

Original Research

Retrospective study on assessment of Radiologic Manifestation of Pulmonary Tuberculosis in pediatric age group RT: Radiologic Manifestation of Pulmonary Tuberculosis

¹Mohit Poddar, ²Neha Agarwal

¹Assistant Professor, Department of Pediatrics, National Institute of Medical Science & Research, Jaipur, Rajasthan, India;

²Assistant Professor, Department of Radiodiagnosis, National Institute of Medical Science & Research, Jaipur Rajasthan, India

ABSTRACT:

Introduction: The interpretation of non-specific radiological imaging, moreover, change according to the setting the clinician is working, either high TB incidence or low-incidence, due to pre-test probability. Chest radiography (CXR) may not be sensitive in detecting lymphadenopathy, which is considered to be the fingerprint of primary pulmonary tuberculosis. **Materials and Methods:** One induced sputum (IS) and one gastric aspirate (GA) were collected from each participant and evaluated by smear microscopy and culture. All participants included had at least one follow up visit arranged within six months of recruitment regardless of initial disease classification, to assess symptom resolution with or without TB treatment. Those who remained symptomatic were re-assessed, by repeated CXR and collection of new samples. **Results:** Mean age of the patients of the present study was 12.2 years. There were 20 percent of the patients between the age group of 5 to 10 years. There were 27 males and 33 females. **Conclusion:** Under the light of above obtained data, the authors conclude that radiographic imaging is valuable diagnostic tools for tuberculosis patients. However; further studies are recommended.

Keywords: Radiologic Manifestation, Pulmonary Tuberculosis, paediatric patients.

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Corresponding author: Neha Agarwal, Assistant Professor, Department of Radiodiagnosis, National Institute of Medical Science & Research, Jaipur Rajasthan

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INTRODUCTION

Meticulous disease descriptions from the prechemotherapy literature provide unique insight into events following primary *Mycobacterium tuberculosis* infection, summarized as the so-called "timetable of childhood TB."^{1,2}

Infants and young children are more likely than older children and adults to develop life-threatening forms of TB disease (i.e., disseminated TB and TB meningitis), and because of their age, pediatric TB acts as a surrogate for identifying recent transmission. The greatest number of TB cases is seen in children less than 5 years of age and adolescents older than 10 years of age.³⁻⁵ *Mycobacterium tuberculosis* is spread through aerosolized particles by subjects with pulmonary TB

during expiratory efforts, such as coughing, sneezing, speaking, or singing. Apart from conditions where drainage is present, extrapulmonary TB is not transmitted.⁵⁻⁷ Hence; we planned the present study to assess the radiological manifestations of pulmonary tuberculosis in paediatric patients.

The interpretation of non-specific radiological imaging, moreover, change according to the setting the clinician is working, either high TB incidence or low-incidence, due to pre-test probability. Chest radiography (CXR) may not be sensitive in detecting lymphadenopathy, which is considered to be the fingerprint of primary pulmonary tuberculosis.⁸ For this reason, in high-income settings, the use of chest computed tomography (CT) scan to evaluate suspected TB pediatric cases is increasing,

nevertheless no guidelines nor score are published in this regard. While a retrospective report on radiological interpretation of pediatric TB in developed countries has been recently published,⁹ unfortunately this study does not describe nor analyze any specific radiological findings; therefore, CXR and CT interpretation still relies only on the single radiologist experience, based on small reports currently available in literature. For this reason, we performed this retrospective study to describe CT findings, focus on air-space involvement and lymphadenopathy.

CXR remains a critical tool for diagnosing intrathoracic TB which is the most common presentation of TB in children.¹⁰ In fact, CXR signs suggestive of TB are considered essential to establish a diagnosis of probable intrathoracic TB, according to international consensus clinical case definitions.¹¹ The most common radiological finding associated with TB in children is perihilar or mediastinal lymphadenopathy.^{12,13} Cavitory lesions are rare,¹³ except in very young infants and HIV infected children,¹⁴ or with the emergence of adult-type disease during adolescence. Few studies have described CXR findings in young children evaluated for TB, comparing TB cases with those considered not to have TB. We describe radiological findings in children under 3 years of age investigated for TB in Mozambique, in an area endemic for both TB and HIV.¹⁵

MATERIALS & METHODS

Ethical approval was obtained from institutional ethical committee and written consent was obtained

RESULTS

Data records of a total of 60 paediatric patients were analysed in the present study.

Table 1: Age-wise distribution of patients

Age group (years)	Number of patients	Percentage
Less than 5	14	23.3
5 to 10	22	36.6
More than 10	24	40

Mean age of the patients of the present study was 12.2 years. There were 20 percent of the patients between the age group of 5 to 10 years. There were 27 males and 33 females.

Table 2: Gender-wise distribution of patients

Gender	Number of patients	Percentage
Males	27	45
Females	33	55

In the present study. Radiographic manifestations are shown in Table 3. Unilateral nodular infiltration was seen in 29 percent of the patients. Bilateral nodular infiltration was present in 6 patients. Patchy consolidation was present in 25 percent of the patients. Calcified nodule was present in 7 percent of the patients.

