

## ORIGINAL ARTICLE

### PATTERNS OF CHEST X-RAY FINDINGS IN CHILDREN WITH SEVERE PNEUMONIA ADMITTED TO THE DEPARTMENT OF PEDIATRICS AND CHILD HEALTH, TIKUR ANBESSA SPECIALIZED HOSPITAL

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#### ABSTRACT

**Background:** Respiratory diseases are a major cause of mortality and morbidity worldwide especially in most developing countries. Amongst these respiratory diseases, pneumonia is the leading cause of death in children worldwide. In developing countries childhood pneumonias were diagnosed using clinical parameters, usually based on presence of cough and fast breathing. The simple chest radiograph has been an important investigative tool in the diagnoses of pneumonia.

**Objective:** To see the pattern of chest x-ray (CXR) findings in patients with severe pneumonia.

**Methods:** A prospective cross sectional study of 162 patients with severe pneumonia who were admitted to paediatric emergency unit of Tikur Anbessa Specialized Hospital (TASH) with chest x-ray.

**Result:** The prevalence of positive chest x ray finding in patients with severe pneumonia was (48%). The commonest site of CXR finding was on the right upper lobe which accounts to 78.7%. Related type of chest x-ray finding was consolidation (27%). Chest x-ray has strong association with late presentation and underlying medical illness.

**Conclusion:** Chest X-ray can give useful information about the presence of pneumonia more commonly if chest x-ray taken after 4 days of illness, so physicians should select patients who need x-rays immediately, to avoid unnecessary exposure to radiation and wastage of time and money.

**Key words:** Pneumonia, chest x-ray, TASH, causality, Emergency Unit

#### Introduction

Pneumonia is the leading killer of children worldwide especially in developing countries. It kills more children than any other illness i.e. AIDS, malaria and measles—accounting for 29 per cent of all under-five deaths. In Ethiopia under-five mortality is 68 deaths per 1,000 live births in 2012 (1), and the plan is to decrease to 66 deaths per 1000 live births by 2015 according to Millennium De-

velopment Goals. In developing countries childhood pneumonias are diagnosed using clinical parameters, usually based on presence of cough and raised respiratory rate. Although this is cheap, sensitive and maximizes the number of children identified and treated empirically but also nonspecific and highly dependent in the context in which it is

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being applied.

In order to make a definitive diagnosis of clinical pneumonia you might need invasive procedure, which make more difficulties in identifying the causative organisms (2).

Blood culture is not an acceptable way to identify bacterial pneumonia (3- 5) and a specimen from interstitial tissue is technically difficult and need experienced personnel and it is a risky procedure (4, 6). Therefore, chest X-ray can give useful information about the presence of pneumonia. Simple chest radiograph has been an important investigative tool in the diagnoses of diseases, since the discovery of X-rays in late nineteenth century (6). Chest radiograph is frequently used in the management of acute lower respiratory infection in children and still considered to be the gold standard for diagnosing respiratory infection and pneumonia (7).

The standard test for diagnosis of patients is a two view plain chest radiograph. To provide an objective end point WHO established standard categorization for radiological case definition of pneumonia, classified as: 1) Alveolar pneumonia: i.e. end point consolidation, which may be fluffy of part or whole lobe often containing air bronchogram and or with plural effusion 2) Non alveolar (i.e. other consolidation or infiltrate) (8). The presence of other infiltrates as defined above in the absence of pleural effusion as well as other non-end point (i.e. linear, interstitial,

pre-bronchial thickening, multiple areas of atelectasis).

Several studies have found the pattern of radiologic features could not accurately distinguish a bacterial etiology from a viral etiology, although unilateral and or lobar infiltrates are often seen in bacterial pneumonia and some chest x- ray findings show disease severity. Studies regarding incidence of chest x- ray finding of patients with severe pneumonia in Africa are scarce. There are no literatures in Ethiopia which supports the incidence of chest x- ray finding for severe pneumonia. In Tikur Anbesa Specialized Hospital (TASH) at emergency unit severe pneumonia is the commonest cause of emergency admissions. (9)

Hence, this study will evaluate prevalence of chest x- ray findings of patients with severe community acquired pneumonia in our hospital.

The study was done at Addis Ababa University, Department of Paediatrics and Child Health, emergency unit which is located in the capital city of Ethiopia. .

