

## Original Research

### Chest Radiographic Findings in Primary Pulmonary Tuberculosis

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#### ABSTRACT:

**Background:** The study was undertaken to describe the radiographic findings of primary pulmonary tuberculosis (TB) in previously healthy adolescent patients. **Materials and Methods:** Two independent examiners had examined the chest radiographs of 100 participants who had the same TB strains. Typical TB was defined as nodule(s), consolidation, or cavitation-like lesions in the upper lung zones. Atypical TB was defined as having lesions of nodule(s), consolidation, or cavitation in lower lung zones, as well as pleural effusion. **Results:** Cavitory lesions were present in 69(69%) students. Pleural effusion was observed in 1 patient, mediastinal lymph node enlargement was also seen in 1 patient. Hilar lymph node enlargement was seen in only 9 subjects (9%). Lesions with upper lung zone predominance were observed in 69 (69%) patients. Bilateral involvement of lung lesions was observed in 17(17%) patients. Overall, 46 (46%) students had the typical form of reactivation TB and 19 (19%) had TB lesions of the atypical form, based on chest radiograph findings. **Conclusion:** The most common radiographic features in primary pulmonary TB by recent infection in previously healthy teenagers are upper lung lesions, which were long thought to represent radiographic markers of reactivation pulmonary TB by remote infection.

**Keywords:** Adolescent, Mycobacterium tuberculosis, Pulmonary tuberculosis, Thoracic radiography

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#### INTRODUCTION

TB is a global health problem and the second leading infectious cause of death, after human immunodeficiency virus (HIV). As per the World Health Organization (WHO) reports, 6.1 million cases of TB were notified by national TB programs in 2012, of which 5.4 million were new cases.<sup>1</sup> Of these, 2.5 million had sputum smear-positive pulmonary TB (PTB), 1.9 million had sputum smear-negative PTB, and 0.8 million had extrapulmonary TB (EPTB); case type was unknown in the remaining cases. India accounted for 26% of total cases of TB worldwide in 2012. TB is one of the leading causes of mortality in India, killing two persons every 3 min, nearly 1000 every day.<sup>2</sup> The number of TB deaths is disappointingly large, given that the majority of these are preventable and that curative regimens have been available for a long time now. To confirm that TB in an adult is due to recent infection, we document recent tuberculin skin test conversions or utilize restriction fragment length polymorphism (RFLP)

analysis (DNA fingerprinting with the IS6110 insertion sequence) of *M. tuberculosis* isolates.<sup>3-5</sup> Isolates from patients infected with epidemiologically unrelated strains of TB have different RFLP patterns, whereas those from patients with epidemiologically linked strains generally have identical RFLP patterns. Therefore, clustered cases of TB, defined as those in which the isolates have identical or closely related genotypes, have usually recently been transmitted. Hence, this study was conducted to evaluate the radiographic findings of primary pulmonary TB in previously healthy adolescents.

#### MATERIAL AND METHODS

On the chest radiographs of 100 people who had the identical TB strains, restriction fragment length polymorphism analysis was done. Nodular, consolidation, or cavitation lesions in the upper lung zones were regarded as typical TB lesions. Lesions with nodules, consolidation, or cavitation in the lower lung zones, as well as pleural effusion, were

considered to be signs of atypical TB. Every participant in our study underwent a chest radiography examination in the first grade of middle or high school. Because all of these students were previously healthy and had normal chest radiographs at their previous student medical checkups, we defined the most recent infection discovered by RFLP analysis as primary TB.

## RESULTS

Cavitary lesions were present in 69(69%) students. Pleural effusion was observed in 1 patient, mediastinal lymph node enlargement was also seen in 1 patient. Hilar lymph node enlargement was seen in only 9 subjects (9%). Lesions with upper lung zone predominance were observed in 69 (69%) patients. Bilateral involvement of lung lesions was observed in 17(17%) patients. Overall, 46 (46%) students had the typical form of reactivation TB and 19 (19%) had TB lesions of the atypical form, based on chest radiograph findings.

