Section: Respiratory Medicine

Original Research Article

ASSESSMENT OF SYMPTOMS, RADIOLOGICAL FINDINGS AND PULMONARY FUNCTIONS IN PREVIOUSLY TREATED DRUG SENSITIVE PULMONARY TUBERCULOSIS PATIENTS

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Received *: 21/09/2025*
Received in revised form *: 08/11/2025*
Accepted *: 28/11/2025*

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DOI: 10.70034/ijmedph.2025.4.447

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (4); 2473-2478

ABSTRACT

Background: Tuberculosis (TB), primarily caused by Mycobacterium tuberculosis, remains a significant public health concern globally. Although pulmonary tuberculosis (PTB) is curable with appropriate anti-tubercular therapy (ATT), many patients experience persistent respiratory impairment post-treatment, now recognized as post-TB lung disease (PTLD). PTLD includes a wide spectrum of structural and functional lung abnormalities, contributing to morbidity and reduced quality of life. Despite its burden, PTLD remains under-recognized and poorly addressed in current TB control programs.

Materials and Methods: We conducted a cross-sectional, observational hospital-based study focusing on patients who had completed treatment for drug-sensitive pulmonary tuberculosis at the Department of Respiratory Medicine, SHKM GMC, Nalhar. Pulmonary function was assessed using spirometry and the 6-minute walk test (6MWT). Lung function patterns were analyzed to determine the predominant impairment. Correlations were evaluated between forced vital capacity (FVC) and 6-minute walk distance (6MWD), and between modified Medical Research Council (mMRC) dyspnea grading and spirometric parameters including FVC and forced expiratory volume in the first second (FEV1).

Results: Our study found that a significant proportion of treated PTB patients exhibited impaired lung function, as evidenced by spirometry and the 6MWT. The study included 90 previously treated PTB patients with a mean age of 42.9 ± 11.4 years. Shortness of breath was the most common symptom (67.8%), followed by cough (33.3%). Spirometry revealed abnormal lung function in 70% of patients: 22.2% had restrictive, 21.1% obstructive, and 26.7% mixed patterns. The mean 6-minute walk distance (6MWD) was 406 ± 129.9 meters. A significant positive correlation was found between FVC and 6MWD ($r = 0.658$, $p = 0.001$). FVC showed a statistically significant decline with increasing mMRC dyspnoea grade ($F = 6.65$, $p = 0.001$).

Conclusion: This study highlights that despite successful treatment, pulmonary tuberculosis often results in persistent lung function impairment and reduced exercise capacity, underscoring the chronic burden of post-TB sequelae and the need for regular monitoring, pulmonary rehabilitation, nutritional support, individualized care, and formal guidelines to improve long-term outcomes and overall well-being.

Keywords: Pulmonary tuberculosis, Post-tuberculosis lung disease, 6MWT, Lung function impairment, mMRC dyspnea grading, FVC, FEV1.

INTRODUCTION

Tuberculosis (TB) is an infectious disease primarily caused by an aerobic bacteria named Mycobacterium tuberculosis that most commonly affects the lungs. TB can also affect other parts of the body, such as lymph nodes, pleura, bone and joints, blood, peritoneum, meninges, genitourinary tract, pericardium and skin. Pulmonary tuberculosis (PTB) is an air-borne disease transmitted as droplet nuclei.[1] TB occurs in every part of the world. It is estimated that 25% of the global population has been infected with TB bacteria. Around 87% of new TB cases were reported in the 30 high TB burden countries. India bear a significant burden, accounting for 24% of global TB cases.