All paediatric patients aged between 2 months and to 14 years who were admitted to paediatric emergency unit of TASH with the diagnosis of severe community acquired pneumonia were recruited in the study. The study design was prospective cross sectional study conducted from December 2013 to May 2014.

unit was approximately 1-2 cases daily (review of the registration book of emergency ward of TASH over six months- unpublished data) and by calculating the prevalence of severe community acquired pneumonia admission at emergency unit of TASH over 6 months which is 15%. The estimated sample size was 196 with 95% CI and margin of error or desired precision of 0.05. [The inclusion](#) criteria were age between 2 months and 14 years and who were admitted at the emergency unit of TASH with the diagnosis of severe community acquired pneumonia. [The exclusion criteria](#) were patients with no chest x ray, hospital acquired pneumonia, foreign body aspiration and if parents or guardians don't agree to participate.

After the data was collected and compiled the analysis was done using SPSS. The results were expressed in description, rate and tables and association was made. Finally conclusion and recommendation was forwarded.

**Ethical Clearance:** After obtaining approval by the Department Research and Publication Committee the study was conducted.

Table 1: Age distribution of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia

Classification	Number	Percent %
1-2 yrs	38	19.4
2-5 yrs	21	10.7
5-10 yrs	16	8.2
≥ 10 yrs	8	4.1
Total	196	100%

Mon-months, yrs-years

Hundred forty three (73%) of patients were from Addis Ababa city, and the rest 53 (27%) were out of the city. From one hundred ninety six patients 111( 56.6 %) presented with fast breathing, cough 47 (24%), fever 34 (17.3%) and 4 (2% ) were having grunting and other complaints. 111(56.6%) presented with three days of compliant, 72 (36.7%) presented after three days but within seven days

and 13 (6.6%) presented after one week of their illness.

Fifty five (28.1%) of patients admitted with severe pneumonia were having previous admission with same compliant. Out of this 34 (61.8%) having only once, 11(20%) had twice and eight children (14.5%) had three admissions (table 2)

**Table 2: duration of illness and previous history of pneumonia in patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia**

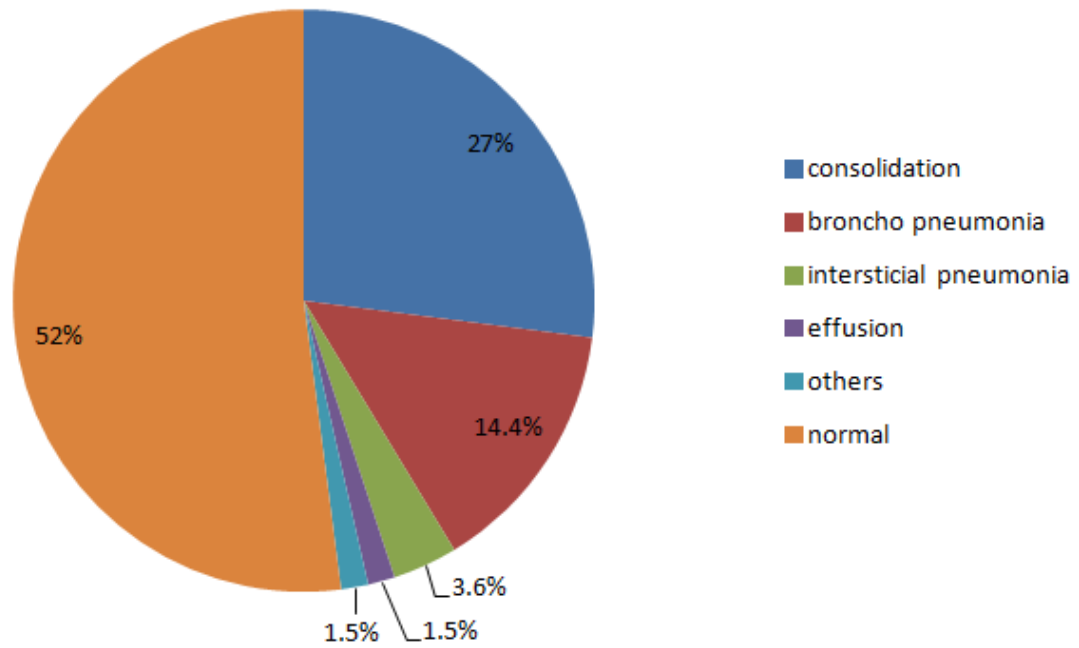
Duration of illness	Number of patients	Percent (%)
Within 3 days	111	56.6
4-7 days	72	36.7
>7 days	13	6.6
Previous history of pneumonia	55	28.1
Only one time	34	61.8
Two times	11	20.0
Three times	8	14.5
Four times	1	1.8
Six times	1	1.8

Out of one hundred ninety six children 139 (69.9%) were having underlying illness and 59 children (42.14%) were having cardiac disease. Hundred thirty seven children (69.9%) were the calculation same % as in 139 ) having auscultatory chest finding. The commonest type of chest finding was crepitations in 105 children (53.5%), bronchial breath sound (BBS) in 13 (6.6%) and wheeze in 10 (5%) children. In 73 children (53.2%) the findings were on the right side of the

chest, in 22 (16. %) on the left side of the chest and in 42 (30.6%) bilaterally.

