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Original Research Article

A STUDY ON ROLE OF CHEST RADIOGRAPH IN DIAGNOSIS OF ETIOLOGY OF TACHYPNEA IN CHILDREN LESS THAN FIVE YEARS OF AGE

Kannu Priya[1], Obaida Zea[1], Bir Prakash Jaiswal[2]

[1]Senior Resident, Department of Paediatrics, NMCH, Patna, Bihar, India
[3]Professor, Department of Paediatrics, NMCH, Patna, Bihar, India

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Corresponding Author:
Dr. Obaida Zea
Email: zeyaobaida@gmail.com

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Abstract

Background: Respiratory diseases are the commonest cause of death in children under 5 year. Pneumonia is the leading killer of children worldwide. It kills more children than any other illness i.e. AIDS, malaria and measles–accounting for 29 per cent of all under-five deaths. Hence, this study evaluates the role of chest x ray findings in diagnosing the etiology of. Tachypnea in children less than five years of age. **Materials and Methods:** This is an institution based observational study conducted in the Department of Pediatric NMCH, Patna, Bihar on tachypneic children aged between 2 months to 59 months, over a period of one year (December 2022 to January 2024). 200 patients attending the Pediatric Emergency of NMCH, Patna, Bihar, during the study period fulfilling the inclusion and exclusion criteria. **Result:** In Chest x-ray findings of this present study, Hyperinflation with parahilar opacity was present in 35% cases, Consolidation in 25% cases, Hyperinflation in 20% cases, Bronchopneumonia in 9% cases, Interstitial pneumonia in 4% cases, Pleural effusion in 2% cases; Atelectasis, Rounded homogenous opacity, Honeycomb lesion and Unspecified findings were seen in 1% cases each. **Conclusion:** In this study we have seen that chest X-ray can give useful information about the presence of pneumonia more commonly in patients who complain of cough and Tachypnea for 3 days and more.

INTRODUCTION

Respiratory diseases are the commonest cause of death in children under 5 year. Pneumonia is the leading killer of children worldwide.[1] It kills more children than any other illness i.e. AIDS, malaria and measles–accounting for 29 per cent of all under-five deaths. It is estimated that more than 150 million episodes of pneumonia occur every year among children under five in developing countries, accounting for more than 95 per cent of all new cases worldwide. Between 11 million and 20 million children with pneumonia will require hospitalization and accounts more than 3 million or an estimated 29% of all deaths, among children younger than 5 year worldwide.[2] In India under-five mortality is 49 deaths per 1,000 live births, and the plan is to decrease to 42 deaths per 1000 live births by 2015 according to Millennium Development Goals and pneumonia is leading cause of death in this age group.[3] 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, it is also nonspecific and highly dependent on the context in which it is being applied.[4] So the simple chest radiograph has been an important investigative tool in the diagnoses of diseases, since the discovery of X-rays in late nineteenth century. 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.[5] The use of chest radiography in the initial assessment of acute lower respiratory infection rests on the assumptions that; (i) clinical assessment plus radiography results in a more accurate diagnosis than clinical assessment alone; (ii) this leads to changes in clinical management; and (iii) the changes benefit the patient.[6] The standard test for diagnosis of patients is a 2 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 or part of whole lobe or entire lung often containing air bronchogram and or with plural effusion. 2) Non alveolar (i.e. other consolidation or infiltrate). The presence of other infiltrates as defined above in the absence of plural effusion as well as other non-end point (i.e.

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linear, interstitial, pre-bronchial thickening, multiple areas of atelectasis). When more than one radiological signs were present, the condition is designed as severe radiological pneumonia.[7] There are studies which show the importance of chest x-ray findings in patients with severe pneumonia. One study reports 53.2% of patients with severe pneumonia have chest X ray findings,[1] and also other study shows 50% of chest X-rays were positive.[8] Other two reports were 42.4%,[9] and 34%.[10] There is some variation but not significant. 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 shows diseases severity. One study shows that radiological findings such as multifocal bilateral distribution, the simultaneous involvement of at least three sites and right hilar consolidation are associated with severe CAP in otherwise healthy children, and could be considered markers of disease severity.[11] The studies regarding incidence of chest x ray findings of patients with severe pneumonia in Eastern India are scarce. In CNMCH pediatric emergency department, Tachypnea is the commonest cause of admission. In order to diagnose pneumonia we are using clinical parameters according to WHO classification and also chest x-ray which is the gold standard and most commonly utilized tool for pediatricians in diagnosing pneumonia and other respiratory conditions.[12] Patients can have chest x ray before admission or after stabilization of the patient as much as possible in the same day of admission and interpreted by radiology residents under supervision of senior radiologist. But there are few studies which shows role of chest x ray to diagnose the etiology of Tachypnea in children less than five years of age. Hence, this study evaluates the role of chest x ray findings in diagnosing the etiology of. Tachypnea in children less than five years of age.