An estimated global total of 10.8 million people were affected with TB in 2023, equivalent to 134 incident cases per 100 000 population.[2] Prevalence of microbiologically confirmed PTB among 15 years and above in India was 316 per lakh population. Incidence of PTB in India for the year 2022 was 199 per lakh population.[3] Haryana's adjusted TB prevalence by cartridge-based nucleic acid amplification test (CBNAAT) was 459 per lakh population from prevalence survey of India 2021, with adult pulmonary TB case notification rate 160 per lakh population.[4] TB remains one of the top 10 causes of death worldwide, with the World Health Organization reporting 10 million new cases and 1.4 million deaths in 2023. The World Health Organization (WHO) estimates that TB diagnosis and treatment saved around 58 million lives between the years 2000 and 2018. Despite the success in treating TB, a substantial number of survivors, estimated at 20-30%, develop post-tuberculosis lung disease (PTLD), a condition that significantly contributes to morbidity and long-term disability worldwide. This underscores the need for addressing PTLD as an extension of the global TB burden. Despite a bacteriologically confirmed cure, PTB has a continued effect on health-related quality of life, exercise capacity and pulmonary function that can be regarded as sequelae of the disease.[5-7]

PTLD can be defined as evidence of chronic respiratory abnormality, with or without symptoms, attributable at least in part to previous PTB.[8] Risk-factors for PTLD include multiple episodes of TB, drug-resistant TB, delayed diagnosis and perhaps smoking. PTLD patients have a lower life expectancy and a higher chance of developing recurrent TB. Additionally, PTLD is a significant contributor to the global burden of chronic pulmonary diseases.[9]

Current TB policies do not address PTLD adequately, often mistaking persistent symptoms as recurrent TB, leading to misdiagnosis and stigma. PTLD is unrecognized in the WHO End TB Strategy and current TB registries lack post-treatment monitoring. This highlights the need for increased awareness and policy attention. We also investigated the correlation between FVC and 6MWD and correlation between mMRC grading of dyspnoea with FVC and FEV1 in these patients.

MATERIALS AND METHODS

The present study was conducted in the Department of Respiratory Medicine at SHKM Government Medical College and Hospital, Nalhar, Nuh, over a period of one year from June 2023 to June 2024. It was designed as a hospital-based, cross-sectional observational study. The study population comprised 90 patients who attended the Respiratory Medicine outpatient department (OPD), had been declared cured or had completed treatment for drug-sensitive pulmonary tuberculosis (PTB), and met the inclusion criteria for enrollment.

Inclusion Criteria

1. Patients who were declared cured or treatment completed for drug-sensitive PTB
2. as per the national tuberculosis elimination program (NTEP) guidelines.
3. Patients with age between 18-70 years.
4. Patients who were willing to participate in study after giving informed consent.

Exclusion Criteria

1. Microbiologically confirmed and clinico-radiologically diagnosed drug-sensitive PTB patients.
2. Patients who were declared cured or treatment completed for extra pulmonary TB cases.
3. Patients who were declared cured or treatment completed for multi-drug resistant TB cases.
4. Current or ex smokers.
5. Cases with previous history of COPD, bronchiectasis, asthma, occupational lung diseases, interstitial lung diseases (ILD) and severe covid 19.
6. Cases who are incapable of doing spirometry or having contra indications in performing spirometry.

Sample size: Sample size of 90 adults aged between 18-70 years has been calculated using the Cochran's formula $n0 = Z2p(1-p)/e2$[10].

Methodology: Patients of age between 18 to 70 years, who were declared cured or treatment completed from PTB as per NTEP guidelines and presenting to out patient department of SHKM Government medical college Nuh, were enrolled for the study as per inclusion and exclusion criteria. Data was collected from the enrolled patients using data collection tool including symptoms with mMRC grading of dyspnoea, general physical examination, systemic examination, BMI, Spirometry, CXR findings, and 6MWT. The data thus obtained were analyzed to assess pulmonary functions, predominant pattern of lung function impairment (obstructive, restrictive or mixed), correlation between FVC and 6MWD and correlation between mMRC grading of dyspnoea with FVC and FEV1 in these patients.

Study tools: Pre designed and pre tested semi structured schedule following all guidelines Sputum

AFB and CBNAAT Spirometry- FVC, FEV1, FEV1/FVC & PEFR (peak expiratory flow rate) 6MWT, CXR, CT scan of thorax.

Operational definitions:

- TB treatment outcome definitions:

Cured - A pulmonary TB patient with bacteriologically confirmed TB at the beginning of treatment who was smear or culture negative in the last month of treatment and on at least one previous occasion.

