

CHILDHOOD PRIMARY TUBERCULOSIS IN RAMATHIBODI HOSPITAL, RADIOGRAPHIC MANIFESTATIONS

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ABSTRACT

The aim of this study was to review the radiologic features of primary tuberculosis in childhood and to determine whether there is any significant difference in the pattern of disease which occurs among different age groups. Chest radiographs of 84 children with pediatric primary tuberculosis who were treated at Ramathibodi hospital were reviewed. Pulmonary infiltration was found in 84.09% of the cases and was the most common abnormality identified on the initial chest radiograph. The infiltration was more common in the right lung. Lymphadenopathy was found in 72.73% that typically involved the hilar and paratracheal regions. Both the younger (0-5 years old) and the older (6-15 years old) children had high prevalence of parenchymal abnormalities and lymphadenopathy.

MATERIALS AND METHODS

The hospital records and radiographs of pediatric tuberculosis patients in Ramathibodi hospital from June 1992 to May 1995 were reviewed.

Over 100 children under the age of 15 years were selected for initial analysis. Eighty four cases with adequate clinical and radiological information were included in our series (table 1).

Table 1. Epidemiologic characteristics of study group (n = 84).

Characteristic		No. of patients	percent
Age (years)	0 - 5	36	42.86
	6 - 15	48	57.14
Sex	female	49	58.33
	male	35	41.67

The cases ranged in age from 1 month - 15 years old. Thirty six of eighty four children (42.86%) were younger than 6 years of age and 48 children (57.14%) were older than 6 years. There was a slight female predominance with

49 girls (58.33%) and 35 boys (41.67%).

The diagnosis of tuberculosis was accepted if mycobacterium tuberculosis was isolated from any body site or if the clinical findings were

consistent with tuberculosis; and at least two of the three following criteria were also met¹:-

1. Tuberculosis skin test with 5 TU purified protein derivative units resulted in an area of induration 10 mm. or greater in size.

2. Other disease entities were ruled out and the subsequent clinical course was consistent with tuberculosis.

3. An adult source patient with contagious disease caused by *M. tuberculosis* was discovered.

After reviewing the hospital records and radiographs of these proven tuberculosis children, these criteria were met in 84 cases. These cases had adequate clinical and radiologic documentation and were selected for further analysis. There

were only 39 cases whose radiographs were available for review. The remainder 45 cases with missing radiographs were also included in our series. The radiologic reports of these latter cases were used for the analysis. There were 49 boys and 35 girls. The chest radiographs obtained at presentation were assessed for the presence and location of pulmonary infiltration, lymphadenopathy, atelectasis, calcification, scarring and pleural effusion. (Some of the cases in our series are illustrated in Figures 1 - 6). Pulmonary infiltration was classified as being in the upper, middle, lower zone or multifocal i.e. infiltrates involving more than one lung zone or bilateral involvement. Atelectasis was classified as either lobar or segmental in distribution.

