

Original Research Article


# Radiological findings of pulmonary tuberculosis in adolescents in a teaching hospital, Sangareddy

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	International Archives of Integrated Medicine, Vol. 4, Issue 6, June, 2017.	
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	Available online at <a href="http://iaimjournal.com/">http://iaimjournal.com/</a>	
	ISSN: 2394-0026 (P)	ISSN: 2394-0034 (O)
	Received on: 09-06-2017	Accepted on: 15-06-2017
	Source of support: Nil	Conflict of interest: None declared.
<b>How to cite this article:</b> Chinta Vittal Prasad, Nagababu Pyadala. Radiological findings of pulmonary tuberculosis in adolescents in a teaching hospital, Sangareddy. IAIM, 2017; 4(6): 170-174.		

## Abstract

**Background:** Tuberculosis (TB) accounts for 1.7 million deaths, according to the recent WHO report. India alone accounts for one fifth (21%) of all the TB cases globally.

**Objectives:** Radiologic findings of pulmonary tuberculosis (TB) in adolescents.

**Materials and methods:** A cross-sectional, observational study of 170 patients with TB aged 10 to 19 years. Data were collected from the TB notification and medical records during the period of 2014-2017. Data were shown in tables and analyzed using the chi-square test, with a 5% significance level.

**Results:** Mean age was 15.6 years; 97 (57%) patients were males. The most common radiologic lesion was the upper pulmonary lobe infiltrates (43.33%), and isolated cavitation was found in 20.7% of the patients. Both lungs were affected in 32.2% of the patients. The finding of bilateral radiologic lesions was significantly associated with longer disease duration ( $p = 0.0005$ ).

**Conclusion:** Pulmonary TB in adolescents has similar characteristics to TB in adults, evidencing the important role played by adolescents to transmit the disease in community.

## Key words

Tuberculosis, Adolescents, Chest radiography.

## Introduction

Tuberculosis (TB) accounts for 1.7 million deaths, according to the recent WHO report. India alone accounts for one fifth (21%) of all the TB cases globally [1]. Although the real situation of tuberculosis (TB) in adolescents is not well-known, children and adolescents account for 3% to 25% of the TB cases registered in different countries, with high frequencies in areas of high disease burden [2]. In developed countries, TB affects mainly the elderly, but, in developing countries, the productive younger population is the most affected [3, 4]. Children play a limited role in TB transmission in the community, but adolescents can develop bacilliferous, thus transmissible pulmonary TB [5]. At that age, the individual is under development and undergoing behavioral and emotional changes, which can make adherence to treatment of prolonged diseases, such as TB, difficult. This can lead to treatment discontinuation, resulting in perpetuation of TB transmission in the community and appearance of resistant strains. Adolescents have greater social interaction and are more susceptible to illnesses and transmission of TB and other diseases. This study aimed at assessing radiological aspects of pulmonary TB in adolescents.

## Materials and methods

A cross-sectional, observational study of 270 patients with TB aged 10 to 19 years. Data were collected during the period of 2014-2017. Each notified case had the medical record located and scrutinized, along with the respective chest radiographic report present in the database of the BCG-Revac trial, which allowed the analysis of the radiologic patterns and their distribution according to age and disease duration [6]. Radiologic patterns were adapted from Marais, et al. [4]. The definition of adolescence of the World Health Organization that includes individuals aged 10 through 19 years, was adopted. Statistical analysis was performed with the software SPSS 20.0. The significance level was 0.05.

## Results

Among 170 patients, 57% were male and 42.9% were female. Mean age was 15.6 years (**Table - 1**). **Table - 2** shows the major characteristics of the chest radiographic findings. The most frequent types of radiologic lesion were as follows: infiltrates (43.5%); cavitations (20.6%); and condensation (12.35%). Hilar lymph node enlargement was found in 4.7% of the cases, and atelectasis in 0.6% of the cases. The TB radiologic lesions were bilateral in 31.7%.

**Table - 1:** Age-sex wise distribution of adolescents with pulmonary tuberculosis.

Category	Total cases
Male	97 (57%)
Female	73 (42.94%)
10-15 years	65 (38.23%)
16-19 years	105 (61.7%)

**Table - 2:** Findings of chest radiography of adolescents with pulmonary tuberculosis.

Category	Total cases
Normal	09 (5.3%)
Condensation	21 (12.35%)
Infiltrate	74 (43.5%)
Cavitations	35 (20.6%)
Pleural effusion	19 (11.1%)
Lymph-node pulmonary	08 (4.7%)
Miliary	03 (1.8%)
Atelectasis	01 (0.6%)
Bilateral lesions	54 (31.7%)