Treatment completed - A TB patient who completed treatment without evidence of failure but with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results are unavailable[11].

- 6MWT:

Provided a standardized, objective, and integrated assessment of cardiopulmonary and musculoskeletal function related to our daily activities. The test involved a 6 minute walk along a flat corridor at a pace as quick as the patient can manage. Patient were permitted to slow down, to stop and to rest as necessary, but walk was resumed as soon as they were able. Before and after the test, respiratory rate, heart rate per minute, and blood pressure was checked, and the walking distances of each patient within six minutes were recorded. The test was conducted in compliance with American Thoracic Society (ATS) guidelines[12].

- Spirometry:

Spirometry was carried out in Shaheed Hasan Khan Mewati Government Medical College PFT Laboratory. It was carried out in accordance with ATS-ERS Society Guidelines using BTL08SPIRO, a computerized PFT analyzer unit. The patients were informed about manoeuvres. All patients were instructed not to use any bronchodilator on the preceding night and on the day of procedure. Furthermore, the individuals who failed to fulfil acceptability and reproducibility criteria of spirometry were excluded. FVC, FEV1, FEV1/FVC ratio and Peak expiratory flow rate (PEFR) values were noted. Spirometry findings were classified into normal, obstructive, restrictive or mixed defects.

- Normal - FEV1/FVC ratio of >70% and an FVC of >80% predicted.
- Obstructive - obstructive defect is defined as an FEV1/FVC ratio of <70% and an FVC of >80% predicted.
- Restrictive- restrictive defects is defined as FEV1/FVC ratio of >70% with an FVC of <80% predicted.
- Mixed- combined defects were FVC of <80% predicted and an FEV1/FVC ratio of <70%[13].

Statistical analysis:

The statistical analysis for this study primarily involved descriptive statistics to summarize the demographic, clinical, and spirometric data of the participants.

Frequencies and percentages were calculated to represent categorical variables such as sex, educational status, occupational profile, symptoms, comorbidities, and spirometric patterns. Continuous variables, including age, BMI, duration since completion of PTB treatment, FEV1, FVC, FEV1/FVC ratio, and distance covered in the 6MWT were expressed as mean ± standard deviation (SD) along with their ranges, medians, and inter-quartile ranges (IQR). Association between continuous variables was analysed by Pearson correlation and Comparison of continuous variable among more than two categories was analysed by ANOVA. A p value less than 0.05 was considered as statistically significant. Data analysis was performed using Jamovi 2.5.3.

RESULTS

The study comprised 90 participants with a mean age of 42.9 ± 11.4 years, ranging from 18 to 70 years. The age distribution showed that the majority of participants were in the age group 41–50 years (28.9%), followed by 31–40 years (24.4%) and 51–60 years (22.2%). Participants aged ≤20 years and >60 years represented the smallest groups at 2.2% and 4.4%, respectively [Figure 1]. Among the participants, 57.8% were male and 42.2% were female [Figure 2], showing a male predominance in the study sample.

