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Post-Tuberculosis Radiological Sequelae in Patients Treated for Pulmonary Tuberculosis: An Observational Study

Aarati Adhikari[1], **Shradha Shrestha**[1], **Rajesh Acharya**[1], **Manish Mishra**[1]

[1]Department of Radiology, College of Medical Sciences-Teaching Hospital, Bharatpur, Chitwan, Nepal.

ABSTRACT

Background

Tuberculosis (TB) is a preventable and usually curable disease. However, the residual radiological lesions may persist even after the successful treatment. This study aims to assess the spectrum of post-TB radiological sequelae on chest CT scans in patients who have completed pulmonary TB treatment in a tertiary care facility.

Methods

A cross-sectional analytical study was conducted among 117 adult patients (18 years or above) with clinical or microbiological diagnosis of pulmonary TB and who completed the treatment for more than 1 year. Patients with previous history of other lung diseases like chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD), treatment failure and multidrug resistant (MDR) tuberculosis were excluded. A non-probability purposive sampling technique was used for data collection. Data was entered and analyzed by using SPSS-16.

Results

Out of total 117 cases of TB, residual lesions were seen in 104 cases (88.89%). Of the residual lesions, 54.80% were parenchymal, 6.7% were pleural and 2.9% were mediastinal. Overlap lesions like pleuro-parenchymal and parenchymal-mediastinal were 31.7% and 3.8% respectively.

Conclusions

A higher percentage of TB cases that were treated had residual radiological lesions. Pulmonary fibrosis was more common followed by pleural thickening.

Keywords: post-tuberculosis; radiological sequelae; fibrosis; pleural thickening.

Correspondence: Dr. Aarati Adhikari, Department of Radiology, College of Medical Sciences-Teaching Hospital, Bharatpur, Chitwan, Nepal. Email: luckyaarati@gmail.com, Phone: +977-9841173277. **Article received**: 2025-03-16. **Article accepted**: 2025-08-12. **Article published**: 2025-12-30.

INTRODUCTION

Tuberculosis (TB) is one of the world's leading causes of death from a single infectious agent. More than 10 million people continue to fall ill with TB every year and the number has been rising since 2021. The WHO estimates the global incidence of TB in 2023 to be 10.8 million.[1] TB is one of the major public health burdens in Nepal.[2] The total TB incidence in 2023 in Nepal is 229 per 100,000 population followed by 54 number of deaths per 100,000 population.[1] Even after the completion of treatment, patients continue to exhibit a diverse array of symptoms and radiological sequelae. These residual changes can significantly impact a person's quality of life.[3] Khan et al. elaborated the spectrum of radiological sequelae in patients already treated for the pulmonary tuberculosis and has classified them into the parenchymal, airway , pleural, vascular and mediastinal.[3] Parenchymal lesions include tuberculoma, cavity, aspergilloma and bronchogenic carcinoma. Airway disease includes bronchiectasis, tracheobronchial stenosis. Mediastinal lesions include lymph node calcification, esophago-bronchial and esophago-mediastinal fistula, constrictive pericarditis and fibrosing mediastinitis. Pleural calcification, fibro-thorax, bronchopleural fistula, chronic empyema, and pneumothorax are examples of pleural lesions.[4] This study aims to assess the range of radiological sequelae that are visible on a CT scan chest in post TB patients. The sequelae, when symptomatic, negatively affect patient's quality of life.[5] The findings of this study will facilitate to formulate the guidelines necessary for evidence-based management of patients with post-TB sequelae.

METHODS

This is a hospital based analytical cross-sectional study conducted over the period of 6 months from August 2024 to January 2025 in Department of Radiology, College of Medical Sciences Teaching Hospital, Bharatpur, Chitwan, Nepal. The research proposal of this study was approved by the Ethical Review Committee of COMS-TH **(Ref. No.)**. This study includes 117 adult patients (18 years or above) with clinical or microbiological diagnosis of PTB and had completed the treatment for more than 1 year. CT scan chest of patients with history of treatment completion for pulmonary TB were studied. Patients with previous history of other lung diseases like chronic obstructive pulmonary disease and interstitial lung disease, treatment failure and multidrug resistant tuberculosis were excluded from the study. Data was collected from CT scan films of all the post tubercular patients who were recommended for CT scan chest from other departments. Well informed, verbal as well as written consent was taken from all the study participants. Data on demographics, comorbid conditions, laterality, radiological sequelae on CT scan chest was collected in a predesigned proforma. CT scan chest were evaluated by two independent Radiologists. Radiological sequelae were evaluated and classified into parenchymal, pleural and mediastinal lesions. The data was entered and analyzed using SPSS 16. Percentage for qualitative variables of PTB sequelae was carried out.

RESULTS

A total of 117 patients under the inclusion criteria were included in the study. There were 68.37% male (n= 80) and 31.63% female (n= 37) with mean age of 63 years. Complete radiological resolution of pulmonary tuberculosis was seen in 13 cases (11.11%). Residual lesions were observed in 104 cases (88.89%). Among the residual lesions, 57 cases (54.80%) were solely parenchymal, 7 cases (6.7%) were pleural and 3 cases (2.9%) were mediastinal nodes. Rest of the cases had overlap lesions, 33 cases (31.7%) were pleuro-parenchymal and 4 cases (3.8%) were mediastinal - parenchymal (Table 1).

