ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 06 | June - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CLINICAL PRESENTATION OF POST TUBERCULAR PATIENTS IN A TERTIARY CARE CENTER

Respiratory Medicine

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ABSTRACT

Pulmonary tuberculosis (PTB) often culminates in enduring lung impairment, precipitating chronic respiratory ailments such as chronic obstructive pulmonary disease (COPD). Current tuberculosis (TB) registries, however, primarily focus on acute phase monitoring, leaving a substantial gap in understanding the protracted consequences of PTB. Despite documented associations between TB and COPD, guidelines lack detailed directives for managing PTB sequelae. This research endeavors to bridge this knowledge void by comprehensively evaluating the clinical profiles and complications of post-PTB patients in India. Employing interviews and systematic assessments, the study delineates prevalent symptoms, radiological aberrations, and compromised quality of life among these patients. Significantly, correlations between symptomatology, pulmonary function, and quality of life underscore the imperative for holistic post-PTB care and support. Furthermore, the study advocates for heightened vigilance regarding long-term sequelae when assessing symptomatic individuals with a TB history. This study highlights the exigency for further investigation to elucidate additional factors influencing the quality of life in this patient cohort.

KEYWORDS

INTRODUCTION

Pulmonary tuberculosis (PTB) can result in permanent lung impairment, characterised by the presence of scarring, fibrosis, cavitation, or other forms of damage observed on radiographic images. [1-5]The resulting harm can result in the decline of lung capacity, persistent respiratory symptoms, and ultimately, the development of chronic respiratory conditions such as chronic obstructive pulmonary disease (COPD), bronchiectasis, and aspergillosis [1-5]. Nevertheless, the existing TB registries endorsed by the WHO solely concentrate on tracking the number of deaths and illnesses during TB treatment. Consequently, patients are not monitored beyond the point of being cured from the disease [6]. Among the numerous international TB guidelines, only a limited number make reference to TB sequelae, and none provide details on how to identify or effectively handle this condition. This can be attributed to the scarcity of studies that specifically examine the long-term consequences following pulmonary tuberculosis (PTB). While smoking remains the primary and most significant risk factor for COPD, the substantial prevalence of the disease in developing nations cannot be solely attributed to smoking. The association between tuberculosis (TB) and other risk factors unrelated to smoking in the development of chronic obstructive pulmonary disease (COPD) has been extensively documented [7]. The correlation between tuberculosis (TB) and chronic obstructive pulmonary disease (COPD) in individuals who do not smoke is substantiated by data from the Burden of Obstructive Lung Disease (BOLD) and Proyecto Latinoamericano de Investigación en Obstrucción Pulmonar (PLATINO) studies. These studies conducted sub-group analyses and discovered even stronger connections between TB and COPD in individuals who have never smoked [8,9]. A comprehensive examination and statistical analysis revealed that the correlation between a previous occurrence of tuberculosis (TB) and the existence of chronic obstructive pulmonary disease (COPD) was most pronounced in individuals who have never smoked and those who are younger than 40 years old [10].

Due to the lack of follow-up on patients with PTB after treatment, there is limited information available regarding their sociodemographic characteristics and the symptoms associated with post-PTB complications. The typical approach that physicians take with such patients is currently not known. It is often observed that patients with post-tuberculosis (PTB) complications are mistakenly treated as active PTB cases based on clinical and radiological evidence. This is mainly due to a lack of knowledge about the long-term effects of PTB among primary care practitioners. The literature has provided limited documentation on the presentation and management of respiratory failure in these patients. There has been limited research on the impact of reduced lung function on health-related quality of life (QoL). Several studies have identified a correlation between spirometry measures and specific components of St. George's Respiratory Questionnaire (SGRQ) scores, as well as the overall score [11,12].

There is a lack of comprehensive data on the clinical characteristics and quality of life of patients with post-PTB sequelae worldwide, especially in India where tuberculosis is prevalent. Therefore, the purpose of this study was to conduct a thorough assessment of the clinical characteristics and post-PTB complications.

METHODS

This study was conducted at a single center, specifically the Chest Clinic of a tertiary care academic medical center in Central India, over a period of (duration). The study included patients over the age of 18 who had previously been diagnosed with pulmonary tuberculosis and received treatment based on microbiological reports or the judgment of the clinician. These patients were included in the study if their current symptoms could not be attributed to any other concurrent illness. The study did not include children, pregnant women, or patients with another concurrent pulmonary disease. The study protocol received approval from the institute's ethics committee and adheres to the ethical guidelines outlined in the 1975 Declaration of Helsinki, as confirmed by the institution's human research committee.