## Discussion

As the adolescent TB is similar to the TB disease in adults, the diagnostic tests and the diagnostic methods used in adults can also be used in adolescent age group. There are no special diagnostic guidelines for the diagnosis of tuberculosis among adolescents. The delay in the final diagnosis of Tuberculosis disease from the onset of symptoms is a big challenge in adolescents. The study conducted in Toronto, Canada has found that the average time from the onset of symptoms to diagnosis of Tuberculosis disease was 5.25 months with a median of 4

months [7]. The present study showed a predominance of characteristic lesions of re-infection or adult type TB in the adolescents assessed: 43.5% of chest x-rays had infiltrates in the upper third of the lungs, and 20.6% of the radiographs showed cavitations. In addition, most patients with cavitations were adolescents in the post pubertal stage (median of age, 16 years), a situation compatible with primo-infection occurring early in childhood. Chest radiograph was largely used in the services of the National TB Control Program emphasizing the importance of imaging diagnosis in health care services in India. Radiologic patterns of pulmonary TB allow us to infer several aspects of the pathogenesis and clinical picture of the patients assessed. Classically, there are two presentations of TB: primo-infection or primary TB, and reinfection. The former is more commonly found during childhood, and is characterized by uni- or bilateral hilar lymph node enlargement either in association or not with pulmonary infiltrates [4]. Likewise, hematogenous disseminations, also found in TB primo-infection, radiologically expressed as disseminated micronodular infiltrates, known as the miliary pattern [8]. In the present study, the primary TB presentation classified as lymph node-pulmonary, primary complex, and miliary added up to over 3% of the total. It is evident that the adolescents here studied had already developed TB primo-infection prior to the disease that made them look for health care. In India and in other countries with a high TB burden, TB primo-infection and primary TB are more common in children than in adults, because of the high likelihood of contact with *M. tuberculosis* during childhood. In developed countries, the likelihood of developing TB primo-infection can be postponed to adolescence or adulthood [8, 9]. Individuals who had TB primo-infection or had been vaccinated with BCG develop a type of immunogenic defense that, when exposed to a bacillary burden originating from a contagious source, relies on the immune memory to trigger phagocytosis of the bacilli, which then entry a state of metabolic inactivity [10, 11]. If the immune system fails re-

infection or adult-type TB can occur. In such cases, the chest radiograph shows characteristic infiltrates and cavitations in the upper pulmonary thirds, usually in the posterior segments. The most severe radiologic forms of re-infection TB appear as extensive bilateral lesions, cavitations, and bronchial dissemination of the disease [8]. In this study, cavitations were more common in adolescents aged 16 years or older, while lymph nodes enlargement were more common in patients aged 15 years or less. This distribution confirms the classical notion that more suggestive forms of primary TB occur in younger individuals and post-primary manifestations in older adolescents. The same analysis regarding sex, showed no difference. Pleural effusion due to TB, more common in adolescents and adults than in children, was observed in 11.1% of the patients. In this study, the most severe TB lesions were related to the longer duration of symptoms, possibly due to a diagnosis delay in health services. The effectiveness of TB control programs can be assessed through the delay to establish TB diagnosis [11]. This study had some limitations. One concern is the lack of information about some variables, such as demographic data and less number of cases. Similarly, comparison of our data with those reported in the literature could not be done as most studies in countries where TB is endemic and affects adolescents do not allow for separate analysis of that age group. TB control programs around the world use the cut-off point of 15 years to categorize patients as children or adults, and, thus, data referring to adolescents (over 10 years of age) can't be retrieved. In conclusion, most cases of TB in adolescents were similar to those in adults: apical pulmonary infiltrates, extensive lesions, and cavitations. Primary TB forms were rare [12]. Delay in diagnosis leads to the delay in the treatment of tuberculosis and thus increased infectivity of the diseased person in the community. It is observed that the compliance to TB treatment in adolescent age group is difficult because of different social issues. It is very important to promote Tuberculosis control programs in this age group because of their unwillingness to the adherence and acceptance of

the anti-tubercular treatment [13, 14, 15]. This delay may have accounted for the finding of severe lesions in many patients. Adolescents belong to a group that deserves special attention from health care providers, either due to their difficulty in adhering to prolonged treatments or to their reluctance to look for medical care. Thus, further efforts are recommended to improve the efficacy of the health care network for diagnosing TB and to provide more information regarding the complaints suggestive of TB in adolescents, aiming at earlier diagnosis of the disease.

### Conclusion

Pulmonary TB in adolescents has similar characteristics to TB in adults, evidencing the important role played by adolescents to transmit the disease in community.

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