



## Severity of Pneumonia and Chest X- Ray Findings in Children Aged 2 Months to 5 Years...A Correlation

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### ABSTRACT

Worldwide 16% of death in children under the age 5 years is only due to pneumonia every year. X- ray chest is simple tool to diagnose the pneumonia especially in developing country like in India. This study was done to know the incidence of radiologically proven pneumonia and to see the correlation between x ray findings and clinical severity of pneumonia, so as to predict the severity of pneumonia on the basis of x ray chest done on first day of hospitalization. Interstitial pneumonia is more common in younger children and lobar pneumonia in older, but in severe and very severe pneumonia cases most common radiological pneumonia was bronchopneumonia in both younger and older children, which was statistically significant. Right side pneumonia is more common than left & most common lobe affected was upper lobe. 54% of patients had radiologically proven pneumonia while 46% were normal x ray findings. More likely if taken within 3 days of onset of symptoms. So the basis to start treatment should be on the clinical background and clinical severity, rather than X-ray chest. Late x-ray films give more chance of positive findings and multilobar infiltration or diffuse heterogeneous opacity in lungs positively correlated with clinical severity and gives idea about course and duration of hospitalization.

### KEYWORDS

severe pneumonia, interstitial, bronchopneumonia, chest Xray

### Introduction

The WHO defines pneumonia as an acute disease episode with cough combined with fast breathing with age specific cut-values for increased respiratory rate. Pneumonia can be classified according to the part of lung affected:

**Lobar pneumonia** -Consolidation confined to segmental boundaries.

**Bronchopneumonia**- widespread or ill-defined consolidation.

**Interstitial pneumonia**- ongoing and progressive process with variable distribution of interstitial change within the lung.

Common symptoms include cough, fever, chills, loss of appetite and wheezing, stuffy nose. Children with severe pneumonia may experience respiratory distress characterized by tachypnea, chest indrawing, grunting, flaring of nose, cyanosis, and respiratory fatigue. Sometimes convulsions, unconsciousness and hypothermia.

Physical examination includes general appearance, respiratory rate, work of the breathing, & chest auscultation. Child's appearance, consciousness, ability to breastfeed or drink, ability to sustain sucking, vocalization, smiling, color and consolability may provide important leads to presence and severity of a bacterial illness. Confirmatory chest radiography is important as two main patterns of pneumonia are recognized; **interstitial** and **alveolar**. Viral infections are associated with diffuse interstitial infiltrates, hyperinflation, alveolar infiltrates and peribronchial thickening while bacterial pneumonia is associated with lobar infiltrates, alveolar infiltrates and pulmonary abscesses.

### AIMS AND OBJECTIVES

- To find the incidence of radiological changes in case of pneumonia in children.
- To correlate the severity of pneumonia in children with chest X-ray Findings.

### MATERIAL AND METHODS

**Study design:** it was a Prospective study to correlate severity of pneumonia with chest X ray findings in children 2 months to 5 years of age who attended department of pediatrics, Govt. Medical College Kota from 1st April 2015 to 31 December 2015. A detailed history of symptoms as fever, cough, rapid breathing, refusal to feeds, wheezing etc. was taken & collected in semi structured Performa. Chest x ray was taken for every case on first contact and reported by Radiologist in department of radiology. Finding of x ray have been correlated with patient's clinical findings. Total 150 cases of all type of pneumonia were studied from IPD & OPD. Children with known chronic disease, Immunocompromised patient & Infant less than 2 months were excluded from study. The WHO ARI criteria were applied & children were considered to have fast breathing if - RR 60 or more than 60 in < 2 months [0 to 59 days]

- RR 50 or more than 50 in 2 months – 1 yr. [60-364 days]
- RR 40 or more than 40 in 1 yr – 5 yrs.[365 days to 5 years]

### OBSERVATIONS :

A total of 150 patients were enrolled(89 males & 61 females) & divided in 2 groups, 2 months to 1 year(41) and 1 year to 5 year(109), as etiology of pneumonia, radiological change and severity is different in both age groups.