NA conducted one-on-one interviews with the patients using a pre-designed proforma to gather a comprehensive history. The proforma included demographic information, clinical symptoms and their intensity, as well as the usage of inhalers. The clinic measured the individual's height in centimeters and weight in kilograms, and subsequently calculated their body mass index (BMI). The socio-economic status was evaluated using the Modified Kuppuswamy scale. The intensity of dyspnea was assessed utilizing the modified Medical Research Council scale (mMRC). The study also recorded the parameters of the pulmonary function test (PFT), including forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1), and the ratio of FEV1 to FVC. The percentage predicted value of these parameters was also documented. Obstructive disease was

characterized by a forced expiratory volume in one second to forced vital capacity ratio (FEV1/FVC) of less than 0.8, with a forced vital capacity (FVC) equal to or greater than 80% of the predicted value. The diagnosis of restrictive disease was made based on a FEV1/FVC ratio greater than 0.8 and an FVC value less than 80% of the predicted values. Combined disease was characterized by a FEV1/FVC ratio below 0.8 and an FVC below 80% of the predicted value. The chest radiographs were evaluated for abnormalities in the four quadrants (right upper, right lower, left upper, left lower quadrant) using a scoring system developed by Báez-Saldaña. The severity of the abnormalities was rated on a scale of 0-5.

Statistical Analysis

The continuous data were reported as the mean±standard deviation (SD) if they followed a normal distribution, and as the median [interquartile range (IQR)] if the data did not follow a normal distribution. The categorical variables were displayed as frequency and percentages (n; %). The comparability of groups was assessed using the Chi-square test, Student's t-test, or Mann-Whitney test, depending on the circumstances. Results were considered statistically significant if the p-value was less than 0.05. The statistical analysis was conducted using freely available online software.

RESULTS

Table 1 shows the baseline clinical and demographic characteristics of the 100 patients in the study reveal a relatively young mean age of 41.4±7.1 years, with a distribution across age groups showing a predominance in the 40-49 age bracket. The majority of patients were male (68.0%) and non-smokers (86.0%). Occupationally, a significant portion were skilled workers (28%) or unemployed (39%). Body mass index analysis indicates a substantial proportion of patients (51%) with a BMI below 18.5. The prevalence of comorbidities was low, with diabetes mellitus and hypertension reported in small percentages. Approximately half of the patients were on inhaler treatment, with a minority receiving haemostatic drugs or both.

Table 1: Baseline clinical and demographic characteristics of the patients (n= 100).

Characteristics of patients	Mean±SD or N (%)
Age (years) (Mean±SD)	41.4±7.1
Age groups (years)	N (%)
18-29	9 (20)
30-39	28 (28.0)
40-49	51(51.0)
50-59	15 (15.0)
≥60	6 (6.0)
Gender	N (%)
Male	68 (68.0)
Female	32 (32.0)
Smoking status	N (%)
Non-smoker	86 (86.0)
Active smoker	5 (5.0)
Reformed smoker	9 (9.0)
Body Mass Index (kg/m^2) (n=100)	N (%)
<18.5	51 (51.0)
18.5-22.9	23 (23.0)
23-24.9	9 (9.0)
≥25	17 (17.0)
Comorbidities	N (%)
Diabetes mellitus	7 (7.0)
Hypertension	3 (3.0)
No comorbidities	90 (90.0)
On current treatment	N (%)
Yes, inhaler treatment	51 (51.0)
Yes, hemostatic drugs	14 (14.0)
Yes, both	1 (1.0)
No	34 (34.0)

Figure 1 displays the most common presentation of patients post tuberculosis. Majority (74%) patients presented with Post TB OAD (Obstructive Airways Disease), followed by Post TB Bronchiectasis (13%), Post TB pneumothorax and allergic symptoms (5% each); and 2% and 1% patients presented with post TB Aspergillosis and Post TB IPF (Idiopathic Pulmonary Fibrosis), respectively.

Table 2 outlines the symptoms reported by the 100 patients in the study group, providing both frequency counts and mean duration with standard deviation where applicable. Shortness of breath was the most prevalent symptom, affecting 74% of patients with a mean duration of 6.0±2.5 years. The modified Medical Research Council (mMRC) scale indicates varying degrees of dyspnea, with mMRC 1 being the most common (31%). Cough (63%) and expectoration (53%) were also frequently reported, with mean durations of 7.1±3.2 and 6.4±2.5years, respectively. Chest pain (22%) and hemoptysis (32%) were less common but still present in significant proportions of patients, with mean durations of 5.2±2.1 and 6.4±2.3 years, respectively. Asymptomatic cases were minimal.

