

# Role of X ray chest in Paediatric intensive care unit (PICU): Is it a good predictor of outcome ?

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## Abstract

**Introduction:** ICU patients are prone to several cardiopulmonary disorders which when superimposed on the underlying pathology that prompted admission create a complex radiological appearance, which may be difficult to interpret on the basis of imaging findings alone. Our objective is to assess whether radiographic findings predict outcomes among children hospitalized with pneumonia. **Material and Methods:** A retrospective study of 127 cases was carried out in the Department of Radio Diagnosis, who were referred for a Chest radiograph evaluation from PICU. Patients with complaint suggestive of acute cardiopulmonary and systemic illness on the basis of clinical/laboratory/ultrasonography findings / who were referred for a radiographs evaluation of the cardiopulmonary. Several measures of disease severity were assessed. The severity of the illness was evaluated and the outcome parameters was calculated using the chi square test. **Results:** There were 127 patients of less than 12 years taken in study in which 74 were males and 53 were females, in which 27% were of cardiac illness, 46% of respiratory illness, 13% of CNS, 9% routine X ray and 5% of others. radiological findings in cardiac patient shows that maximum 91.11% of patents have cardiomegaly followed by consolidation , effusion and minimum number have normal findings and in respiratory cases, maximum patients shows consolidation (71.11%) followed by increased vascular markings(54.33%), infiltrate (23.72%), effusion16.9%), normal (0.084%) and cardiomegaly (0.05%). **Conclusion:** Admission radiographic findings are associated with important hospital outcomes and care processes and may help to predict disease severity. Chest radiograph adds on for evaluation of available, appropriate diagnostic and therapeutic interventions in critically patients in PICU.

Keywords: Chest radiography, Pneumonia, Cardiac illness, PICU

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## Introduction

Chest radiographs (CXR) are common investigation in any of patient with respiratory complain in Intensive care unit [1, 2]. Radiological evaluation is invariably at the forefront when a clinician encounters a child with suspected pneumonia in the hospital. Most of the radiological studies in pneumonia have focused on epidemiologic, diagnostic and etiological perspectives. The evaluation of clinical outcome measures (time to defervescence of fever and tachypnea) has been infrequently taken into account vis-à-vis underlying type of radiological abnormalities [3,4].

X ray is having critical role and implications in various conditions. This includes Inter-costal drainage tube insertion before and after, Central venous catheterization, endotracheal intubation. various cardiac and lungs

surgery. [5-12]. Some of these studies have discussed role of routine X ray in the patients admitted in ICU. They have also discussed role of xray in Patients on mechanical ventilator [13-16].

There are fewer evidences regarding efficacy and therapeutic value of these routine x ray done in ICU settings [17,18,19].

Arguments for adopting a restrictive approach include variable interpretation of CXRs depending on clinician and patient factors, low incidence of clinically unsuspected abnormalities, potential harm arising from unnecessary treatment of minor or false positive findings, cost, radiation exposure and adverse events arising from repositioning of the patient to obtain the CXR [20,21].

## Material and Methods

This study was conducted in the Department of Radiodiagnosis & Paediatrics of tertiary care teaching hospital. The study comprised of 127 patients with a systemic illness in PICU who were referred for a chest radiograph evaluation.

**Study Design:** retrospective study

**Inclusion Criteria:** Patients of age less than 12 years, with clinically suspected systemic illness who admitted in PICU of our hospital.

**Exclusion Criteria:** Patients more than 12 years and outside of our hospital.

**Collection of data:** The study was a retrospective analysis of chest radiographs of patients who were admitted at our institution with a diagnosis of Acute systemic illness. The protocol was approved by the institute ethics committee. We included patients with complaint suggestive of acute cardiopulmonary and systemic illness on the basis of clinical/ laboratory/ ultrasonography findings / who were referred for a radiographs evaluation of the cardiopulmonary. Several measures of disease severity were assessed. Dichotomous outcomes included supplemental oxygen use, need for intensive care unit (ICU) admission, and need for invasive mechanical ventilation. Continuous outcomes included

hospital length of stay and, for those requiring supplemental oxygen, duration of oxygen supplementation, measured in hours. To categorize infiltrate patterns and the presence and size of radiopacity, we reviewed the final report from admission chest radiographs to obtain the final clinical interpretation performed by the attending pediatric radiologist. Infiltrate patterns were classified as single lobar (reference), unilateral multilobar, bilateral multilobar, or interstitial. Children with both lobar and interstitial infiltrates, and those with mention of atelectasis, were classified according to the type of lobar infiltrate.

**Statistical Analysis-** Descriptive statistics were summarized using frequencies and percentages for categorical variables and median and interquartile range (IQR) values for continuous variables. Associations between radiographic findings and disease outcomes were analysed using logistic and linear regression for dichotomous and continuous variables, respectively. A p value of < 0.05 was considered statistically significant.

**Statistical Software-** Data analysis was done using SPSS version 16.0 Data transformation by recoding, counting and cross tabulation was performed and obtained information was processed using Pearson chi-square and Fisher's-exact test.

## Results

**Table No.-1: Patient distribution in study**

Age	Male	Female	Total
0-1	20	14	34
2-5	41	28	69
6-12	13	11	24
<b>Total</b>	<b>74</b>	<b>53</b>	<b>127</b>

As shown in above table there were 74 males and 53 females in our study.

**Table No-2: Indication for chest x ray**

Systemic involvement	No. of patient	Percentage
Cardiac	34	27
Respiratory	59	46
CNS	16	13
Routine x ray	12	9
Others	06	05

The above table shows the maximum 46 % cases were of respiratory followed by cardiac 27% cases then 13% cases were of CNS, 9% came for routine chest x ray and 5% due to others.