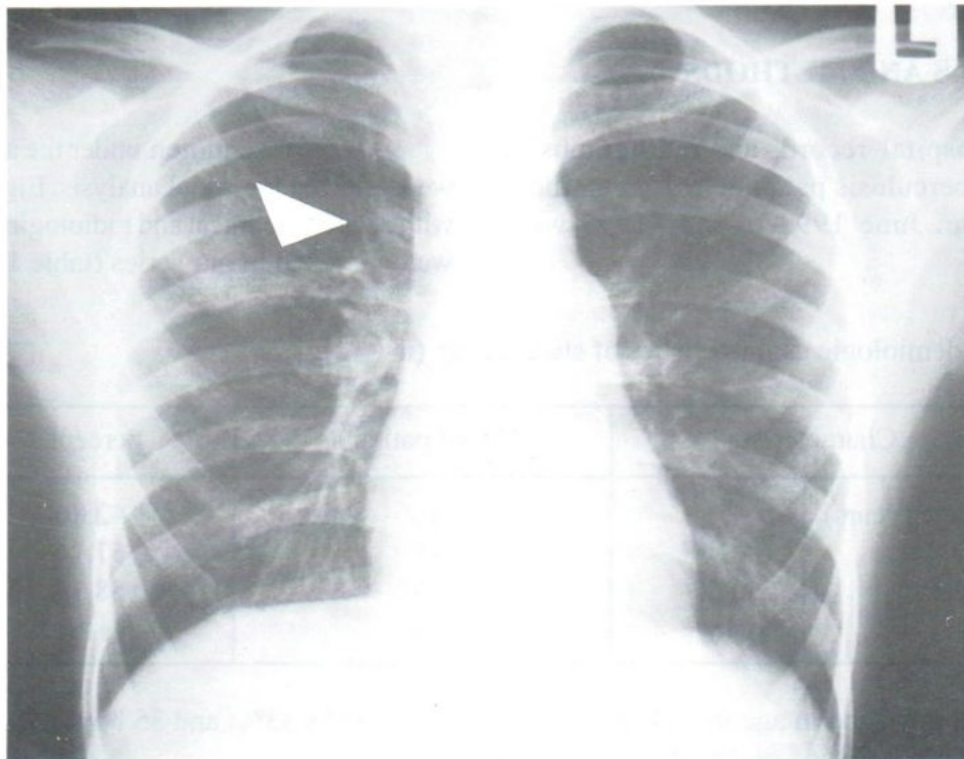
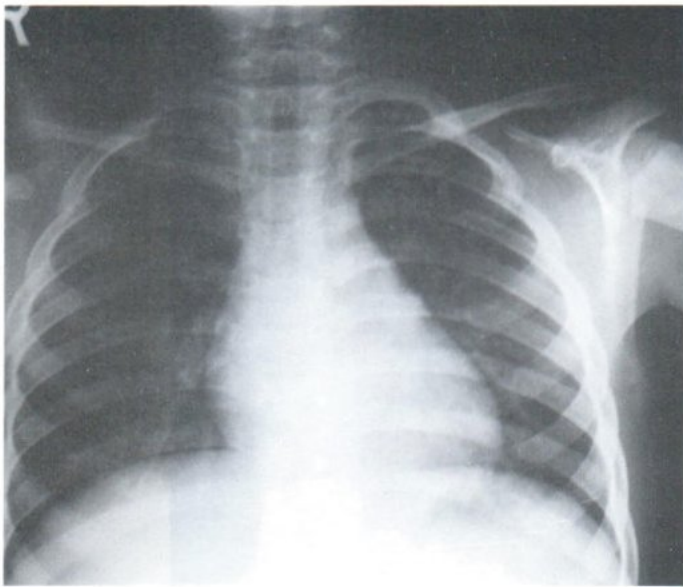
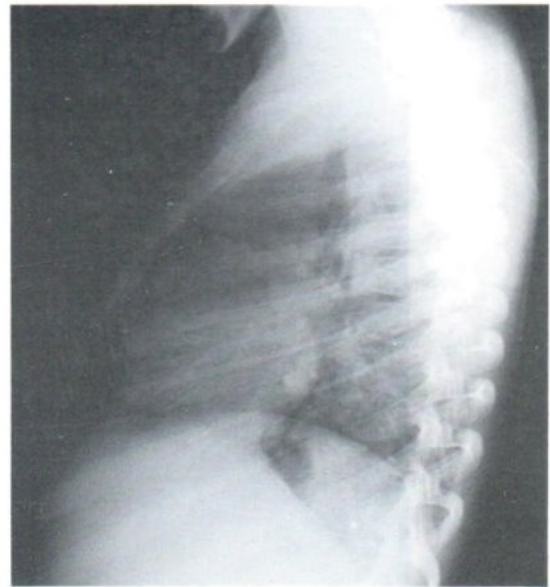


Fig.1. An 8 year old girl developed hemoptysis. She also had the history of tuberculous contact. PA chest film shows fibro-patchy infiltration in the RUL.

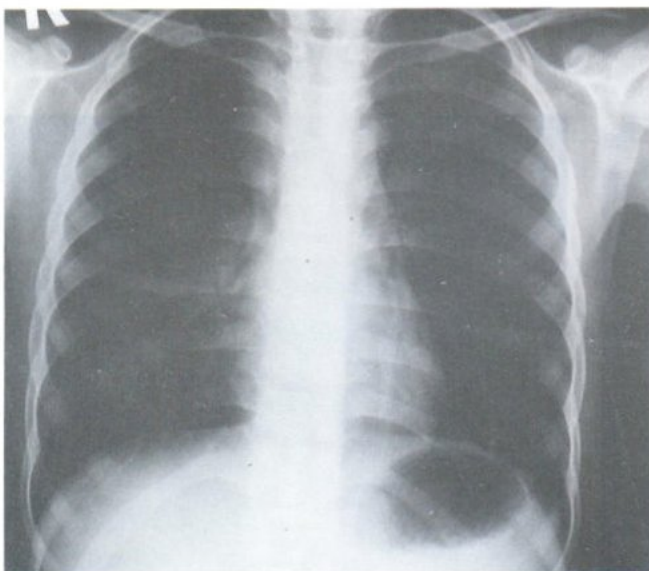


A.

