

Study on the chest radiographic results in patients with pulmonary tuberculosis referred to zabol tuberculosis center: A descriptive study

Razieh behzadmehr*, Elham Nejadkehkha

Abstract

Introduction: Tuberculosis is the most common cause of death from infectious diseases in the world. The aim of this study was to evaluate the findings of chest radiography in patients with pulmonary tuberculosis referred to Zabol tuberculosis center.

Material and methods: This descriptive-analytical study was performed on 101 patients with positive tuberculosis in from January to December 2020. Data were collected using an information form and finally analyzed by SPSS software version 22.

Results: In this study, 101 patients were studied, of which 71 were female and 30 were male, and the mean age of patients was 62.68 ± 13.61 years. The frequency of turbidity in patients with smear grade 1, 2 and 3 was 71.4%, 78.5% and 76.5%, respectively. The frequency of cavitation in patients with grade 1, 2 and 3 was 11.5%, 28.5% and 52.9%, respectively. The frequency of nodular view in patients with grade 1, 2 and 3 was 18.6, 42.8 and 35.3%, respectively.

Conclusion: In general, the results of this study showed that with increasing smear grading, the frequency of cavitation cases increases significantly and the frequency of reticulonodular view cases decreases significantly.

Keywords: Tuberculosis; Chest radiography; Smear grade

Introduction

Tuberculosis is a bacterial disease caused by *Mycobacterium tuberculosis* and sometimes *Mycobacterium bovis*. About one-third of the world's population (2 billion people) is infected with the tuberculosis virus and is at risk of contracting tuberculosis, and each year about 9 million people become infected with active tuberculosis (1 to 2 million people) and die from the disease.¹

It is the leading cause of death from single-agent infectious diseases (even more so than AIDS, malaria, and measles) and ranks tenth in the global burden of disease, and is projected to maintain its current status by 2020 and even reaches to rank seventh.² The basis of the diagnosis of pulmonary tuberculosis is a direct and simple test of patients' sputum is suspected. In the best case, the sensitivity of the sputum test in the diagnosis of pulmonary tuberculosis is fifty to sixty percent.^{3,4} In pulmonary form, children often get sputum or gastric juice test results are usually negative even in culture, so the diagnosis is mainly based on clinical history, history of contact of a child with

pulmonary tuberculosis with a positive sputum smear (especially in the family), chest radiography and tuberculin test.⁵ According to standard definitions of a patient who has at least two positive sputum smear tests for fast acid bacilli. Or a patient who has only one sputum test positive for fast acid bacilli with radiographic changes in the chest confirming pulmonary tuberculosis. Or a case of positive smear in terms of acid-fast bacilli accompanied by sputum culture is considered positive smear tuberculosis.⁶ The degree of positive smear is determined based on the number of bacilli in each microscopic field. Some studies have considered the degree of positivity of the primary smear to be effective in determining the outcome of treatment and have named it as a predictor that if the degree of positivity is more, the probability of treatment failure and death is higher.^{7,8} In some studies, the relationship between the degree of positivity of the primary smear and clinical manifestations has been suggested.⁹

Chest radiography is also a suitable and sensitive tool for diagnosing lung lesions, including tuberculosis, so that if the chest picture is normal, the diagnosis of tuberculosis is partially removed.¹⁰ On the other hand, in cases where we are actively looking for this disease and when it is diagnosed in its early stages, pulmonary involvement can indicate our success in early detection of these patients, which is achieved by radiographic findings. No study is performed about chest radiographic results in patients with pulmonary tuberculosis in Iran and chest radiographic findings of patients, and in the world few studies have been done in this regard, and due to the importance of this issue in early diagnosis and reduction of transmission of infection and treatment, this study was performed to determine the radiographic findings of the chest in patients with pulmonary tuberculosis.

Methods

This descriptive-analytical study was performed on all patients with pulmonary tuberculosis referred to Zabol Tuberculosis Center from January to December 2020, except for patients with immunodeficiency hepatitis and diabetes. In this study, 101 patients were studied, of which 71 were female and 30 were male. Samples were recorded according to a checklist that included demographic information, sputum smear grade, and radiographic findings of the chest. Demographic information of patients such as age, sex and place of residence as well as smear information and its degree and chest radiographic findings were collected. Data were collected using SPSS software in the form of frequency, percentage, mean and standard deviation and analyzed the data using chi-square test.