Percentage of sev pneumonia (34.14%) in infant & very sev pneumonia (26.82%) was significantly higher in infants <1 yr.

Most common symptom was fast breathing (100%) followed by cough (96%), fever(92%) and nasal flaring(82%). Chest indrawing 37.33%, Refusal to feed 14.66%, & peripheral Cyanosis was seen in 19%.

Crepitation was most common finding in all types of pneumonia(77>3%). 72.09 % in patient of pneumonia, 84.21% in severe pneumonia and 84.61 % in very severe pneumonia.

Next common finding is wheeze and crepitation both found in 19 patients (12.66%). Isolated wheezing was seen in 6.7% pneumonia cases, 5.26% of severe pneumonia cases and 3.86% of very severe pneumonia cases. Neither crepitation nor wheeze is associated with severity of pneumonia.

Most significant finding is decreased air entry in lungs on single or both sides as seen in 42.10% cases of severe pneumonia and in 69.2% of very severe pneumonia cases. As the severity of disease increases air entry in lungs significantly decreased.

A total of 81 cases had radiological findings of pneumonia, most commonly Lobar pneumonia 29(35.80%), f/b Bronchopneumonia 26(32%) and Interstitial pneumonia 22(27.16%) Empyema with consolidation was seen in 4 cases. Most common radiological finding in infants with pneumonia was interstitial infiltration 31.70%, followed by bronchopneumonia 26.82%, lobar pneumonia in 12.19% of patients. Very severe pneumonia in this group manifested predominantly as bronchopneumonia, (54.54 %). In the age group of 1-5 yrs, lobar pneumonia in 24(22.01%), interstitial in 9(8.25%), Bronchopneumonia 15(13.76%), Pneumonia with empyema (2.75%) & Normal x ray finding in 53.21%. In severe pneumonia, bronchopneumonia was most common (33.33%), which is multilobar infiltration or heterogeneous opacities in one or both lung field, then is lobar pneumonia 25%. study showed that interstitial pneumonia (31.70%) is more common in younger age group, and lobar pneumonia is more common in older age group (29.66%) compare to infants (12.19%). Right lung involvement (58.13%), was more common, f/b bilateral (25.58%), and least common in left side 16.66%. Most commonly Right upper lung (52%) is involved then right lower lung (24%), right middle lung (16%) and more than one lobe (8%).

In left sided pneumonia most common lobe involvement is left lower lobe (64.2%) . normal xray was frequently associated with early presentation of patient within 3 days(82.35%) while 41% patients had radiological changes when presented at > 7 days of symptoms. So later x ray films have more chances of radiologically proven pneumonia.

Routine care was given to 97 (64.66%), O2 inhalation given in 35 patients of which 34.28% had Bronchopneumonia, 22.85% lobar pneumonia, 17.14% had interstitial pneumonia and 20% of patient had a normal x ray.

14 required intensive care support. Bronchopneumonia (multiple heterogeneous opacity in multiple lobe of lungs) are more severe type of pneumonia which is also matching severe and very severe pneumonia category class as given by WHO & also required more higher level of care like O2 inhalation, intensive care and ventilator support.

Interstitial infiltrates was also associated with increased severity at presentation but similar length of stay and duration of O2 requirement compared with single lobar disease.

**Discussion**

Severe and very severe pneumonia is more common in infants as they are not so immunocompetent as older child. Of 150 patients, 54% patient had radiologically proved pneumonia & 46% had normal x ray so each pneumonia case does not necessarily have an abnormal x-ray. most common finding on auscultation was crepitation, but presence of crepitation does not correlate with severity of pneumonia. Decreased air entry on auscultation has a positive association with severity of pneumonia. Right side lung involved more than left side because right bronchus is more wider and shorter than left bronchus and chance of aspiration and invasion of bacteria is more in right. Patients presenting after 7 days of symptoms also have more radiologically pneumonia because as duration of disease increases change in lung parenchyma will be more which will be reflected in x-ray films. Similarly patient stayed more than 7 days in hospital had clinically as well as radiologically severe pneumonia.