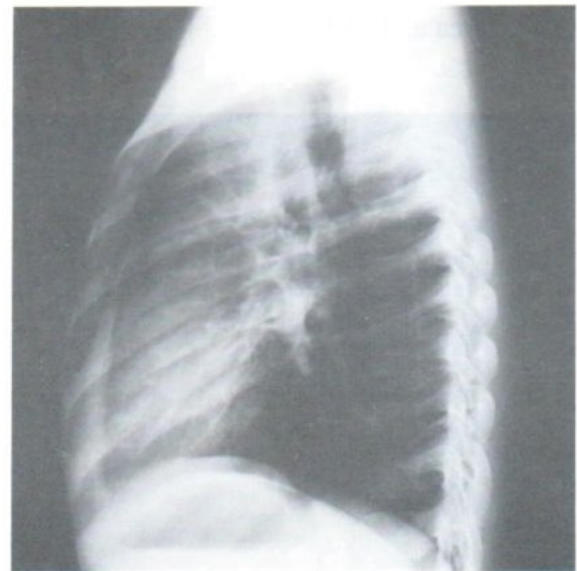


B.

Fig. 2A,B. A 5 year old boy with positive tuberculin test. PA and lateral chest radiographs show reticulo-nodular infiltration in RLL. with bilateral hilar adenopathy.



A.



B.

Fig. 3A,B. An 8 year old girl presented with fever and cough for 1 month. PA and lateral chest radiographs show right para-tracheal and right hilar adenopathy.

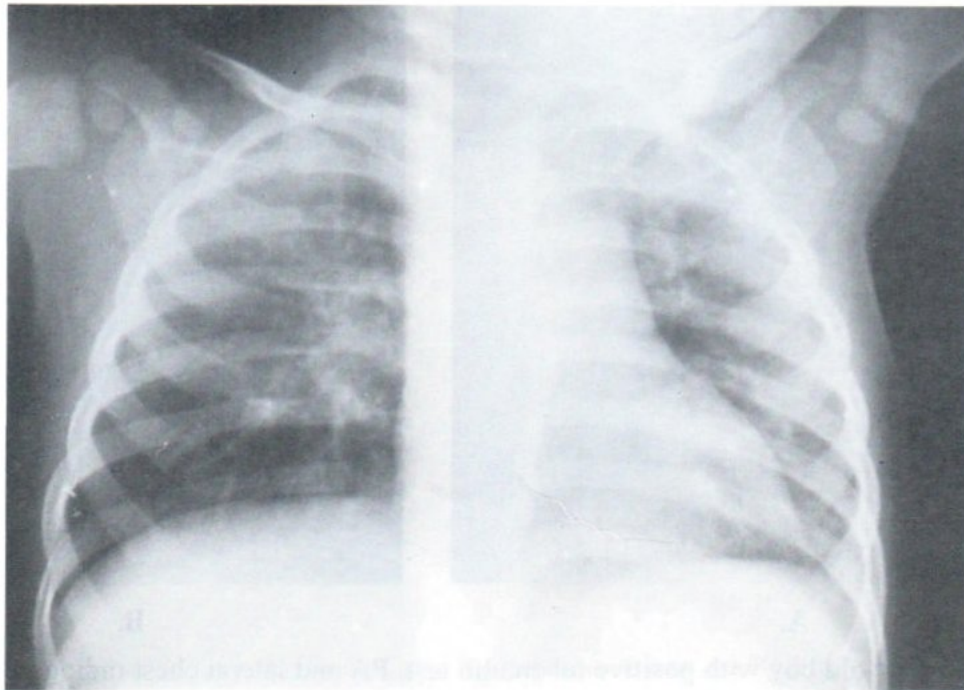


Fig.4. A 1 year old girl came in with the history of close tuberculous contact. AP chest radiograph shows interstitial infiltration in peri-bronchial areas of both lungs, more in the right peri-hilar area and LLL.

