findings.

In a study conducted by Zukin DD et al [9], it was found that the sign with highest positive predictive value for the presence of any radiographic abnormalities was tachypnoea and chest examination findings such as crepitation and abnormal breath sounds comprised of a high-risk group, which

increased significantly the likelihood of pneumonia.

There is frequent disagreement between pneumonia diagnosed by clinical examination and that diagnosed by chest radiography. Radiographs appear to have greater impact on diagnosis and management when any inconsistencies arise.

Routine investigations like white blood cell count (WBC), differential count (DC) and erythrocyte sedimentation rate (ESR) may provide a clue in differentiating bacterial from viral pneumonia.

Our observation shows that WBC count, neutrophilia, lympocytosis and elevated ESR aided very little to differentiate bacterial from viral pneumonia (low sensitivity and specificity).

This was in comparison with studies done by Virkki R et al [6], Drummond P et al [10] and Wubbel L et al [11].

In recent years, the best information on the bacterial etiology of pneumonia in young children has been obtained through blood culture, despite the fact that the sensitivity of this method is somewhat lower.

In our study, blood culture was positive in 14 cases (9.33%). S pneumonia was the most common organism isolated (6 cases) followed by S.aureus.

Kabra SK et al [12] and Bahl R et al [13] have reported positive blood culture in 16% and 11% of patients respectively. The yield of blood culture varies from 5-15% for bacterial pathogens and cannot be relied upon. Because of very low positivity of blood culture, we could not correlate our clinical findings with etiological diagnosis.

Conclusion

Chest X-ray is valuable aid in the diagnosis of pneumonia in children. Follow up chest roentgenogram is vital for evaluating the response to treatment in pneumonia.

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