Result

Of the 101 participants, 71 (70.3%) were male and the rest were female. The mean age of patients was 62.68 years with a standard deviation of 13.61. The youngest and oldest patients were 18 and 86 years old, respectively. There was no significant difference between the two sexes in terms of grade smear ($p=0.192$).

Department of Radiology, Zabol University of Medical Sciences,
Zabol, Islamic Republic of Iran

Corresponding author: Razieh behzadmehr
e-mail: razbebehzadmehr@gmail.com

The frequency of turbidity in patients with smear grade 1, 2 and 3 was 71.4%, 78.5% and 76.5%, respectively. This difference in turbidity in patients with different grades was not statistically significant ($p=0.833$) (Table 1).

Table 1: Frequency of turbidity cases by degree of smear.

| | | Grade1 | Grade2 | Grade3 | P value |
|---------------|-----|--------|--------|--------|---------|
| Consolidation | Yes | 50 | 11 | 13 | 0.833 |
| | | 71.40% | 78.50% | 76.50% | |
| | No | 20 | 3 | 4 | |
| | | 28.50% | 21.40% | 23.50% | |

The frequency of cavitation in patients with grade 1, 2 and 3 was 11.5%, 28.5% and 52.9%, respectively. This difference in the frequency of cavities in the three groups was statistically significant ($P=0.001$) (Table 2).

Table 2: Frequency of cavities by degree of smear.

| | | Grade1 | Grade2 | Grade3 | P value |
|------------|-----|--------|--------|--------|---------|
| Cavitation | Yes | 8 | 4 | 9 | 0.001 |
| | | 11.50% | 28.50% | 52.90% | |
| | No | 62 | 10 | 8 | |
| | | 88.50% | 71.40% | 47.05% | |

The frequency of nodular view in patients with grade 1, 2 and 3 was 18.6%, 42.8% and 35.3%, respectively. This difference in the frequency of nodular view in the three groups was not statistically significant ($p=0.086$).

The frequency of reticulonodular involvement in patients with grade 1, 2 and 3 was 24.2%, 7.1% and 0.0%, respectively. This difference in the frequency of reticulonodular involvement in the three groups was statistically significant ($p=0.022$). On the other hand, patients with reticulonodular involvement were significantly more likely to have grade 1 smear. The lowest frequency of reticulonodular view belonged to grade 3 smears.

Discussion

In this study, 101 patients with tuberculosis were studied. Of these, 71 (70.3%) were female and the rest were male. In the studied patients, 70 cases had grade 1 (74.3% female and 25.7% male), 14 cases had grade 2 (male=female) and 17 cases had grade 3 (70.6% female and 29.4% male). As a result, there was no significant difference between the two sexes in terms of grade smear ($p=0.192$). Due to the lack of similar studies that have examined the relationship between sexes and smear grading, the findings of this study cannot be compared. The mean age of patients was 62.68 years with a standard deviation of 13.61. The youngest and oldest patients were 18 and 86 years old, respectively. The mean age of patients with grades 1, 2 and 3 was 64.47, 62.07 and 55.82 years, respectively. The age difference between patients in different grades was not statistically significant ($p=0.122$). There was also no relationship between increasing or decreasing age and smear rating. In other studies children under 15 years of age were in the study group and therefore due to differences in the study population it is not possible to compare the results. Most of the patients were from Zabol city (52.5%) and the least of them were from Hamoon and Helmand cities (2%). The frequency of turbidity in patients with 1, 2 and 3 smear degrees was 71.4, 78.5 and 76.5%, respectively. This difference in the degree of turbidity