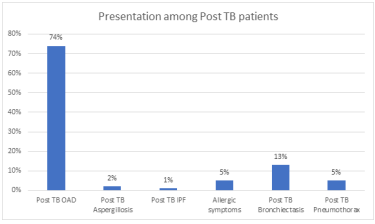

Figure 1: Clinical Presentation among Post TB patients

Table 2: Symptoms reported by the study group (n=100)

Symptom	N (%)	Mean (±SD) symptom duration (years)
Asymptomatic	7 (7.0)	
Shortness of breath	74 (74.0)	6.0±2.5
mMRC 0 (Dyspnea only with strenuous exercise)	25 (25.0)	
mMRC 1 (Dyspnea when hurrying or walking up a slight hill)	31 (31.0)	
mMRC 2 (Walks slower than people of the same age because of dyspnea or has to stop for breath when walking at own pace)	27 (27.0)	
mMRC 3 (Stops for breath after walking 100 yards/91 m or after a few minutes)	12 (12.0)	
mMRC 4 (Too dyspneic to leave house or breathless when dressing)	4 (4.0)	
Cough	63 (63.0)	7.1±3.2
Expectoration	53 (53.0)	6.4±2.5
Chest pain	22 (22.0)	5.2±2.1
Hemoptysis	32 (32.0)	6.4±2.3

Table 3 presents the association between symptoms reported by the study group and various parameters including imaging, pulmonary function test (PFT) patterns, and quality of life scores (SGRQ and SOLQ). The PFT patterns are categorized into Normal, Obstructive, Restrictive, and Mixed, with corresponding percentages for each symptom. Mean scores of radiographic abnormalities and quality of life scores (SGRQ and SOLQ) are provided for the total study group and each symptom category. The SGRQ scores are further broken down into Symptom, Activity, and Impacts components, while the SOLQ scores encompass Physical function, Emotional function, Coping skills, and Treatment satisfaction. This comprehensive table offers insights into the relationship between reported symptoms and various clinical parameters and quality of life measures in the patient population under study.

Table 3: Association of symptoms reported by the patients with the imaging, pulmonary function test parameters, and the quality of life scores (n=100)

		Total study group	Symptoms reported by the study group					
			Asympt omatic	Shortnes s of breath	Cough	Expecto ration	Chest pain	Hemopt ysis
Pulmonary function test pattern	Normal (n[%])	4 (4.0%)	26 (26.0)	0 (0)	21 (21.0)	0 (0)	0 (0)	0 (0)
	Obstructive (n[%])	19 (19.0%)	0 (0)	21.0 (21.0)	9 (9.0)	19 (19.0)	0 (0)	18 (19.0)
	Restrictive (n[%])	16 (16.0%)	51 (51.0)	16 (16.0)	15 (15.0)	23 (23.0)	27 (27.0)	16 (16.0)

	Mixed (n[%])	61 (61.0 %)	23 (23.0)	63 (63.0)	55 (55. 0)	58 (58.0)	73 (73.0)	66 (66.0)
Score of radiographic abnormalities (Mean± SD)	6.7±2.1	9.5± 2.5	6.9±2. 2	7.0±1. 9	7.0± 2.7	8.4±2 .4	6.9±1.8	
SGRQ score (Mean± SD)	Total	42.3± 11.0	5.4±2. 9	51.4± 14.2	50.5 ±12. 8	49.4± 13.4	52.9 ±12. 4	36.4±1 0.4
	Sympto mps	50.2± 13.0	18.1±3 .7	57.7± 13.8	62.2 ±13. 4	60±1 5.3	63.4 ±14. 9	45±11. 6
	Activity	43.0± 10.5	1.0±0. 3	55.3± 12.3	49.1 ±12. 8	48.7± 12.6	51.8 ±13. 2	33.2±1 0.4
	Impacts	39.6± 13.2	4.2±1. 7	47.5± 13.1	48.0 ±14. 9	46.9± 10.8	50.6 ±10. 1	35.7±1 2.7
SOLQ score (Mean± SD)	Physical function	66.6± 16.7	98.7±1 1.7	58.7± 12.9	62.3 ±15. 7	62.3± 1 2.6	59.9 ±14. 3	72.5±1 3.2
	Emotion al function	71.2± 19.5	98.9±1 3.4	65±13 .4	64.9 ±14. 2	65±1 3.1	62.5 ±12. 6	74.3±1 1.5
	Coping skills	80.7± 18.1	100±1 2.8	78.4± 15.7	77.1 ±14. 2	78.1± 11.8	75.8 ±13. 2	78.2±1 2.8
	Treatme nt satisfact ion	38.5± 14.3	58.3±1 2.4	38.1± 11.4	36.2 ±9.7	36.7± 12.5	32.5 ±11.5	34.1±1 1.3