Most common radiological pneumonia in infant is interstitial pneumonia, and in older child lobar pneumonia as in infancy common organisms are that cause interstitial pattern like parahilar infiltration, multiple linear infiltration, peribronchial thickening. In older child more common cause organism of pneumonia is bacterial, and among the bacteria, streptococcus pneumoniae and H.influenzae are common. But most common radiological findings in severe and very severe pneumonia is Bronchopneumonia (multiple heterogeneous opacity in multiple lobes of lungs), f/b multilobar pneumonia

Because diffuse involvement of lungs by multiple heterogeneous opacity or multiple lobar pneumonia, more affect the gas exchange and produce clinical severe pneumonia. Bronchopneumonia also requires higher level of care like O2 inhalation, ICU & Ventilatory support in comparison to other pneumonia and duration of hospitalization is also more in these patient. Malnutrition is also associated with more severe pneumonia and in chest x-ray findings these patient also having more change radiologically

**Recommendations:-**

Severity of pneumonia is based on by clinical presentation of patient & physical examination hence should be treated accordingly. Normal x- ray findings does not means that patient having no pneumonia, so initial treatment should be started on the basis of clinical findings. Treatment should not be delayed in waiting of chest x ray films.

Level of care like should be decided by clinical presentation & physical examination, like difficulty in respiration and cyanosis or fall in spo2 & not be based solely on x ray film especially if taken within 3 days of onset of symptoms.

Radiological changes in X ray films depends on age of patient, organism for pneumonia & on underlying disease or immunodeficiency or malnutrition associated with pneumonia. So while treating the pneumonia all these condition should be kept in mind.

X-ray chest may give supportive evidence and it may give also idea about possible aetiology like viral pneumonia having interstitial infiltration and hyperinflation of chest, more chances of spontaneous resolution unless get infected by secondary bacterial infection.

Most common radiological findings in severe and very severe pneumonia are Bronchopneumonia and common cause of Bronchopneumonia are staphylococcus, Klebsiella so whenever treating severe and very severe pneumonia with Bronchopneumonia these organism should be covered on priority. These patients may also required O2 inhalation or ICU care or may also required ventilator support, so prompt treatment and appropriate antibiotic can prevent complication and mortality.

Immunization should be completed in each and every child by increasing the awareness in community.

**Distribution of patients according to severity of pneumonia**

**Table 1**

Age of patient	pneumonia	Sev pneumo- nia	Very sev pneumonia	Total
2month- 12month	16(39.02%)	14(34.14%)	11(26.82%)	41(27.33%)
1-5 yrs	70(64.22%)	24(22.01%)	15(13.76%)	109(72.66%)
Total	86	38	26	150

P= 0.018556, p<0.05, significant

Auscultatory findings in relation to severity of pneumonia

**Table no 2**

Type of	Pneumonia	Severe	Very severe	Total
No findings	09(10.4%)	2(5.26%)	0(0.00%)	11
Crepitation	62(72.09%)	32(84.21%)	22(84.61%)	126
Wheeze	6(6.7%)	2(5.26%)	1(3.86%)	9
Wheeze & Crepitation	12(13.95%)	4(10.52%)	3(11.53%)	19
p-value -0.61245				

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**Severity of pneumonia and x ray findings.**

**Table no.3**

X ray findings	Pneumonia	Severe pneumonia	Very severe. Pneumonia	Total
Lobar pneumonia	16(10.66%)	8(5.33%)	5(3.3%)	29(19.33%)
Bronchopneumonia	2(1.33%)	12(8%)	12(8%)	26( 17.3% )
Interstitial Pneumonia	10(6.66%)	9(6%)	3(2%)	22(14.66%)
Pneumonia with Effusion	0(0%)	1(0.66%)	3(2%)	4(2.66%)
Normal x rays	58(38.66%)	8(5.33%)	3( 2% )	69(46%)
Total	86(57.33%)	38(25.33%)	26(17.33% )	150
P=2.35126E-10, p<0.05 significant				

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