Aims and Objectives

To study the role of chest radiographs in diagnosing the etiology of Tachypnea in children less than five years of age.

MATERIALS AND METHODS

This is an institution based observational study conducted in the Department of Pediatric NMCH, Patna, Bihar on tachypneic children aged between 2 months to 59 months, over a period of one year (December 2022 to January 2024). 200 patients attending the Pediatric Emergency of NMCH, Patna, Bihar, during the study period fulfilling the inclusion and exclusion criteria.

Inclusion Criteria

Patients aged between 2 months to 59 months, presenting with clinical features of tachypnea due to respiratory causes and willing to participate in the study through a written informed consent (annexure 1). WHO Age- Dependent Criteria for diagnosing tachypnea in children 60 breaths/min 2-11 months ---------- >50 breaths/min 12-59 months ------ >40 breaths/min

Exclusion Criteria

Patients less than 2 months and more than 59 months will be excluded from the study. Tachypnea due to non-respiratory causes (eg. Cardiac causes, Neurological causes, metabolic causes, Traumatic causes) will be excluded from the study. Tachypnea due to upper respiratory tract infections· will be excluded from the study

Statistical Analysis: Categorical variables are expressed as Number of patients and percentage of patients and compared across the groups using Pearson's Chi Square test for Independence of Attributes/ Fisher's Exact Test as appropriate. The statistical software SPSS version 20 has been used for the analysis. An alpha level of 5% has been taken, i.e. if any p value is less than 0.05 it has been considered as significant.

RESULTS

A total 660 children with signs and symptoms of respiratory tract involvement were seen at the pediatric emergency ward of NMCH, Patna, Bihar. Of these Chest radiographs were obtained in 200 patients, presented with Tachypnea and the radiographs were subsequently reviewed by pediatric radiologist.

In this present study, among 200 patients, 60% are infants, 27% are between 1-2 yrs of age and 13% are between 2-5 yrs of age. Out of 200 Patients 54% are Male and 46% are Female. Fever with Cough as a chief complaint was Present in 48% Patients. In this present study, Difficulty in breathing (dyspnea) was present in 97% cases.

In my study; Predominantly wheeze with crepitations was present in 27% cases, no finding seen in 17% cases, only wheeze 20% cases, only crepitations in 11% cases, predominantly crepitations with wheeze in 8% cases, diminished Vesicular breath sound (VBS) in 10% cases, Predominantly Bronchial breath sound (BBS) with crepitations and wheeze in 4% cases, diminished Vesicular breath sound with wheeze in 3% were present.

In this present study, Auscultatory chest findings were present bilaterally in 47% cases, in right lung 25% cases, in left lung 12% cases.

In Chest x-ray findings of this present study, Hyperinflation with parahilar opacity and increased bronchovascular markings was present in 35% cases, Consolidation in 25% cases, Hyperinflation in 20% cases, Bronchopneumonia in 9% cases, Interstitial pneumonia in 4% cases, Pleural effusion in 2% cases; Atelectasis, Rounded homogenous opacity, Honeycomb lesion and Unspecified findings were seen in 2% cases each.

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In CXR findings of this present study, Bilateral lobe(B/L) involvement was seen in 63.4% cases, Right upper lobe(RUL) involved in 12.1% cases; Right middle lobe(RML), Right lower lobe(RLL) and whole left lung involved in 6.1% cases each; Left upper lobe(LUL), Left lower lobe(LUL) and whole Right lung involved in 4.1% cases each.