in patients with different grades was not statistically significant. ($P=0.833$) Although patients with grade 2 had more turbidity than patients with grade 1 and 3, but the difference between the three groups was not significant. The opacity was the same, so there does not appear to be a correlation between the degree of smear and the opacity in the graph. This finding is not consistent with other studies. In Minko study, with increasing smear degree (+1, +2, +3 or +4), the frequency of turbidity cases increased significantly and its frequency increased to +1, +2, +3 and +4 degrees. It was 81%, 95% and 100%, respectively. In the study of Ores, with increasing the degree of smear, the number of turbidity cases also increased significantly. Matsuka also showed that the frequency of turbidity increased with increasing number of fast acid bacilli. The reason for the difference between the results of this study and other studies can be attributed to the fact that we have studied in this study Chest radiographs were based on smear grading, while other studies examined the relationship between CT scan and HRCT findings and smear grading. The frequency of cavitation in patients with grades 1, 2, and 3 was 11.5%, 28.5%, and 52.9%, respectively. This difference in the frequency of cavities in the three groups was statistically significant ($P=0.001$). Patients with different grades were different in terms of cavitation, i.e. in patients with grade 3 cavitation was significantly higher than patients with grade 1 and 2, so it seems to be between smear degrees. And there is a connection hole. In Minko study, with increasing smear degree (+1, +2, +3 or +4), the frequency of CT scan findings including cavitation also increased significantly, so that the frequency of Cavitation cases in degrees +1, +2, +3 and +4 were 33%, 68%, 94% and 100%, respectively. In Ores study, cavitation increased significantly with increasing smear degree. The frequency of cavitation increased with increasing number of fast acid bacilli. Cavitation had a significant relationship with smear rating. This study showed that the frequency of nodular view in patients with grade 1, 2 and 3 was 18.6, 42.8 and 35.3%, respectively. The difference between the frequency of nodular view in the three groups was not statistically significant ($P=0.086$). Although patients with grade 2 had more nodular view than patients with grade 1 and 3, the difference between the three groups of smear was not significant. There is no correlation between nodules and graphs. The frequency of nodules increased with increasing smear degree but their difference was not statistically significant ($P=0.16$).

In the study of Ores, with increasing the degree of smear, the score of nodules also increased significantly ($P=0.0001$). The frequency of reticulonodular involvement in patients with grade 1, 2 and 3 were 24.2%, 7.1% and 0%, respectively. This difference in the frequency of reticulonodular involvement in the three groups was statistically significant ($p=0.022$). On the other hand, patients with reticulonodular involvement had significantly more grade 1 smears. And the lowest frequency of reticulonodular lesions belonged to grade 3 smears (0.0%). These results showed that between the degree of smear and involvement, there is a reticulonodular involvement in the connection graph, so that with increasing smear rating (+1, +2 and +3) the frequency of reticulonodular view decreases. Due to the lack of similar studies examining CXR findings based on smear rating, the findings cannot be compared with this study.

Conclusion

In general, the results of this study showed that with increasing smear grading, the frequency of cavitation cases increases significantly and the frequency of reticulonodular view cases decreases significantly.

Conflict of interest

The authors declare that they have no conflicts of interest.

References

1. Global tuberculosis control; epidemiology, strategy, financing, WHO report, Geneva, World health organization. 2009; 4 (5):22-30.
2. Treatment of tuberculosis. Guideline for national programmes, 4th ed. Geneva, World health organization. 2006; 3(8):23-8.
3. Tuberculosis statistics 2010, Geneva, world Health organization, 2010; 2(3):45-60.
4. Tuberculosis statistics of Iran, communicable disease management Center Ministry of Health and Medical Education, Annual meeting kerman, Iran. 1389; 3(2):32-38.
5. Nasehi , Mahshid, Myrhqany, et al. Country Guidelines of tuberculosis (second edition) Communicable disease management Center, Ministry of Health and Medical Education.1388; 6(8):12-19.
6. Nasehi M, Myrhqany L. Country Guidelines of tuberculosis (second edition) Communicable disease management Center, Ministry of Health and Medical Education 1388; 32(2):89-98.
7. PG Gopi, V mChandrasekaran, R Subramani, et al. Association of conversion & cure with initial smear grading among new smear positive pulmonary tuberculosis patients treated with category 1 regimen Indian. J Med Res. 2006;123:807-814 .
8. SR Kanade, G Nataraj, R Anita, et al. Correlation between smear positivity grade at two months with culture positivity and final outcome in patient receiving anti tuberculosis treatment. Bombay Hospital Journal 2010; 52(2):183-187.
9. Jann-Yuan Wang, Li-Na lee, Chong-Jenyu, et al. Factors influencing time to smear conversion in patient with smear-positive pulmonary tuberculosis. Respirology 2009; 14:1012-1019.
10. S Bawri, S Ali, C Phukan, et al. Study of sputum conversion in New Smear positive pulmonary Tuberculosis Cases at the monthly Intervals of 1st,2nd &3rd month Under Directly observed treatment ,short course (Dots) Regimen. Lung India 2008; 25(3):118-123.