Table 4 displays Pearson correlation coefficients between different domains of the St. George's Respiratory Questionnaire (SGRQ) and the Seattle Obstructive Lung Disease Questionnaire (SOLQ). Negative correlations are observed between SGRQ domains (Total, Symptoms, Activity, Impacts) and SOLQ domains (Physical function, Emotional function, Coping skills), indicating that higher scores on the SGRQ correspond to lower scores on the SOLQ, reflecting worse respiratory health and quality of life. The strongest negative correlations are found between SGRQ Activity and SOLQ Physical function, and between SGRQ Impacts and SOLQ Emotional function, suggesting a close relationship between functional limitations and emotional well-being in patients with respiratory conditions.

Table 4: Pearson correlation coefficients between different domains of the St. George's Respiratory Questionnaire (SGRQ) and the Seattle Obstructive Lung Disease Questionnaire (SOLQ).

	SGRQ Total (p-value)	SGRQ Symptoms (p-value)	SGRQ Activity (p-value)	SGRQ Impacts (p-value)
SOLQ Physical function	-0.86* (<0.0001)	-0.58* (<0.0001)	-0.90* (<0.0001)	-0.81* (<0.0001)
SOLQ Emotional function	-0.85* (<0.0001)	-0.71* (<0.0001)	-0.76* (<0.0001)	-0.85* (<0.0001)
SOLQ Coping skills	-0.60* (<0.0001)	-0.44*(<0. 0001)	-0.52* (<0.0001)	-0.62* (<0.0001)
SOLQ Treatment satisfaction	-0.04 (0.693)	-0.19 (0.058)	0 (1.000)	-0.02 (0.843)

*p value <0.0001

Abbreviations: SGRQ: St. George's Respiratory Questionnaire; SOLQ: Seattle Obstructive Lung Disease Questionnaire.