**Table No-3: Radiological findings in cardiac patients**

Findings	No. of patients	Percentage
Cardiomegaly	31	91.11%
Consolidation	07	20.58%
Effusion	07	20.58%
Infiltrate	12	35.29%
Increase vascular markings	16	47.05%
Normal findings	06	17.64%

The above table shows of radiological findings in cardiac patient shows that maximum 91.11% of patents have cardiomegaly followed by consolidation, effusion and minimum number have normal findings.

**Table No-4: Radiological findings in respiratory illness**

Findings	No. of patients	Percentage
Consolidation	42	71.11%
Effusion	10	16.9%
Infiltrate	14	23.72%
Increased vascular markings	32	54.23%
Normal	05	0.084%
Cardiomegaly	03	0.05%

Above table shows that maximum patients shows consolidation (71.11%) followed by increased vascular markings (54.33%), infiltrate (23.72%), effusion 16.9%, normal (0.084%) and cardiomegaly (0.05%).

**Table No.-5: Association between radiological findings and outcome.**

Radiological findings	Survive	Expired	P- value
Cardiomegaly	29	5	S
Infiltrate	30	2	NS
Consolidation	47	4	NS
Effusion	16	01	NS
Increased vascular markings	46	04	NS
Normal	12	0	NS

S- significant, NS- not significant.

The above table shows that the highest survival with cardiomegaly findings which is highly significant with p value less than 0.05

## Discussion

This study quantifies the diagnostic performance of radiographic findings in the diagnosis of acute CHF and respiratory illness in consecutive patients presenting with acute dyspnoea to the emergency department. Acute systemic illness requires active treatment and therefore accurate diagnosis. Overall, radiographic signs were specific but only moderately sensitive in the diagnosis of CHF. This finding has important implications for clinical practice. The chest radiographs were taken using either digital or computed radiography, via an anteroposterior projection with the child lying. The symptoms typically occurred at 3–8 days before the chest radiographs [22].

Wan-liang Guo et al [23] found that, There were 71 (56%) male and 55 (44%) female CAP cases with lobar or multi foci infiltration. Similar to our study. They found 70 pneumonia cases were caused by *Mycoplasma pneumoniae* and 18 by viruses. Univariate analysis of the mycoplasma and viral causes of the CAP revealed that increased respiratory rate, wheeze, male gender and lymphocyte percentage were the factors associated with the differentiation of mycoplasma and viral aetiologies of pneumonia ( $p < 0.05$ ). N Mueller-Lenke et al [24] found that In 107 of 202 patients CHF was found to be the cause of acute dyspnoea. Patients with CHF were older and more

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often had coronary artery disease and arterial hypertension. Most likely due to their significantly higher age, CHF patients more often required chest radiography to be performed in the supine position (36% v 22%,  $p = 0.066$ ). Overall, radiographic CHF signs were specific but only moderately sensitive in the diagnosis of CHF.

Cardiomegaly was the only radiographic finding with a sensitivity > 50%. However, specificity (71%) was lower than that for cephalisation (93%), hilar haziness (94%), Kerley B lines (96%), interstitial oedema (93%), and alveolar oedema (99%). In our study we found radiological findings in cardiac patient shows that maximum 91.11% of patents have cardiomegaly followed by consolidation, effusion and minimum number have normal findings.

Al aseri Z et al [25] found that Chest radiographs are one of the most complex imaging modalities to interpret. They assess how accurately emergency physicians interpreted chest radiographs in relation to radiologist reports. Radiological descriptions of chest radiographs from 667 emergency department (ED) patients, aged 14 to 84 years, were retrospectively reviewed.

The overall level of agreement and agreement for different categories (congestive heart failure, pneumonia, and other) were assessed in 312 cases for which reports were available.

Hannington Ssemmanda, et al [26] did a cross-sectional study in Mulago Hospital ICU and 87 patients for mechanical ventilation were recruited with mortality as the outcome of interest. Chest X-ray results were the main independent variable and MEWS was also gotten for all patients.

They recruited 87 patients; most were males (60.92%), aged between 16 and 45 years (59.77%), and most admissions for mechanical ventilation were from the Trauma Unit (30.77%). Forty-one (47.13%) of the 87 patients died and of these 34 (53.13%) had an abnormal CXR with an insignificant IRR = 1.75 (0.90–3.38) ( $p = 0.062$ ). In our study radiological findings association with outcome was the highest survival with cardiomegaly findings which is highly significant with  $p$  value less than 0.05.

Maria Francesca Patria et al [27] studied the comparison with the children with mild/moderate CAP, in severe CAP there was a significantly greater frequency of a bilateral multifocal distribution ( $p = 0.01$ ), the simultaneous involvement of  $\geq 3$  sites ( $p = 0.007$ ), and the involvement of the right hilum ( $p = 0.02$ ). The same results were confirmed in the multiple logistic regression model. In our study

shows that maximum patients shows consolidation (71.11%) followed by increased vascular markings (54.33%), infiltrate (23.72%), effusion 16.9%, normal (0.084%) and cardiomegaly (0.05%).

## Conclusion

Predominant radiological findings in respiratory illness is consolidation (71.11%) followed by increased vascular markings and In cardiac illness 91.11% of patents have cardiomegaly followed by consolidation, effusion and minimum number have normal findings.

Association between radiological findings and outcome shows that the highest survival with cardiomegaly findings which is highly significant but future studies are needed with large study group to finds association with outcome.

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