Table 1: Distribution by Age

Age	Frequency	%
< 1 Year	120	60
1-2 Years	54	27
2-5 Years	26	13
Total	200	100

Table 2: Distribution of Sex

Sex	Frequency	%
Male	108	54
Female	92	46
Total	26	13

Table 3: Distribution by Auscultatory chest findings

Auscultatory chest findings	Frequency	%
wheeze(p) and crepitations	54	27
no finding	34	17
wheeze only	32	16
crepitations only	24	12
both crepitations(p) and wheeze	14	7
diminished VBS	22	11
BBS(p) and crepitations	8	4
BBS(p), crepitations and wheeze	8	4
diminished VBS, wheeze	4	2
Total	200	100

Table 4: Distribution by Chest x-ray findings

CXR	Frequency	%
Hyper Inflation with parahilar opacity and increased bronchovascular markings	70	35
Consolidation	50	25
Hyperinflation	40	20
Bronchopneumonia	18	9
Interstitial Pneumonia	8	4
Pleural Effusion	4	2
Hyperlucent lung field with collapsed lung border	2	1
Atelectasis	2	1
Unspecified	2	1
Rounded homogenous opacity	2	1
Honeycomb lesion	2	1
Total	200	100

DISCUSSION

In this present study a total of 200 patients has been enrolled and 108(54%) were male and 92(46%) were female. The commonest age at presentation was less than 12 months. Most of this patients presented with fever with cough followed by fast breathing and cough; then fever with fast breathing and few cases presented with grunting {88 (44%), 48 (24%), 16 (8%), 4 (2%) respectively}. This finding is consistent with the study done by Salwa Ahmad Al-Najjar et al.[13] The commonest auscultator finding is predominantly wheeze and crepitation (27%) which is comparable to Salwa Ahmad Al-Najjar et al.[14] study (82%); followed by no finding seen in21% cases, only wheeze 16% cases, only crepitation in 12% cases, predominantly crepitation with wheeze in 7% cases, diminished Vesicular breath sound (VBS) in 11% cases, Predominantly Bronchial breath sound (BBS) with crepitation and wheeze in 4% cases, diminished Vesicular breath sound with wheeze in 2% cases were present. In my study, Auscultatory chest findings were present bilaterally in 47% cases, in right lung 25% cases, in left lung 12% cases.[4] In this study of Two hundred patients; 196(98%) were having abnormal chest x-ray and this finding is comparable with Ali Salih KEM, et al.[15] study (52.3%), but it is greater than Salwa Ahmad Al-Najjar et al.[16] study (42.4%), Njeze et al.[17] study (37%) and Mulholland et al. study(34%). All of the above study was done on patients who have pneumonia but my study was conducted on patients only who have Tachypnea, so we can explain the difference.[1,3,4] In this study most of chest x-ray findings were seen on bilaterally in 100(50%) cases, in right lung 50(25%) cases, in left lung 24(12%) cases. In Chest x ray findings of my study, commonest finding was Hyperinflation with parahilar opacity; present in 70(35%) cases,

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Consolidation in 50(25%) cases, Hyperinflation in 40(20%) cases, Bronchopneumonia in 18(9%) cases, Interstitial pneumonia in 8(4%) cases, Pleural effusion in 4(2%) cases; Atelectasis, Rounded homogenous opacity, Honeycomb lesion and Unspecified findings were seen in 2(1%) cases each. This study is similar with Patria et al. study, which showed that Parenchymal densities were more prevalent in the right than the left lung and the most frequent radiological presentation was focally distributed parenchymal densities in patients 63.3%, whereas 36.7% showed multifocal consolidations; of these 123 patients predominantly bilateral consolidation seen in 69.1% and only five radiographs 1.5% showed interstitial changes. This study also consistent with Brazilian study which showed pulmonary infiltrate and consolidation in 161 cases (54%) and 119(40%) respectively. In this study Interstitial pneumonia was seen in 15 cases (5%) but Salwa Ahmad Al-Najjar et al.[18] study showed that it is as common as that of consolidation.[19] In CXR findings of my study; Bilateral lobe(B/L) involvement was seen in 63.4% cases, Right upper lobe(RUL) most commonly involved (12.1% cases) than Right middle lobe(RML) and Right lower lobe(RLL); which were involved in 6.1% cases each; Left upper lobe(LUL) and Left lower lobe(LUL) were involved in 2.1% cases each. These findings are similar with Grafakou et al.[20] study (Greece) showed that from 169 chest x-rays, consolidation was right sided 109 cases and left sided in 58 cases. The majority of children with left sided pneumonia, more commonly had the lower lobe affection while in right-sided pneumonia, the upper lobe was more commonly affected 49.5%; 32.1%;middle lobe, 14.7%; and more than one lobe 3.6%.[21]

The mortality rate of patients in this study is 9-10%, which is greater than Mulholland et al. study (3.8%).[22]

CONCLUSION

In this study we have seen that chest X-ray can give useful information about the presence of pneumonia more commonly in patients who complain of cough and Tachypnea for 3 days and more. So physicians should have to select patients who need x-rays to avoid unnecessary exposure to radiation and wastage of time and money for all patients with pneumonia.

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