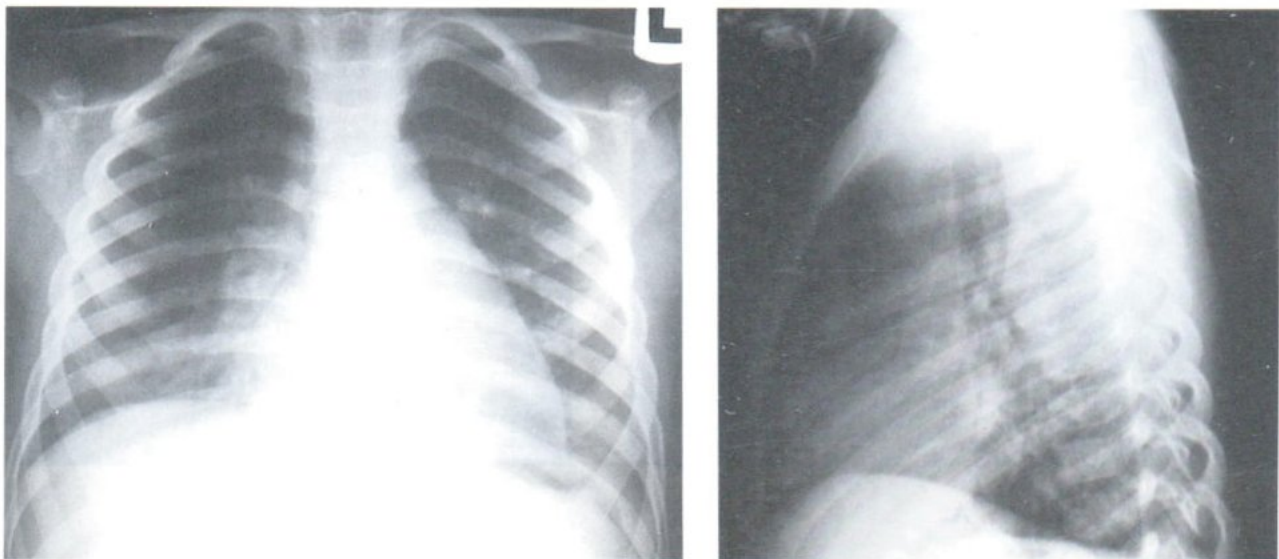


Fig.5A,B. A 2 year old boy with high fever and cough for 3 weeks. PA and lateral chest radiographs show patchy infiltration in right peri-hilar area, RML, and both lower lobes. Rt. hilar adenopathy is noted.

