Clinical, Bacteriological and Radiological Study of Severe Pneumonia in Children at a Tertiary Care Centre

ABSTRACT

**Background** Pneumonia is the largest killer of children under 5 years, around the world. About four children die from pneumonia every minute. WHO definition of very severe pneumonia is a clinical diagnosis based on the presence of cough or difficulty in breathing plus at least one of the following: central cyanosis, refusal of feeds, convulsions, lethargy. The present study was done to know the risk factors, clinical, bacteriological and radiological features of severe pneumonia in children.

**Methods** This was a prospective study of severe pneumonia conducted in 150 children in the age group of 1 month to 5 years with clinical features of severe pneumonia. Detailed history and physical examination were done. Children were classified into severe and very severe pneumonia.

**Results** Study showed that 53% of children belonged to the age group of 1 month to 1 year. Fast breathing, cough and fever were the most common symptoms. Refusal of feed was present in 19% cases. Tachypnoea, chest retractions and crepitations were the most common signs. Diarrhoea (6.6%) and septicaemia (3.3%) were the associated illness; 83.3% had severe pneumonia, 16.7% had very severe pneumonia; 30% were malnourished and 66.6% were anemic.

**Conclusion** Pneumonia is one of the major causes of morbidity and mortality in children. Among risk factors studied previous history of similar illness, inappropriate immunization, anaemia, malnutrition, poor housing conditions were found significant. Chest X-ray is valuable aids in the diagnosis of pneumonia in children. Severity of pneumonia and malnutrition associated illness were important risk factors for mortality.

**KEYWORDS** pneumonia, WHO criteria, under five, malnutrition

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 (ARIs) 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 (ALRTIs), mostly pneumonia.2

Modernisation, industrialisation and urbanisation 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 have been well established. The use of these clinical signs in the early detection and treatment of children with pneumonia by primary healthcare 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 worldwide as the aetiology of pneumonia in children is difficult to establish. Clinical and radiological criteria do not accurately reflect the aetiology 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 risk factors and to study the efficacy of various antibiotics that are used routinely in our sector.

MATERIALS AND METHODS

This was a prospective clinical study of severe pneumonia conducted on 150 children who were admitted to pediatric wards and PICU in GSL Medical College Hospital, Rajahmundry, during August 2014 to August 2015. Epidemiological factors affecting the same were studied and bronchoscopy was done whenever it was needed.

**Inclusion criteria:** Children admitted to paediatric wards and PICU of GSL General Hospital with clinical features of severe pneumonia between the age group of 1 month and 5 years were included in the study.

**Exclusion criteria:** Children with congenital anomalies of heart and lungs, anatomical defects like cleft lip and cleft palate, immunocompromised states like human immunodeficiency virus infection (HIV) and infants less than 1 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. were taken.

General physical and systemic examination was carried out including any systemic illness. According to WHO ARI criteria, children were classified into two 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 hospitalization served as cases, those survived were taken as controls.

The investigations carried out were

- Hb, TC, DC, ESR
- Chest X-ray
- Blood culture in relevant cases

Depending on the radiological findings, bacterial (consolidations, alveolar infiltrates) and viral (interstitial infiltrates, hyper aeration) pneumonias were differentiated. Repeat X-rays were taken in cases with bacterial pneumonia, to look for radiological clearance after treatment.

Majority of patients received first line antibiotics - ampicillin and gentamycin. Children who does not respond to first-line antibiotics within 48 hrs, received second line antibiotics – amoxicillin clavulonic acid and amikacin. In case of empyema/massive consolidation, cefoxolin and ceftriaxone were used. Closed tube drainage was done in cases of empyema. Oxygen support, IV fluids, nebulization were given wherever needed. All children were observed during the hospital stay and the response to treatment was noted.

STATISTICAL ANALYSIS

Statistical analysis was carried out using proper statistical and analytical method. Significance for the statistical tests was pre determined at a probability value of 0.05 or less (p < 0.05).

RESULTS

In the present study, 150 cases of severe pneumonia were studied (Tables 1–3).

In the present study majority of cases (53%) were less than one year of age.

In the present study, mean duration of cough (6.5 ± 4.40), fever (5.67 ± 4.26), tachypnea (2.38 ± 1.40) and chest retractions (2.12 ± 1.14) during hospital stay.

According to WHO ARI programme, 83.33% had severe pneumonia and 16.67% had very severe pneumonia.

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 and post measles bronchopneumonia in 5.3% cases.

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%
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and complications of pneumonia include empyema (8), pleural effusion (3), collapse (2), and pneumothorax (2). Chest X-ray was normal in 8 cases (Fig. 1).

In the present study, culture was positive in only 149 out of 150 cases. Streptococcus pneumonia was the most common organism isolated (5 cases) followed by S. aureus (5 cases) and Klebsiella (4 cases).

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.

Antibiotics were added in 8 cases and oral antibiotics were used at discharge in 60.67% cases; 74% were completely immunized, 9% were unimmunized; 17% partial immunized.

Grade I, II PEM was present in 66% and Grade III, IV PEM was present in 30% of the patients were anemic. Majority (96.67%) lived in ill-ventilated house (kutcha) and of 56% of the house were crowded; 97.33% had poor sanitary facility (open air defecation).

In our study, case fatality rate was 6.3% (9 cases); 55.5% (5 cases) of deaths occurred within 24 hours of presentations to hospital. All 14 cases belonged very severe pneumonia class. According to WHO ARI programme Anemia was present in 6 (66.6%) and malnutrition (Grade III and IV) in 7 (77.7%) cases.

- Risk factors for very severe pneumonia were studied. It was found that incomplete immunisation, past history of similar illness, malnutrition grade III and IV, kutcha house and cooking fuel other than LPG (indoor pollution) were significant risk factor for very severe pneumonia.
- Mean duration of hospital stay was 7.7 ± 3.3 days. Mean duration of hospital stay in severe pneumonia was 8.9 ± 4.2 days.

CONCLUSION

- ARI, especially pneumonia is one of the major causes of morbidity and mortality in children. Bronchopneumonia is the predominant form of presentation in infants and preschool children.
- Among the risk factors studied, previous history of similar illness, inappropriate immunization for age, anemia, PEM grade 3 and 4, poor housing conditions and indoor air pollution (use of cooking fuel other than LPG) were found significant for severe pneumonia.
- Symptoms and signs mentioned in the WHO ARI control programme were very sensitive and can be applied to hospitalised children.
- Routine haematological investigations and blood culture will not give much information regarding severity or etiology of illness.
- 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.
- Severity of pneumonia (very severe), PEM grade 3 and 4, and associated illness (septicemia) were the important risk factors for mortality.
- Ampicillin and Gentamicin are still the antibiotics of choice in pneumonia.

Indiscriminate use of higher antibiotics is not justified, in view of emergence of drug resistant organisms.

REFERENCES