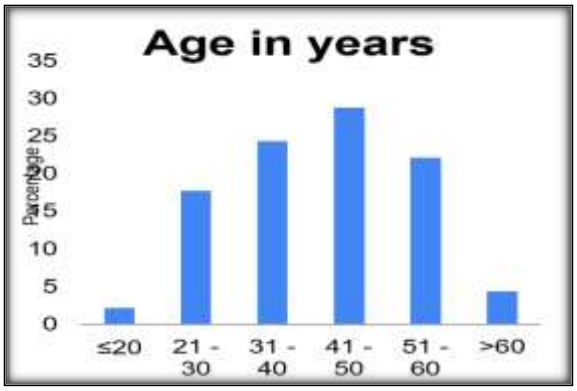

Figure 1. Distribution according to age

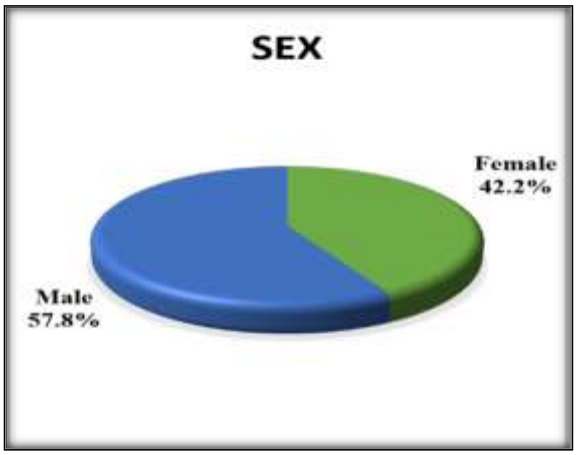

Figure 2: Distribution according to sex

The mean BMI was 20.2 ± 2.6, with values ranging from 14 to 26.5. Most participants (57.8%) had a normal BMI, while 30% were underweight, and 12.2% were over weight. This may suggests a substantial proportion of under-nutrition in the study sample. The average duration since completion of PTB treatment was 5 ± 2.6 years, with a range of 1–10 years. Approximately half (51.1%) of participants had a history of PTB within past 5 years, while 48.9% had PTB 5 to 10 years ago.

Table 1: Distribution according to symptoms

Symptoms	Frequency	Percent
Shortness of breath	61	67.8
Cough	30	33.3
Fever	18	20
Loss of appetite	15	16.7
Loss of weight	9	10.0
Chest pain	8	8.9
Hemoptysis	5	5.6
Swelling of legs	2	2.2

Among symptoms, shortness of breath (67.8%), cough (33.3%) and fever (20%) were the most frequently reported (Table 1). The other symptoms were loss of appetite (15%), loss of weight (9%), chest pain (8%), hemoptysis (5%) and swelling of legs (2%).

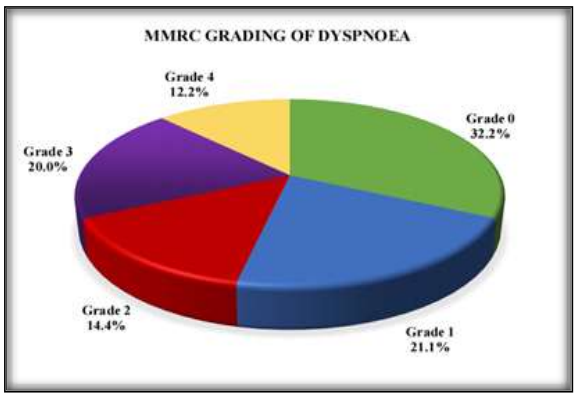

Figure 3: Distribution according to MMRC Grading of Dyspnoea

Regarding MMRC grading, 32.2% had no dyspnoea (Grade 0), while the remaining participants experienced varying levels of dyspnoea, with 20% in Grade 3 and 12.2% in Grade 4 [Figure 3].

Table 2: Distribution according to radiological findings

CXR FINDINGS	Frequency	Percent
WNL	38	42.2
COLLAPSE/ VOLUME LOSS	16	17.8
BRONCHIECTATIS	12	13.3
FIBRO CAVITATORY CHANGES	11	12.2
RETICULONODULA R SHADOWS	11	12.2
HILAR CALCIFICATIONS	9	10.0
CALCIFICATIONS	6	6.7
TRACTION BRONCHIECTASIS	5	5.6
FIBROSIS	3	3.3
CAVITATION	2	2.2
PLEURAL THICKENING	1	1.1
ASPERGILLOMA	1	1.1

[Table 2] shows that the CXR and chest CT findings in previously treated TB patients demonstrate a wide spectrum of residual pulmonary abnormalities. Among the participants 38 patients (42.2%) had findings within normal limits (WNL), indicating no detectable radiological abnormalities. However, a significant proportion exhibited post-TB changes. The most common abnormality was collapse/volume loss, observed in 16 patients (17.8%), which reflects structural lung damage. These radiological findings highlight the chronic sequelae of pulmonary TB, including structural damage and fibrosis, which contribute to impaired lung function and reduced quality of life. The diverse range of abnormalities underscores the importance of long-term follow-up and targeted rehabilitation to address the residual complications in these patients.

