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Chest radiological features among patients with smear positive pulmonary tuberculosis

Abstract

Background: Chest x-ray has an important role in the diagnosis of tuberculosis (TB). The aim of this study was to determine the radiological changes in patients with smear positive pulmonary tuberculosis.

Methods: In this study, 325 patients with smear positive pulmonary TB was 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.

Results: 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. Cavitory lesion and pleural effusion were observed in 68 (20.9%) and 35 (10.7%) patients, respectively.

Conclusion: The results show that pulmonary upper lobes were the most frequent involved sites.

Keywords: Pulmonary tuberculosis, Smear positive TB, Chest X-ray.

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Tuberculosis (TB) is one of the most common causes of mortality in the world. This disease usually affects the lungs, but in about one-third of the cases, the other organs may be affected (1). Approximately, 3-4% of those infected with TB infection will develop into active disease within the first year and in 5-15% in the later years (2, 3). The rate of developing active disease in people with HIV infection will be much higher (4). Detection of acid-fast bacilli using sputum smear is the primary method of diagnosis in tuberculosis (5). Chest radiography has an essential role to evaluate the patients with suspected pulmonary tuberculosis, if chest x-ray is not clear enough to make a diagnosis, a chest CT scan can be used (6, 7).

Pulmonary tuberculosis is divided into two forms, primary and secondary (post primary). Primary tuberculosis is common in childhood often asymptomatic with fewer clinical and pathological findings on the chest. Hilar and mediastinal lymph nodes are involved in this form of disease (8). Secondary tuberculosis is caused by the reactivation of dormant primary tuberculosis, and radiographic findings are seen mostly in the apical and posterior segments of the upper lobes and the superior segment of the lower lobes (9).

Patchy infiltrations with undefined borders are common findings (10). The treatment of the disease plays a significant role in preventing the spread of TB (11). The aim of this study was to determine the radiological changes in patients with smear positive pulmonary tuberculosis in Zabol, which is located in Southeast Iran.

Methods

In this study, 325 patients with smear positive pulmonary TB infections from March 2010 to March 2011 were enrolled. The medical records of all the patients with TB were studied. The patients who were enrolled in this study had at least two positive smears from three samples performed with Ziehl-Neelsen staining method. The patients with extra pulmonary tuberculosis and those with smear negative were excluded from the study. Chest radiographs were taken in the posterior to anterior view. Questionnaires were used to obtain demographic and clinical information, including the affected lobe or lobes of the left or right lung. The types of involvement were categorized based on patchy consolidation, cavitation, collapse consolidation and bronchopneumonia. The data were collected and analyzed.

Results

Three hundred- twenty five TB patients participated in this study, 116 (35.7%) were males and 209 (64.3%) were females. The highest number of patients was in the age group more than 65 years old, with 92 (28%) patients. The second highest number was between age group 51-65 years, with 65 (20%) patients. The frequency of TB patients with smear positive according to age groups is shown in table 1.

Table 1. Frequency of smear positive pulmonary TB patients according to age groups

| Age Group (year) | Number (%) |
|------------------|------------|
| <10 | 0 |
| 11-20 | 35 (11) |
| 21-30 | 32 (10) |
| 31-40 | 42 (13) |
| 41-50 | 59 (18) |
| 51-65 | 65 (20) |
| >65 | 92 (28) |

The most frequent involved site was the left upper lobe in 175 (53.8%) patients, right upper lobe in 134 (41.2%) cases, left lower lobe in 120 (36.9%) patients and the right lower lobe of 94 (28.9%) patients. The least involved was observed in the right middle lobe in 57 (17.5%) patients. Regarding radiographic findings, bronchopneumonia was seen in 242 (74.4%) patients patchy consolidation in 99 (30.45%), cavities in (20.9%) and lymphadenopathy in 63

(19.3%) cases. Other radiologic findings are shown in table 2.

Table 2. Radiologic findings in smear positive pulmonary TB patients according to gender

| Radiologic findings | Male Number (%) | Female Number (%) |
|---------------------|--------------------|----------------------|
| Normal CXR | 3 (2.5) | 5 (2.4) |
| Patchy infiltration | 38 (32.7) | 61 (29.2) |
| Cavities | 25 (21.5) | 43 (20.6) |
| Bronchopneumonia | 85 (73.2) | 157 (75.1) |
| Pleural effusion | 14 (12) | 21 (10) |
| Lymphadenopathy | 22 (18.9) | 41 (19.6) |
| Calcification | 2 (1.7) | 6 (2.9) |
| Consolidation | 4 (3.4) | 24 (11.5) |
| Tuberculoma | 8 (6.8) | 20 (9.5) |
| Bronchiectasis | 6 (5.1) | 6 (2.9) |
| Emphysema | 0 | 2 (0.9) |
| Total | 116 (35.7) | 209 (64.3) |

Discussion

Tuberculosis is considered a serious health threat to human health since a long time ago, close attention and timely detection of chest radiographic changes related to tuberculosis leads to early diagnosis, treatment and prevents the spread of tuberculosis. The positive predictive values and sensitivity of chest x-ray for TB were reported to be 61% and 67%, respectively (12).

In our study, the most common chest x-ray finding was bronchopneumonia, which was seen in 242 (74.4%) patients. The rate of bronchopneumonia in our study was higher reported by the others which was between 16-57% (13-15). A similar study performed on 546 patients by Geng et al. in Columbia University, 60.5% of patients demonstrated typical radiographic changes (16). In the present study, cavitory lesions were seen in 68 (20.9%) patients however, other studies showed cavitory lesion in 14.8%-51.8% of their cases (13-16). In the present study, hilar and mediastinal adenopathy was seen in 63 (19.3%) patients, but other studies showed this finding in 44%-65% of their patients (13-17). Pleurisy was seen in 10.7% of our patients but other studies reported pleurisy in 7-24.5% of their patients (14, 15, 17). In this study, eight patients (2.46%) had normal chest x-ray but other studies showed normal radiography in 0.8-8%

of their cases (14, 15). In Cohen's study, all patients had abnormal radiological findings (18). In our study, the most affected lobe was the left upper lobe with 175 (53.8%) cases and right upper lobe with 134 (41.2%) cases, while Hatami et al. reported the involvement of the right upper lobe in 50.8% of their cases and the left upper lobe in 43.8% of them (14).

The weakness of this study is the lack of lateral chest radiograph profiles. Lateral chest x-rays are not taken routinely from TB patients in medical centers, while this type of chest radiography is very helpful to examine the lung, hilar structures and parts of the lung located behind the heart. Given the endemic nature of TB in Iran and increased incident of TB in patients with immunodeficiency diseases such as HIV.

We have to pay careful attention to chest radiographs and any pathological findings such as haziness, consolidation, and cavitory lesion and others especially the upper lobe of the lung must be carefully examined and TB must be suspected and included on top of our differential diagnosis list.

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