All patients who were admitted were having chest x- ray for the confirmation of the diagnosis. From hundred ninety six patients 102 (52%) were having normal chest x –ray whereas 94 (48%) patients were having abnormal chest x-ray; of this 53 (27%) had consolidation, 28 (14, 4%) had broncho-pneumonia (Figure 1).

**Figure 1: Prevalence of chest x-ray findings of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia.**



From 94 patients who had abnormal finding 74 (78.7%) were seen on the right side of the chest, 7 (7.4%) seen on the left side and 13 (13.8%) were seen bilaterally (Table 3).

Fifty-three children (27%) stayed in the hospital less than 4 days, 92 (46.9%) patients stayed 4 up to 7 days and 51 (26%) patients stayed more than 7 days. From one hundred ninety six admitted patients 184 (93.9%) were discharged improved and 12 (6.1%) passed away.

Table 3: Site of chest x-ray finding of patients admitted with the diagnosis of severe community acquired pneumonia to the emergency unit of Tikur Anbessa Teaching Hospital, Addis Ababa, Ethiopia

	<b>Bilateral</b>	<b>RUL</b>	<b>RML</b>	<b>RLL</b>	<b>LUL</b>	<b>LLL</b>
Consolidation	53	27	38	5	4	4
Bronchopneumonia	28	14.4	15	3	3	7
Interstitial pneumonia	7	3.6	5	-	-	-
Pleural effusion	3	1.5	1	2	-	-
Other finding	3	1.5	-	-	-	-
Total	94	48	59	10	7	11

Right upper lobe (RUL), right middle lobe (RML), right lower lobe (RLL), left upper lobe (LUL), left lower lobe (LLL)

## Discussion

In the current study the commonest age at presentation was less than 12 months while in the Brazilian study median age was 17 months (10). Most of these patients presented with fast breathing followed by cough, fever and grunting. Our finding has some difference with study done in Iraq (11). The main presenting complaints in Iraq were fever (87.4%), shortness of breath (99.5 %), and cough (98%). The commonest auscultatory finding is crepitations (76.6%) which is com-

parable to Iraq study (82%) followed by bronchial breath sound. The auscultatory findings which are 53.2% on the right side of the chest and, 16 % on the left side of side chest and 30.6% bilateral is comparable with the study done in Iraq and Brazil (11, 10). In our study 48% of the participant were having abnormal chest x-ray while, 52% were having normal chest x –ray and this finding is comparable with Sudan’s study but it is greater than the study done in Iraq and lower than the Nigerian reports.

The explanation for the difference between our findings and the above mentioned studies was our study was conducted in patients who had severe pneumonia. (12, 11, 13)

In our study 78.7% of the chest x-ray findings were on the right side followed by 13.8% bilateral and 7.4% were on the left side. The commonest chest-x ray findings were consolidation 27% followed by bronchopneumonia 14.4% and interstitial pneumonia 3.6%. There were 3 patients who had pleural effusion as complication of pneumonia. These findings are consistent with Brazil and Iraq studies (11, 10, 14)

Commonly affected lobes in this study were right upper lobe, right middle lobe and right lower lobe respectively and the left lower lobe is more affected than that of left upper lobe. This is consistent with Greece study (15, 16, 17, 18). We have seen that there is a statistically significant association between chest x-ray findings with patients who presented after 7 days of complaint ( $p=0.015$ ), patients who had previous admission with similar illness ( $p=0.000$ ). Patients who had crepitations and decreased air entry on auscultation have also an association with chest

x-ray finding ( $p=0.000$ ,  $p<0.012$  respectively). Patients having a cyanotic congenital heart disease, severe acute malnutrition and patients who stayed in the hospital more than 7 days have association with chest x-ray finding ( $p <0.004$ ,  $p <0.006$ ,  $p <0.004$  respectively). This is similar with Sudan study (12, 19, 20, 21, 22). The mortality rate of pneumonia in this study is 6.1%. This has discrepancy with the Australian study 2.8% (3). This discrepancy may be due to other comorbid factors.

### **Conclusion**

Chest X-ray can give useful information about the presence of pneumonia, if chest x-ray taken after 4 days of illness, so physicians should have to select patients who need x-rays immediately, to avoid unnecessary exposure to radiation and wastage of time and money.

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