

Association of Chest Radiograph with Community Acquired Pneumonia among the Children Admitted in Dhaka Shishu Hospital

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Abstract

Background: Community-acquired pneumonia (CAP) is an infectious disease and common reason for hospitalization of children throughout the world. There are few published data about radiological findings and their relationship with community-acquired pneumonia (CAP) severity. **Objective:** This study was conducted to evaluate radiological findings in children with community acquired pneumonia (CAP) of different severity. **Materials and method:** A prospective study was conducted in the department of Paediatric Respiratory Medicine (Pulmonology) in Dhaka Shishu Hospital from November 2016 and April 2017. A total number of 35 children of 1 month to 10 years, who were admitted with cough or respiratory difficulty and radiological pneumonia were included in this study. **Results:** Majority of the study participants 18 (51.43%) were infants with a male preponderance. The most common symptom was cough (94.29%) followed by fever (82.86%) and respiratory distress (42.86%). Crepitation (54.29%), tachypnoea (42.86%) and chest indrawing (28.57%) were the most common signs. Out of total 35 children 17 (48.57%) cases had pneumonia and 18 (51.43%) cases had severe pneumonia. Among chest X-rays, severe pneumonia had greatest frequency of primary end point consolidation (PEP) on right side (n=10, 55.55%), right infiltrates (n=5, 27.78%), bilateral infiltrates (n=2, 11.11%) followed by right sided pleural effusion (n=3, 16.67%) and pneumothorax (n=2, 11.11%). There was no association found between CAP severity and presence of radiological findings of pneumonia. **Conclusion:** This study shows that severe CAP may not always be associated with positive radiological findings. This finding may be taken into consideration during the diagnosis and management of CAP.

Keywords: Community-acquired pneumonia (CAP); tachypnea; primary end point consolidation (PEP); infiltrate.

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Introduction

Community acquired pneumonia (CAP) is defined clinically as presence of signs and symptoms of pneumonia in a previously healthy child due to an infection which has been acquired outside hospital.¹ Annually, approximately 120-156 million cases of acute lower respiratory infections (ALRI) occur globally, with approximately 1.4 million resulting in death.²⁻⁵ Of these, pneumonia kills an estimated 1 million children under the age of 5 every year and accounts for 15% of deaths in children <5 year of age,⁶ with 90-95% of these deaths occurring in the developing world.⁷

The majority of pneumonia episodes in children <5 year of age occurs in just 15 countries, with South Asia and Sub-Saharan Africa collectively enduring the largest burden of more than half the worldwide total cases of pneumonia in children.^{2,8} But early diagnosis and intervention can effectively reduce mortality. In order to make a definite diagnosis of clinical pneumonia one might need invasive procedure, which makes more difficulties in identifying the causative organisms.⁹ Therefore, chest X-ray can give useful information about the presence of pneumonia.¹⁰ But appropriateness of performing chest radiography in children with CAP is still on debate and the actual guidelines recommend for verification of complications in patients with severe CAP.^{11,12}

Therefore, the present study was designed to evaluate radiological findings in children with community acquired pneumonia (CAP) of different severity.

Materials and method

A prospective clinical study was conducted in the department of Paediatric Respiratory Medicine (Pulmonology) in Dhaka Shishu Hospital, Dhaka, Bangladesh, over a period of 6 months (November 2016 and April 2017). A total number of 35

children of both sexes in the age group of 1 month to 10 years, admitted with community acquired pneumonia (CAP) were included in this study. They presented with cough and respiratory distress and radiological pneumonia. Children with congenital anomalies of heart and lungs, anatomical defects like cleft lip and palate, immune deficiency, known case of asthma were excluded. Written informed consent was obtained from all guardians of the patients. A detailed history of the relevant symptoms such as fever, cough, rapid breathing, wheezing, etc. was taken. A detailed general examination of each child including anthropometry was carried out. Detailed systematic examination was done. Any associated illness such as diarrhoea, congestive cardiac failure if present was noted. Socio economic history, immunization status were also recorded and all the data were collected in structured questionnaire. Investigations included chest X-ray, CBC and blood culture. Pneumonia was defined radiologically as the presence of end-point consolidation or other (non-end-point) infiltrate in lungs according to the WHO radiological classification of pneumonia¹³ and the finding was confirmed independently by a radiologist and a paediatrician. Categorical variables are given as numbers and percentages and were analyzed using cross table analysis with the Pearson chi-square test. All data were entered into SPSS for Windows (version 21.0; SPSS Inc, Chicago, IL).

Results

Among the total of 35 paediatric patients diagnosed with community acquired pneumonia (CAP) majority (51.43%) were infants. There was a male preponderance. Male were 65.71% and female were 34.29% (Table I).