Out of 104 patients with residual lesions, total 89 cases (85.5%) of residual pulmonary fibrosis were observed. Among 89 cases, bilateral fibrosis was seen in 64 cases (61.5%) and unilateral in 25 cases (24%). Similarly, total 40 cases (38.5%) of residual pleural lesions was seen. Out of 40 cases, bilateral pleural thickening was observed in 19 cases (18.2%) and unilateral thickening in 8 cases (7.6%). Similarly, 3 cases (2.8%) had pleural effusion on both sides and 5 cases (4.8%) on unilateral side. Bilateral pleural

calcification was seen in 2 cases (2%) and unilateral on 3 cases (2.8%).

Table 1. Distribution of the residual lesions. (n=104)	
Radiological sequelae	**Frequency (%)**
Parenchymal sequelae	
Fibrosis only	32(30.7)
Bronchiectasis only	5(4.8)
Fibrosis+Bronchiectasis+Granuloma	20(19.2)
Pleural sequelae	
Pleural thickening	6(5.7)
Pleural effusion	1(1.0)
Calcified mediastinal lymph nodes	3(2.9)
Pleuro-parenchymal sequelae	
Fibrosis, bronchiectasis and pleural thickening	21(20.1)
Fibrosis and pleural effusion	7(6.7)
Fibrosis and pleural calcification	5(4.8)
Mediastinal-parenchymal sequelae	
Calcified lymph nodes and fibrosis	4(3.8)

DISCUSSION

In this study, we observed that despite complete treatment and adequate clinical response of pulmonary tuberculosis, large number of patients are left with the residual radiological sequelae. Pulmonary tuberculosis with parenchymal changes is the most common form of tuberculosis.[6] This fact corroborates with observation of maximum number of residual parenchymal changes in current study. The long-term effect of these sequelae is pulmonary-related symptoms like dyspnoea and cough, thus negatively affecting health-related quality of life.[7,5] Up to 40% of the patients with post primary tuberculosis showed a marked pulmonary fibrosis manifesting as atelectasis of the upper lobe with retraction of hilum and mediastinal shift towards the fibrotic lung.[8, 9] Similar findings were observed in present study where total 85.5% of the patients had pulmonary fibrosis.

Gohar Ali et al., conducted an observational study at a tertiary care center in Pakistan for post TB sequelae in patients treated successfully for TB. The study showed that, out of 155 patients, only 11patients (9%) had complete resolution of the disease, whereas 91% patients developed post treatment parenchymal and pleural sequelae. The result of this study showed that parenchymal involvement is the most common form of TB.[10] This was similar to current study where, out of 117 patients, only 13 patients (11.11%) had complete resolution of the disease whereas 88.89% patients developed parenchymal, pleural and mediastinal sequelae. Parenchymal sequelae was the most common residuals. Thus, the parenchymal involvement has to be diagnosed promptly for early intervention and proper management

In a retrospective study by Zubair et al., a total of 321 patients with a mean age of 44 years (SD 19) were studied. They concluded that 82.8% of patients had post-TB radiological sequela with fibrosis being the most common pathology followed by pleural thickening.[10] This was similar in current study, where pulmonary fibrosis was seen as the most common radiological sequelae followed by pleural thickening. Hatipoglu et al., had observed bronchiectasis in 30-60% of the patients with active post primary tuberculosis on HRCT chest. [11] In present study, 24.9% of the patients had bronchiectasis. Cicatricial bronchiectasis followed by cystic bronchiectasis was observed commonly in the upper lobes. Tuberculous pleuritis usually get resolve completely even in the absence of treatment. [12] However, in some, chronic complications may occur during the healing of the tuberculous lesions. Pleural residual lesions in the form of pleural thickening, pleural calcification and fibrothorax have been described.[13] Kwon and collegues observed the incidence of residual pleural opacity as 68.3% (40 out of 60 cases) on CT scan. [14] In current study, total residual pleural lesion was 38.5%. The incidence of mediastinal lymph nodes is high during childhood and it decreases with increasing age.[15] This could be one of the reasons for less number of calcified mediastinal lymph nodes in present study as this study range from an age group of 18 to 92 years.

In a retrospective analysis by Deshpande et al., CT scan chest of 100 patients with history of treated pulmonary tuberculosis were observed. CT findings were analysed based on parenchymal, airway, pleural, mediastinal, and vascular sequelae

of PTB. Parenchymal sequelae included fibrosis with architectural distortion and volume loss (90%), cavities (21%) and tuberculomas (54%). Airway involvement was noted as bronchiectasis (77%) and bronchial stenosis (4%).[16] Lee et al., concluded that micronodules are useful diagnostic sign of tuberculosis and these were found in 100 % patients and persisted in 75% of patients after treatment. Micronodules on CT scans denoted inflammatory lesions in bronchioles. They noted cavities in 73% of patients and persisted in 35% of patients after treatment.[17] Similarly, in present study, we noted cavities in 17% of the patients. Possibly, in those cases which did not show any residual changes on radiography after treatment, the lesions healed before necrosis developed.[18]

CONCLUSIONS

Post TB radiological sequelae in this study population is high. They cause pulmonary dysfunction and increase pulmonary-related deaths, thus adversely affecting the quality of life. Based on findings of this study, further research can be done to design a management protocol in post-TB patients with sequelae.

Conflict of interest: None

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