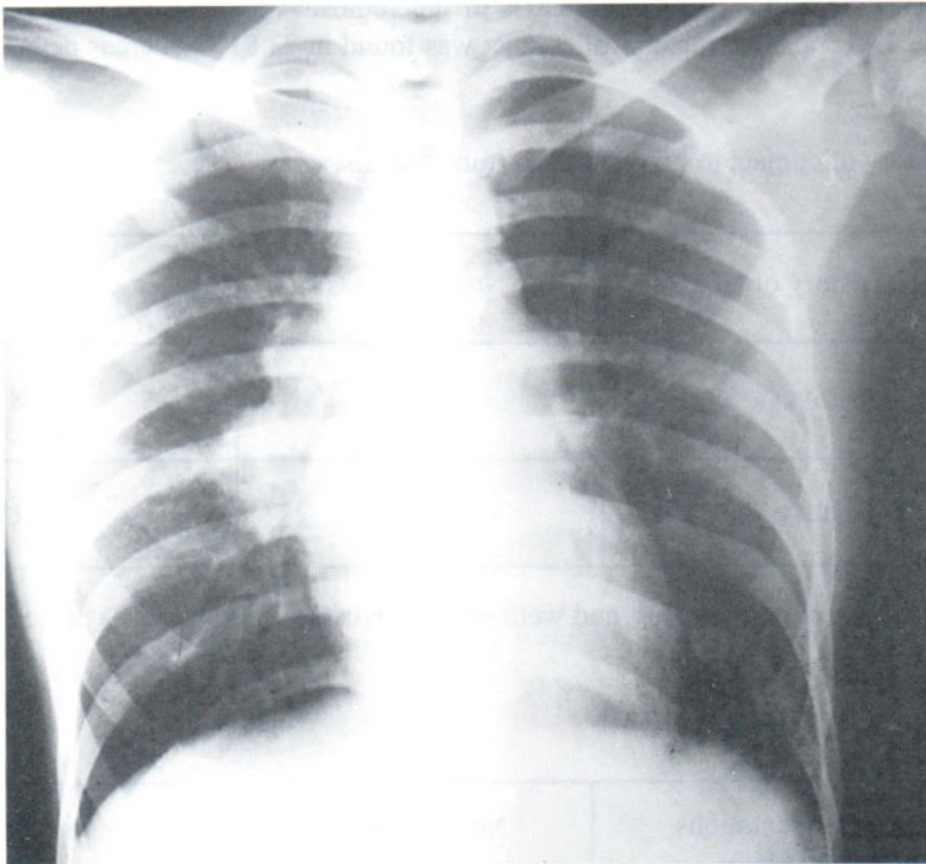


Fig.6. A 10 year old girl with clinical history suggestive of tuberculosis. PA chest radiograph shows right broncho-pulmonary, hilar and para-tracheal adenopathy.

There were 77 cases (91.67%) with the history of BCG immunization and positive BCG scars (Table 2). The rest was non-immunized with negative scars (7cases or 8.33%) .

Table 2. Cases were analyzed according to BCG scars.

BCG scars	No. of patients	percent
present	77	91.67
absent	7	8.33

The history of contact to known cases of tuberculosis was helpful in the initial diagnostic work up (Table 3). A positive history of contact was found in 73.81% whereas negative history was 26.19% .

Table 3. History of contact to known case of tuberculosis.

History of contact	No.of patients	percent
positive	62	73.81
negative	22	26.19

The clinical presentation varies, and were shown in (table 4.) Some cases presented with many problems.

Table 4. Clinical presentations.

Clinical presentations	No.of patients	percent
Lymphadenopathy	28	33.33
Fever	25	29.76
Cough	23	27.38
No symptoms	17	20.23
Weight loss	10	11.90
Hemoptysis	3	3.57

There were 20.23% of children who were asymptomatic at presentation and 79.77% had symptoms. The most frequent occurring symptoms were lymphadenopathy (33.33%), fever (29.76%) and cough (27.38%). Some patients presented with many symptoms. Patients with documented childhood tuberculosis had positive chest radiographic findings in only 44 cases (52.38%), and the remainder (47.62%) had negative findings (Table 5).

Table 5. Radiographic findings.

Radiographic findings	No.of patients	percent
positive	44	52.38%
negative	40	47.62%

The most common abnormality identified on the initial chest radiograph was pulmonary infiltration (84.09%) which was prominent in the right lung but there was no predilection for specific lobe or zone involvement (Table 6). There were no cases of cavitory lesion, miliary pattern or bronchiectasis in our series. There was one case of obstructive emphysema which also had a CT scan done. (Figure 7). None of the cases in our series had HIV infection.

Table 6. Radiographic findings at presentation (n = 44).

Findings	No.of patients	percent
Pulmonary infiltration	37	84.09
Rt. lung	27	
upper zone	11	
middle zone	9	
lower zone	10	
Lt. lung	21	
middle zone	7	
lower zone	8	
Multifocal	11	
Lymphadenopathy	32	72.73
Calcification	10	22.73
Pleural effusion	4	9.09
Atelectasis	2	4.55
- segmental	0	
- lobar	2	
Obstructive emphysema	1	2.27
Scarring	1	2.27

Lymphadenopathy was another common radiographic finding and was found in 72.73% in this study .

Other findings were calcification (22.73%), pleural effusion (9.09%), atelectasis (4.55%) and scarring (2.27%).

The common radiographic findings of pulmonary infiltration and lymphadenopathy were analysed and compared between two age groups (Table 7).

Table 7. Pulmonary infiltrates and lymphadenopathy .

Age (yrs.)	No.of patients.	Infiltration	Lymphadenopathy
0 - 5	36	14	14
6 - 15	48	23	18



Fig.7A. A 13 year old girl presented with weight loss. PA chest radiograph shows obstructive emphysema of the right lung with contra-lateral herniation of right lung. Minimal fibrosis in both upper lobes is noted.