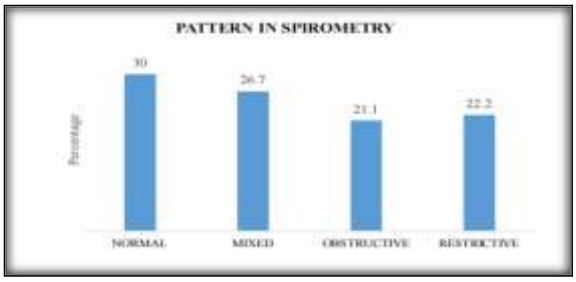

Figure 4: Distribution according to Spirometry Patterns

In spirometry, 30% had normal lung function. Among abnormal patterns, restrictive (22.2%) and obstructive (21.1%) impairments were most common, while 26.7% exhibited a mixed pattern [Figure 4].

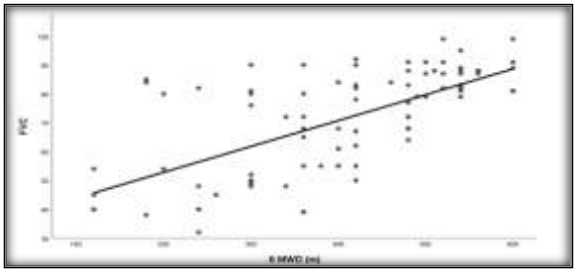

Figure 5: Scatter plot showing correlation between 6MWD and FVC

For absolute values of r, 0 to 0.19 is regarded as very weak, 0.2 to 0.39 as weak, 0.40 to 0.59 as moderate, 0.6 to 0.79 as strong and 0.8 to 1 as very strong correlation (Figure 5). Thus study demonstrates a moderate to strong positive correlation ($r = 0.658$, $p = 0.001$) between FVC and the distance covered in the 6MWT among previously treated TB patients. This finding indicates that better pulmonary function, as measured by FVC, is associated with improved functional exercise capacity. The statistically significant correlation highlights the lasting impact of pulmonary sequelae in post-TB patients, where diminished lung function corresponds to reduced physical endurance and performance.

Table 3: Comparison of FVC with mMRC grading

Correlation of FVC with mMRC grading of the study subjects

mMRC grading	N	FVC		ANOVA	
		Mean	SD	F	p
Grade 0	29	82.6	12.9	6.65	0.001
Grade 1	19	70.3	13.5		
Grade 2	13	66.0	19.2		
Grade 3	18	66.5	18.4		
Grade 4	11	57.3	17.5		

The ANOVA results [Table 3] in the study reveal a statistically significant difference in FVC across different mMRC grading levels for dyspnoea in previously treated TB patients (F = 6.65, p = 0.001). The mean FVC decreases progressively with increasing mMRC grade, indicating that higher levels of dyspnoea severity are associated with lower lung function. Patients with Grade 0 (no dyspnoea) have the highest mean FVC (82.6 ± 12.9), while those with Grade 4 (severe dyspnoea) have the lowest mean FVC (57.3 ± 17.5). This significant gradient underscores the impact of dyspnoea severity on pulmonary function, highlighting the need for targeted interventions to address respiratory impairments in post-TB patients with advanced dyspnoea.

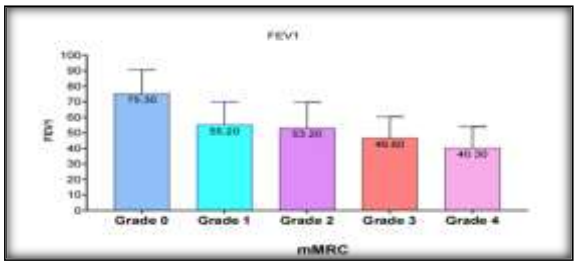

Figure 6: Correlation of FEV1 with mMRC grading

The ANOVA analysis reveals a statistically significant difference in FEV1 across different mMRC grading levels for dyspnoea among previously treated TB patients (F=16.859, p=0.001) (Figure 6). The results indicate a progressive decline in FEV1 as the severity of dyspnoea increases, with patients in Grade 0 (no dyspnoea) exhibiting the highest mean FEV1 (75.3 ± 15.3) and those in Grade 4 (severe dyspnoea) having the lowest mean FEV1 (40.3 ± 13.7). This significant relationship highlights the impact of increasing dyspnoea severity on reduced lung function. The findings underscore the importance of assessing and managing respiratory symptoms in post-TB patients, as worsening dyspnoea is closely associated with a substantial decline in pulmonary function.