Table I: Gender and age distribution of children in the study (N=35)

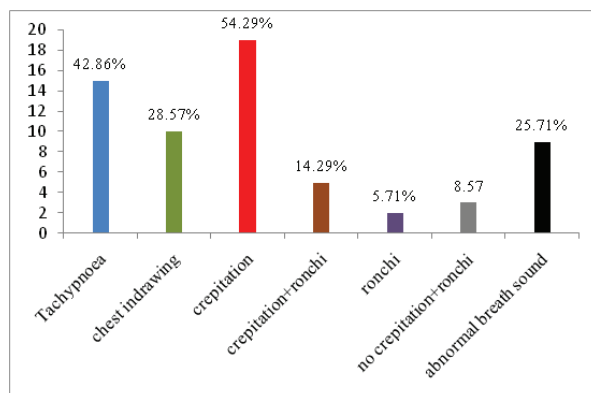
Characteristic	Number of children	Percentage
Gender		
Male	23	65.71
Female	12	34.29
Age (in years)		
<1	18	51.43
1-2	07	20.00
3-5	03	08.57
>5	07	20.00

The most common symptom was cough in 33 patients (94.29%) followed by fever in 29 patients (82.86%) and respiratory distress in 15 patients (42.86%) (Table II).

Table II: Presenting symptoms of children in the study (N=35)

Symptoms	Number of cases	Percentage
Cough	33	94.29
Fever	29	82.86
Respiratory distress	15	42.86
Chest pain	01	02.86
Abdominal pain	01	02.86

Crepitation (54.29%), tachypnoea (42.86%) and chest indrawing (28.57%) were the most common signs. (Fig 1)

**Fig 1: Clinical presentation in the studied children**

Out of total 35 children 17 (48.57%) cases had community acquired pneumonia and 18 (51.43%) cases had severe community acquired pneumonia. Chest X-rays revealed that severe pneumonia had greatest frequency of primary end point

consolidation on right side (n=10, 55.55%), right infiltrates (n=5, 27.78%), bilateral infiltrates (n=2, 11.11%) followed by right sided pleural effusion (n=3, 16.67%) and pneumothorax (n=2, 11.11%). There was no significant radiological association with severity of pneumonia. (Table III)

Table III: Radiological association with severity of pneumonia

Chest X-ray findings	Pneumonia Frequency (%)	Severe Pneumonia Frequency (%)	p value
Primary end point consolidation			
Right	03(17.65)	10(55.55)	0.131
Left	03(17.65)	02(11.11)	
Bilateral	03(17.65)	01(5.55)	
Other infiltrates			
Right	09(52.94)	05(27.78)	0.274
Left	0	0	
Bilateral	02(11.76)	02(11.11)	
Pleural effusion			
Right	01(5.88)		0.222
Left	02(11.76)		
Pneumothorax			
Right	0	02	0.257
Left	0	0	

Discussion

In our study a total of 35 paediatric patients diagnosed with community acquired pneumonia (CAP) were included. Male predominance was seen. Male were 65.71% and female were 34.29%. A study conducted by Arpitha et al. showed a male preponderance with a sex ratio of 1.05:1.¹⁴ The most common age group affected was <1 year which was similar to results found in other studies.¹⁵⁻¹⁷ Cough was the predominant symptom found in 94.29% of patients, followed by fever (82.86%), respiratory distress (42.86%) and others. The incidence of presenting symptoms in our study is comparable with studies conducted by Kabra et al. and Kumar et al.^{18,19} In our study crepitation (54.29%), tachypnea (42.86%) and chest indrawing (28.57%) were the most common signs. Some other studies observed that tachypnoea and chest retractions were highly specific signs in detecting pneumonia.^{20,21} Reddaiah et al. reported that crepitation were found in 76% and rhonchi

in 23.2% of patients of pneumonia which was similar to our study.²²

The radiographic appearance of pneumonia varies with age and with pathogenesis and extent of the disease.²³ The present study showed that out of total 35 children 17 (48.57%) cases had community acquired pneumonia (CAP) and 18 (51.43%) cases had severe community acquired pneumonia (severe CAP) and showed a significant association of primary end point consolidation (55.55%), other infiltrates (27.78%) and bilateral infiltrates (11.11%) with severe pneumonia. Primary end point consolidations were more prevalent in the right than the left lung. Pleural effusion (n=3, 16.67%) and pneumothorax (n=2, 11.11%) was also more in right side. However, our findings are more or less similar to the Spanish and Sudanian studies where chest X-ray proved pneumonia in 62.1% of cases.^{9,24} But a recent Indian study showed a significant association of bilateral infiltrates with severe pneumonia than Primary end point consolidation and other infiltrates.²⁵ Patria et al. showed that parenchymal infiltrates and consolidation were more prevalent in the right than the left lung.²⁶

We did not find any association between CAP severity and presences of radiological findings of pneumonia. No data are available on the association between severe bacterial CAP and radiographic findings. However, Patria et al. found a significant association between severity and right hilar involvement in her study.²⁶

The limitations of our study include the lack of etiological data and other laboratory biomarkers. The number of sample size was small in relation to huge number of population. Long term outcome of the patients were not also assessed.

This study shows that severe CAP may not always be associated with positive radiological findings. This finding may be taken into consideration during the diagnosis and management of CAP and chest X-ray is not recommended for routine use in the diagnosis and management of CAP.

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