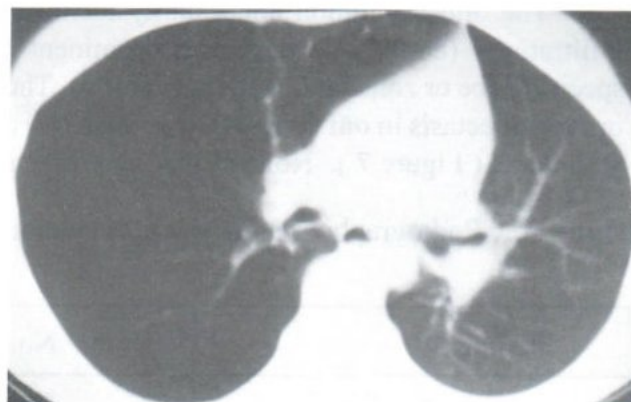


Fig.7B. CT scan confirms obstructive emphysema of the right lung with contra-lateral herniation of right lung across the anterior mediastinum.

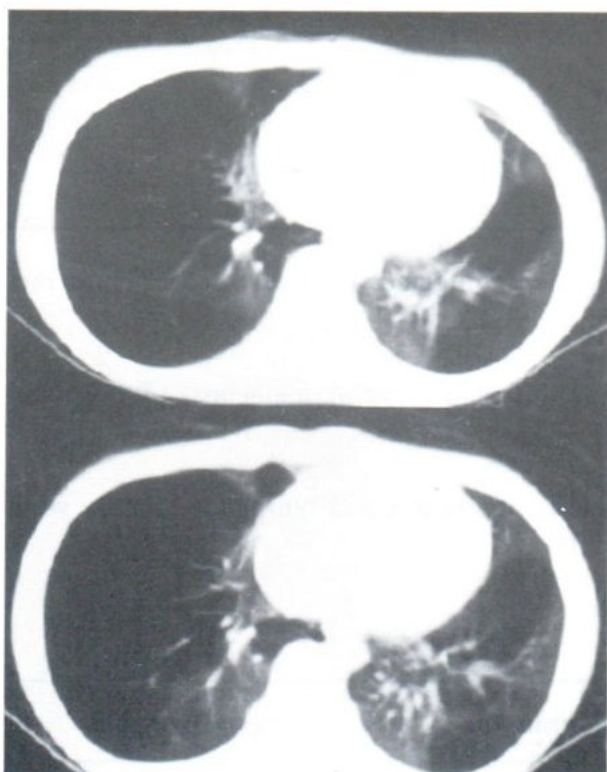


Fig.7C. CT scan of the lower chest shows pan-lobular emphysema of the lingular segment of LUL and postero-basal segment of LLL

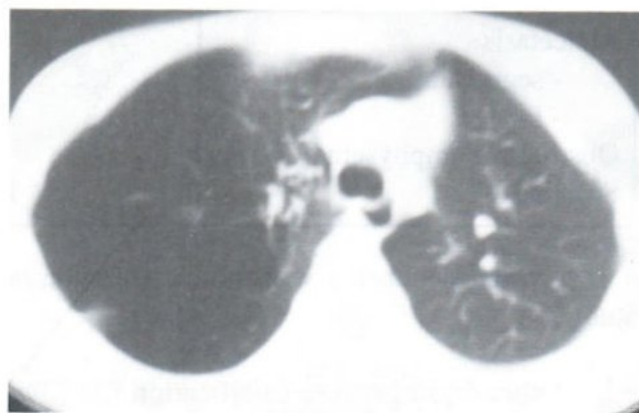


Fig.7D. Small calcified granulomas in the LUL and minimal pleural fibrosis in posterior segment of RUL are shown.

There was no significant difference of the above findings in the two age groups (chi-square test , $p = 0.50$ and 0.95 for pulmonary infiltration and lymphadenopathy, respectively).

Comparison of the frequency of pulmonary infiltrates and lymphadenopathy found in our series and the other three series were also made as shown in (table 8).

Table 8. Comparison of the major findings with other series .

Series	Pulmonary infiltration (%)	Lymphadenopathy (%)
Leung AN. et al.(1)	69.11	92
Starke JR et al .(5)	52.73	73.64
Balachandra S.et al.(2)	36.17	14.93
Thanamee S. et al .	84.09	72.73

DISCUSSION

Koch isolated the etiologic agent *Mycobacterium tuberculosis* in 1882³. It is an obligate aerobic, non motile bacillus with acid fastness that is attributable to mycolic acid within the cell wall. Culture on enriched media is possible but slow, taking 2 to 8 weeks and sputum specimens are difficult to obtain in children. Diagnosis of tuberculosis in childhood is mostly indirect and is usually made on the basis of epidemiologic data, history of recent exposure to an infected adult, tuberculosis skin testing, the chest radiograph and physical examination⁴.