DISCUSSION

In our study, the mean age of participants was 42.9 ± 11.4 years, with an age range of 18 to 70 years. The highest proportion of participants fell within the 41–50 years age group (28.9%), followed by the 31–40 years (24.4%) and 51–60 years (22.2%) age groups. The youngest (≤20 years) and oldest (>60 years) age groups had the lowest representation 2.2% and 4.4% respectively. This age distribution aligns with findings from Allwood et al. and Patil et al., indicating post-TB sequelae predominantly affects adults in their third to fifth decades[14,15]. Our study's concentration of participants in the 41–50 years age group underscores the importance of targeted interventions in middle-aged adults.

In our study, 57.8% of the participants were male, while 42.2% were female, indicating a male predominance. This trend is consistent with multiple studies that have reported a higher prevalence of PTB in males due to risk factors such as occupational hazards, smoking, and delayed healthcare-seeking behavior. Despite this trend, the significant proportion of females (42.2%) emphasizes the importance of gender-sensitive TB control measures.

In our study, the mean duration since TB treatment completion was 5 ± 2.6 years. 51.1% had a TB history less than five years ago, while 48.9% had a history 5 to 10 years ago. This near-even distribution highlights the chronic nature of post-TB lung impairment. Our findings align with previous long-term studies showing persistent or worsening respiratory dysfunction years after treatment completion.[16-18]

Shortness of breath was the most common symptom (67.8%), followed by cough (33.3%), fever (20%), loss of appetite (16.7%), weight loss (10%), chest pain (8.9%), hemoptysis (5.6%), and limb swelling (2.2%). 32.2% reported no dyspnoea (Grade 0), while 20% had Grade 3 and 12.2% had Grade 4 dyspnoea, indicating severe impairment. These results support earlier findings on persistent post-TB symptoms and the association with malnutrition and systemic manifestations.

The CXR and chest CT findings in previously treated TB patients demonstrated a wide spectrum of residual pulmonary abnormalities, including structural damage and fibrosis, which contribute to impaired lung function and reduced quality of life. The diverse range of abnormalities underscores the importance of long-term follow-up and targeted rehabilitation to address the residual complications in these patients.

Spirometry results showed 30% had normal lung function, 26.7% had a mixed ventilatory pattern, 22.2% had restrictive, and 21.1% had obstructive impairment. Mean FEV1 was 57.8 ± 19.5%, FVC was 71.3 ± 17.7%, and FEV1/FVC ratio was 73.7 ± 14.7%. These values indicate significant dysfunction and align with previous literature on post-TB spirometric abnormalities. The mean 6MWD in our study was 406 ± 129.9 meters, indicating reduced functional capacity and supporting prior findings of poor physical performance in post-TB cases.

ANOVA analysis revealed a statistically significant decline in FVC and FEV1 with increasing dyspnoea severity (p = 0.001). Participants with Grade 0 dyspnoea had the highest FVC and FEV1, while Grade 4 had the lowest, suggesting restrictive and obstructive dysfunction correlate with increased breathlessness. These findings are consistent with previous studies showing ventilatory impairment is a

key determinant of dyspnoea severity in post-TB cases.