DISCUSSION

The current study demonstrates that individuals with post-TB sequelae exhibit notable symptoms, radiological abnormalities, spirometry disturbances, and diminished quality of life. Within this group of patients, the most prevalent symptoms were dyspnea and cough, while expectoration, chest pain, and hemoptysis were also notable symptoms. The majority of patients exhibited abnormal spirometry, with the mixed pattern being the most prevalent. 69% of our patients exhibited abnormalities in both sides of their chest on their radiographic images. There were notable disparities in the quality of life indicators between patients who were asymptomatic and those who were symptomatic. SGRQ had the most pronounced impact on the quality of life (QoL) of patients experiencing chest pain. Significant correlations were found between the quality of life (QoL) parameters assessed by the St. George's Respiratory Questionnaire (SGRQ) and the Symptoms and Impact domains of the Severe Asthma Life Questionnaire (SOLQ). Within our study group, a significant majority of patients, specifically 93%, experienced symptoms, with the most prevalent being shortness of breath and cough. Previous studies have shown a significant occurrence of respiratory symptoms, ranging from 78% to 95%. [13-16]. The predominant symptom observed in our study was dyspnea, whereas other studies have indicated cough aligned with study done by Akkara et al[15] and hemoptysis aligned with study done by Panda et al [14] as the prevailing symptoms. Despite the administration of chemotherapy, the extensive damage to tissues caused by tuberculosis can lead to a significant number of deaths and illnesses. The regeneration of the damaged tissue may be accompanied by significant fibrosis, traction bronchiectasis, broncho stenosis, and abnormalities on pulmonary function tests (PFT). [13 , 17] A recent systematic review has reported that the prevalence of post-TB bronchiectasis ranges from 35% to 86%.[18] In addition, the presence of significant fibrosis can cause the lung parenchyma to become rigid, resulting in a condition known as restrictive lung disease. This can manifest in patients experiencing symptoms such as coughing, chest pain, and difficulty breathing. Constriction of airways caused by inflammation can lead to obstruction of airflow, which can manifest as difficulty breathing and reduced ability to exercise.[19,20] Hemoptysis can occur as a result of bronchiectasis and the erosion of blood vessels through cavitation.[17]The observed healing patterns are likely attributable to the host immune system's varying effector response.[19,17] The mixed ventilatory defect exhibited the highest prevalence (61%) among the patterns observed on pulmonary function tests (PFT). The most prevalent abnormalities observed in pulmonary function tests (PFTs) are obstructive, restrictive, or mixed patterns. [15,21,14,22,13,16,23] Our findings indicate that 92% of the patients in our study exhibited abnormal chest X-ray results, with 69% showing bilateral radiographic abnormalities. Abnormal chest radiographs have been detected in 71.9-100% of patients in previous studies. [13, 16, 22, and 24]. Extensive residual lung lesions have been observed to indicate tissue destruction and an elevated susceptibility to opportunistic infections, resulting in permanent disability and diminished quality of life. There is a strong connection between the severity of abnormalities seen on chest computed tomography and the presence of difficulty in breathing (dyspnea).[25] Our study found that quality of life was significantly and negatively affected when assessed using both of our quality-of-life measurement tools. Although numerous studies have examined the quality of life (QoL) in patients with active tuberculosis (TB) or those receiving treatment, [26-28] there is a scarcity of research specifically investigating the QoL in post-TB patients, particularly those experiencing long-term complications. Muniyandi et al. [29] found that the quality of life (QoL) of tuberculosis (TB) patients returned to normal one year after finishing anti-tubercular therapy (ATT), as assessed by the SF-36 questionnaire. Nevertheless, Indian patients were compared to data from the US general population. Singla et al [13] observed a diminished quality of life (QoL) in 46 patients with multidrug-resistant tuberculosis (MDR-TB) after finishing their anti-tuberculosis treatment (ATT), as measured by the SOLQ. Gandhi et al. (2019) [22] enrolled patients who had recently finished anti-tuberculosis treatment (ATT) and found that patients with pulmonary function test (PFT) impairment had lower scores on the Symptoms of Life Questionnaire (SOLQ) in all four domains. In line with our research, Gandhi et al found that the domain of 'Treatment satisfaction' was the most impacted, whereas Singla et al identified 'Physical function' as the most affected.

Patients who have a delayed diagnosis, extensive disease, and require long or repeated treatments are likely to experience TB sequelae. Given the limited effectiveness of pharmacological treatments, it is advisable to start implementing other supportive interventions early on for these patients, as they are likely to yield positive results. These interventions encompass pulmonary rehabilitation, smoking cessation, vaccination against secondary infections, as well as psychological and nutritional support. [30,31] Our study emphasizes

the importance of promptly diagnosing and initiating suitable treatment for patients with active tuberculosis, along with individuals experiencing complications following tuberculosis infection. When evaluating symptomatic patients with a history of TB, it is important to always consider the possibility of long-term complications. An advantageous aspect of our study is the substantial and uninterrupted sample size of patients, which includes individuals with a history of tuberculosis, even if it occurred in the remote past. This study assesses the impact of tuberculosis-related complications on the overall well-being of patients, considering that tuberculosis is a significant health burden in India. Our study utilized two reputable, reliable, and validated instruments to measure the quality of life (QoL) of all patients. The authors themselves administered these instruments, rather than having the patients complete them on their own. Therefore, these questionnaires can be translated and applied in alternative contexts. One limitation of our study is that it is a cross-sectional study conducted at a single centre, and we do not have any follow-up data for these patients. There may be a potential for selection bias as only individuals with moderate and severe cases seek medical attention, thereby excluding mild cases. Therefore, our study may not provide a comprehensive representation of the various diseases experienced by post-TB patients, as it only includes patients who visited the chest clinic. This limitation may restrict the applicability of our findings to the overall population of TB sequelae patients.

CONCLUSION

Ultimately, individuals who have previously had pulmonary tuberculosis develop post-tuberculosis sequelae, resulting in respiratory symptoms. The majority of our study participants exhibited radiographic abnormalities and abnormal pulmonary function tests (PFTs), with the mixed pattern being the most prevalent. The patients' quality of life, as assessed by the SGRQ and SOLQ, was significantly diminished. There were notable correlations observed in the measurements obtained from our two Quality of Life (QoL) instruments. When evaluating symptomatic patients with a history of TB, it is important to always consider the possibility of long-term complications. Additional research is required to assess the impact of other variables on the quality of life.

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