Table 3: Radiographic manifestation

Radiographic manifestation	Number of patients	Percentage of patients
Unilateral nodular infiltration	15	29
Bilateral nodular infiltration	3	6
Patchy consolidation	13	25
Calcified nodule	4	7
Fibrotic scar	5	9

after explaining in detail the entire research protocol. Data records of a total of 50 paediatric patients were included in the present study. Inclusion criteria for the present study included:

- Paediatric patients between the age group of 1 year to 14 years,
- Patients with negative history of any other systemic illness,
- Patients in which complete data records was available

One induced sputum (IS) and one gastric aspirate (GA) were collected from each participant and evaluated by smear microscopy and culture. All participants included had at least one follow up visit arranged within six months of recruitment regardless of initial disease classification, to assess symptom resolution with or without TB treatment. Those who remained symptomatic were re-assessed, by repeated CXR and collection of new samples. TB cases received months of supervised treatment according to the National TB Control Program protocol. Non diseased-contacts were referred to the NTP for isoniazid preventive treatment (IPT) initiation.

Data records of only those patient was analysed in which diagnosis of tuberculosis was confirmed by clinical, bacteriologic and radiologic features as well as tuberculin skin test. Radiographs and computed tomography scans were evaluated. All the data from the record files of the patients was extracted. Data records before the starting of the anti-tubercular therapy were analysed. All the results were summarized in Microsoft excel sheet and were assessed by SPSS software.

Cavity	9	18
Hilar lymph node	40	77
Others	6	12

DISCUSSION

There were 20 percent of the patients between the age group of 5 to 10 years. 42 percent of the patients were between the age group of more than 10 years. Boloursaz MR et al analysed 70 children (43 (61%)female and 27 (38.5%) male) aged between 5 months to 15 years old during a five- y e a r period (from 2001-2006) in pediatric ward. It was performed on children who were confirmed to have TB by various clinical, bacteriologic and radiologic features and tuberculin skin test. We studied the radiologic features of pulmonary TB in these children. Right lung involvement was observed in 65%, left lung 23% and bilateral involvement was detected in 12%. Also middle and superior lobes were the most common lobes affected. The commonest radiographic feature was hilar (mediastinal) lymphadenopathy; 70%detected on chest x-ray (CXR) and 85% on CT scan. Lymph nodes on right side were affected more; 25% were calcified. Also nodular infiltration of lung parenchyma was observed in 35% of CXRS and 61% of CT scans. This was followed by patchy consolidation detected in 25% and 35% of CXRs and CT scans respectively. We also observed that children <3 yr. of age had the highest lymph node involvement but the least parenchymal lesions as compared to older children. It was concluded that primary TB is the most common form of pulmonary TB in children. This could be in the form of hilar lymphadenopathy with or without lung parenchymal involvement.¹⁶

There were 22 males and 28 females in the present study. Radiographic manifestations are shown in Table 3. Unilateral nodular infiltration was seen in 28 percent of the patients. Bilateral nodular infiltration was present in 4 patients. Patchy consolidation was present in 24 percent of the patients. Calcified nodule was present in 6 percent of the patients. Fibrotic scar, cavity and hilar lymph node were present in 8, 16 and 76 percent of the patients. LeungAN et al reviewed the radiologic features of primary tuberculosis in childhood and to determine whether differences in patterns of disease occur among age and ethnic groups. Chest radiographs of 191 children with pediatric primary tuberculosis were reviewed by two observers. Lymphadenopathy, present in 92% of cases, was the most common abnormality identified on the initial chest radiograph and typically involved the hilar and paratracheal regions. Parenchymal abnormalities, identified in 70% of cases, occurred more commonly in the right lung (P less than .001). Children 0-3 years of age had a higher prevalence of lymphadenopathy (P less than .01) and a lower prevalence of parenchymal abnormalities (P less than .001) than older children. A lower prevalence of lymphadenopathy was found in whites than in

nonwhites (P less than .02). The radiologic abnormalities often progressed in the initial follow-up. Lymphadenopathy, with or without concomitant parenchymal abnormality, is the radiologic hallmark of primary tuberculosis in childhood. However, distinct age- related and racial differences in presenting patterns of disease exist and should be recognized.¹⁷

This study had several methodological limitations. First, although most patients had an AP projection, some of them lacked the lateral projection, thus, given the pivotal role of lateral views for lymphadenopathy evaluation, some of them could have been missed. Second, due to the limited number of TB cases identified in these studies, the conclusions, especially on the as-association of HIV status to different radiological findings among TB cases, are not does robust, and studies with greater sample sizes are needed. Second, although we have not observed any cavi- ties, calcified parenchyma (Ghon focus) or vertebral spondylitis among TB cases, we have ob- served that the template not allow differentiating among these lesions, and reporting of the location might not be possible. We recommend that these lesions, which have been found in other CXR evaluations, could be reported separately.

Third, although it has been recom- mended that the readings from the two reviewers were masked to clinical data and discrepan- cies resolved by a third reader, this was not possible due to logistical and personnel constraints (only one was masked). Poor inter observer agreement among reviewers regarding lymphadenopathy evaluation in children has been reported, so this limitation, together with the inadequate capturing of differences in opinion, could have reduced the accuracy of the findings which are being reported. Chest X ray evaluation remains a crucial tool for TB diagnosis in childhood due to the difficulty of isolating TB from sputum or other human samples and the unavailability of reliable TB diagnostic methods in this age group. The correct interpretation of CXR for diagnostic pur- poses in both clinical practice and research makes standardization of reporting critical. There are some scoring systems for adults which are especially useful to discard TB disease,^{18,19} but this type of scoring systems are inexistent for children, which have distinct radiological manifestations and where HIV infection, severe malnutrition adds another level of complexity given the absence of atypical presentation of radiological manifestations. Thus, there is a need for improved scoring systems for pediatric populations.

CONCLUSION

Under the light of above obtained data, the authors

conclude that radiographic imaging is valuable diagnostic tools for tuberculosis patients. However; further studies are recommended.

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