Limitations of the Study

The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out. Additionally, only patients attending the OPD were taken as study subjects and hence asymptomatic individuals from community who had recovered from PTB could not take part in the study

CONCLUSION

This study highlights that despite successful treatment, pulmonary tuberculosis (TB) often results in lasting lung function impairments that negatively impact quality of life. Among 90 previously treated TB patients assessed using spirometry and the 6-minute walk test (6MWT), a range of respiratory abnormalities—including restrictive (22.2%), obstructive (21.1%), and mixed (26.7%) patterns were observed, with only 30% showing normal lung function. The mean 6MWT distance was 406 ± 129.9 meters, with a strong positive correlation between FVC and distance covered ($r = 0.658$, $p = 0.001$), and FVC decreasing with worsening mMRC dyspnoea grade ($p = 0.001$). These findings emphasize the chronic burden of post-TB pulmonary sequelae and the need for ongoing monitoring, pulmonary rehabilitation, nutritional support, and individualized care. Developing formal guidelines for managing post-TB patients could significantly improve outcomes, as early identification and targeted interventions are essential for addressing long-term impairments and enhancing overall well-being.

REFERENCES

1. Kant S. Textbook of tuberculosis & non-tuberculous mycobacterial diseases. Indian J Med Res. 2021 Nov;154(5):762–3.
2. World Health Organization. Global tuberculosis report 2023. Geneva, switzerland: World Health Organization; 2023.
3. India TB Report 2024. Ministry of Health and Family Welfare.
4. National Institute for Research in Tuberculosis. National Health Mission. Ministry of Health and Family Welfare, Government of India. National TB prevalence survey in India (2019-2021).
5. Hunter RL. Tuberculosis as a three-act play: A new paradigm for the pathogenesis of pulmonary tuberculosis. Tuberculosis. 2016;97:8-17.
6. World Health Organization. Tuberculosis Fact Sheet cited 2019 Aug 11.
7. Daniels KJ, Irusen E, Pharaoh H, Hanekom S. Post-tuberculosis health-related quality of life, lung function and exercise capacity in a cured pulmonary tuberculosis population in the Breede Valley District, South Africa. S Afr J Physiother. 2019 Jul 31;75(1):1319.
8. Allwood BW, Van der Zalm MM, Amaral AFS, Byrne A, Datta S, Egere U, et al. International Journal of Tuberculosis and Lung Disease 2020;24(8):820-28.
9. Allwood BW, Byrne A, Meghji J, Rachow A, van der Zalm MM, Schoch OD. PostTuberculosis Lung Disease: Clinical Review of an Under-Recognised Global Challenge. Respiration. 2021;100(8):751-63.
10. Woolson RF, Bean JA, Rojas PB. Sample size for case-control studies using Cochran's statistic. Biometrics. 1986 Dec;42(4):927-32.
11. World Health Organization. Definitions and Reporting Framework for Tuberculosis – 2013 Revision (updated December 2014 and January 2020).
12. ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories. ATS statement: guidelines for the six-minute walk test. Am J Respir Crit Care Med. 2002 Jul 1;166(1):111-7.
13. Aggarwal AN, Agarwal R, Dhooria S, Prasad KT, Sehgal IS, Muthu V,et al. Joint Indian Chest Society-National College of Chest Physicians (India) guidelines for spirometry. Lung India. 2019 Apr;36:S1-S35.
14. Allwood BW, Stolbrink M, Baines N, Louw E, Wademan DT, Lupton-Smith A, et al. Persistent chronic respiratory symptoms despite TB cure is poorly correlated with lung function. Int J Tuberc Lung Dis. 2021 Apr 1;25(4):262-70.
15. Patil S, Patil R, Jadhav A. Pulmonary functions' assessment in post-tuberculosis cases by spirometry: Obstructive pattern is predominant and needs cautious evaluation in all treated cases irrespective of symptoms. Int J Mycobacteriol. 2018 Apr-Jun;7(2):128-133.
16. Chushkin MI, Ots ON. Impaired pulmonary function after treatment for tuberculosis: the end of the disease? J Bras Pneumol. 2017 Jan-Feb;43(1):38-43.
17. Nightingale R, Chinoko B, Lesosky M, et al. Thorax 2022;77:1131–9.
18. Bansal N, Arunachala S, Kaleem M, Kulkarni S, Ravindran S, ShankaraSetty RV et al. Unveiling Silent Consequences: Impact of Pulmonary Tuberculosis on Lung Health and Functional Wellbeing after Treatment. J. Clin. Med. 2024 Jul 14;13(14):4115.