Our series had a slight older children predominance. There was 57.14% of cases in the " favored age "of 5 - 15 years. This is different from previous studies^{1,5}. The girls were affected more than boys in our series. There were 99.67% of cases with BCG vaccination. BCG vaccination, when effective apparently does not prevent infection but interferes with the hematogenous spread of tubercle bacilli, thus reducing the risk of severe pulmonary disease and its complications⁶.

The history of contact is an important clue that supports the diagnosis. A positive history

of contact in our series was found in 73.81% of the cases.

The diagnosis of primary tuberculosis in childhood is difficult to establish clinically due to lack of physical symptoms. At the time of diagnosis, 56-65% of children may be asymptomatic^{5,1}. In our series 20.23% were asymptomatic. The majority of these children were discovered by contact investigation of an adult with contagious tuberculosis. This strongly emphasized the need for diligent and thorough household investigation of adults with tuberculosis.

The major symptoms were fever, cough, weight loss, lymphadenopathy and hemoptysis. The positive chest radiographic findings were found in only 52.38% of the cases, confirming that active tuberculosis occurring in the pediatric population often has a negative chest radiograph in the early stage. The radiologic findings in our series were pulmonary infiltration, lymphadenopathy, calcification, pleural effusion, atelectasis and scarring.

The prominent abnormal finding identified

on the initial chest radiograph was pulmonary infiltration that was similar to the previous study² but was different from the other studies^{1,5} in that the radiologic hallmark of primary tuberculosis in childhood was lymphadenopathy. Findings reflect that each population must look at its own patients with tuberculosis and develop its own criteria for diagnosis. The published criteria used to diagnose tuberculosis from the United States or other countries may not be universal. In our series, pulmonary infiltration had a slight predilection for right lung involvement whereas no specific site or segment of pulmonary parenchymal involvement were noted in other series, documenting upper lobe⁷, and lower lobe⁸. Lymphadenopathy is one of the characteristics of childhood pulmonary tuberculosis in our series, but not a major feature. The nodal enlargement typically involved the hilar and paratracheal nodes, and the lateral chest radiograph was essential and of great diagnostic importance.

In our series, age group differences according to the radiographic pattern of pediatric primary tuberculosis were not as distinct as other studies^{1,2}. Calcification was usually found in the intrathoracic lymphadenopathy which almost always represent tuberculosis. Pleural effusion in primary tuberculosis was usually unilateral and loculated. Atelectasis and scarring were the least frequent findings in our series.

We conclude that the common radiologic findings in pediatric patient with primary tuberculosis in our series were pulmonary infiltration and lymphadenopathy, which were found in 84.09 % and 72.73 %, respectively. Another important point to emphasize is that negative chest roentgenograms will not exclude tuberculosis.

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REFERENCES

1. Leung AN, Muler NL, Pineda PR. Pulmonary tuberculosis in childhood: radiographic manifestations. *Radiology* 1992; 182:87-91.
2. Balachandra S, Pornkul R. The radiological manifestations of childhood pulmonary tuberculosis. *The Thai Journal of Radiology* 1984; 21: 107-16.
3. Smith MHD, Marquis JR. Tuberculosis and other mycobacterial infection. In: Feigin RD, Cherry JD. *Text book of Pediatric Infectious diseases*. Philadelphia: Saunders, 1987:1342-87.
4. Starke JR. Modern approach to the diagnosis and treatment of tuberculosis in children. *Pediatr. Clin. North. Am.* 1988; 35:441-64.
5. Starke JR, Taylor-Watts KT. Tuberculosis in the pediatric population of Houston, Texas. *Pediatrics* 1989;84:28-35.
6. Suider OE, Rieder HL. Tuberculosis in children. *Pediatr Infect Dis J.* 1988;7:271-8.
7. Weber AL, Bird RT, Janown ML. Primary tuberculosis in children with particular emphasis on changes affecting the tracheo bronchial tree. *AJR* 1966;103:123-32.
8. Woodring JH, Mac Vandeviere H, Fried AM. Update: the radiological features of pulmonary tuberculosis. *AJR* 1986;146:497-506.