**Table 1: Demonstrates summarized abnormal chest radiographic findings in remaining 100 subjects.**

Variables	Number of subjects
Small nodules	89
Large nodules	71
Cavity	69
Consolidation	21
Hilar lymph node enlargement	09
Mediastinal lymph node enlargement	01
Pleural effusion	01

## DISCUSSION

Primary TB is acquired by inhalation of airborne organisms and occurs in patients not previously exposed to *Mycobacterium tuberculosis*. It commonly affects infants and children in endemic areas. However, primary TB is now increasingly encountered in adult patients, accounting for 23-34% of all adult cases and even more in non-endemic areas.<sup>6,7</sup> The primary parenchymal focus is known as the Ghon focus and the combination of Ghon focus and enlarged draining LNs constitutes the primary complex: The Ranke or Ghon complex.<sup>8</sup>

In this study, cavitary lesions were present in 69(69%) students. Pleural effusion was observed in 1 patient, mediastinal lymph node enlargement was also seen in 1 patient. Hilar lymph node enlargement was seen in only 9 subjects (9%). Lesions with upper lung zone predominance were observed in 69 (69%) patients. Bilateral involvement of lung lesions was observed in 17(17%) patients. Overall, 46 (46%) students had the typical form of reactivation TB and 19 (19%) had TB lesions of the atypical form, based on chest radiograph findings.

Won-Jung et al<sup>9</sup> described the radiographic findings of primary pulmonary tuberculosis (TB) in previously healthy adolescent patients. The Institutional Review Board approved this retrospective study, with a waiver of informed consent from the patients. TB outbreaks occurred in 15 senior high schools and chest radiographs from 58 students with identical strains of TB were analyzed by restriction fragment length polymorphism analysis by two independent observers. Lesions of nodule(s), consolidation, or cavitation in the upper lung zones were classified as typical TB. Mediastinal lymph node enlargement; lesions of nodule(s), consolidation, or cavitation in lower lung zones; or pleural effusion were classified as atypical TB. Inter-observer agreement for the presence of each radiographic finding was examined by kappa statistics. Of 58 patients, three (5%) had normal chest radiographs. Cavitary lesions were present in 25 (45%) of 55 students. Lesions with upper lung zone predominance were observed in 27 (49%) patients, whereas lower lung zone predominance was noted in 18 (33%) patients. The remaining 10 (18%) patients had lesions in both upper and lower lung zones. Pleural effusion was not observed in any patient, nor was the mediastinal lymph node enlargement. Hilar lymph node enlargement was seen in only one (2%) patient. Overall, 37 (67%) students had the typical form of TB, whereas 18 (33%) had TB lesions of the atypical form. The most common radiographic findings in primary pulmonary TB by recent infection in previously healthy adolescents were upper lung lesions, which were thought to be radiographic findings of reactivation pulmonary TB by remote infection.

Eini P et al<sup>10</sup> determined the radiological changes in patients with smear positive pulmonary tuberculosis. In this study, 325 patients with smear positive pulmonary TB were enrolled. The affected lobe or lobes of the left or right lung were recorded. The types of involvement were categorized based on patchy consolidation, cavitation, collapse consolidation and bronchopneumonia. The data were collected and analyzed. From the 325 patients, 116 (35.7%) were males and 209 (64.3%) were females. The most frequent involved site was the left upper lobe in 175 (53.8%) followed by the right upper lobe in 134 (41.2%) cases. The most frequent radiographic finding was bronchopneumonia in 242 (74.4%) cases. Patchy consolidation was detected in 99 (30.4%) patients. Cavitary lesion and pleural effusion were observed in 68 (20.9%) and 35 (10.7%) patients, respectively. The results showed that pulmonary upper lobes were the most frequent involved sites.

## CONCLUSION

The most common radiographic features in primary pulmonary TB by recent infection in previously healthy teenagers are upper lung lesions, which were long thought to represent radiographic markers of reactivation pulmonary TB by remote infection.

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