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Assessment of Variance in Quality of Life of Post-Pulmonary Tuberculosis Patients with Type Ii Diabetes Mellitus

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KEYWORDS

Tuberculosis, Pulmonary Rehabilitation, Type II Diabetes Mellitus, Post-Tuberculous Lung Disease

ABSTRACT:

Background:

Tuberculosis remains an important cause of morbidity and mortality globally. Many patients who have completed treatment for tuberculosis and have been declared microbiologically cured still continue to have symptoms as a consequence of sequelae of the disease. There is a two-to four-fold higher risk of active TB in individuals with DM compared to non-diabetic individuals.

Aim:

To assess the role of Pulmonary Rehabilitation on the Quality of Life of Post Pulmonary Tuberculosis Patients With Type II Diabetes Mellitus.

Methodology:

A prospective observational study was conducted among 88 post-pulmonary tuberculous patients, including those with comorbid Type II Diabetes Mellitus. All participants underwent pulmonary rehabilitation and their quality of life was assessed using St. George's Respiratory Questionnaire at baseline, 12 weeks, and 3 months' follow-up, and then compared.

Results:

88 participants were enrolled in the study. 60.23 % were males and 39.77 % were females. 31.82% of participants were known cases of Type II Diabetes Mellitus. A statistically significant improvement was observed in the Quality of Life of Post-Pulmonary Tuberculosis patients after 12 weeks of Pulmonary Rehabilitation. [Two-tailed P value < 0.0001]. The improvement in quality of life of non-diabetic participants was found to be statistically significantly better than in diabetic participants at 12 weeks ($p < 0.05$) with weak statistically significantly better improvement at 3 months' follow up ($p = 0.051$).

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INTRODUCTION / BACKGROUND: Tuberculosis remains an important cause of morbidity and mortality globally. Globally in 2023, an estimated 10.8 million people (95% uncertainty interval [UI]: 10.1–11.7 million) fell ill with TB (incident cases), a further increase from 10.7 million (95% UI: 10.0–11.5 million) in 2022, 10.4 million (95% UI: 9.7–11.1 million) in 2021 and 10.1 million (95% UI: 9.5 10.7 million) in 2020.[1] India shares 26% of the global burden of tuberculosis, and is the highest burdened country in the world.

Many patients who have completed treatment for tuberculosis and have been declared microbiologically cured still continue to have symptoms as a consequence of sequelae of the disease. There is a two-to four-fold higher risk of active TB in individuals with DM compared to non-diabetic individuals.[2]

According to a meta-analysis by Wilkinson et al, around 4% of people with type 2 DM develop TB.[3]

The high prevalence areas as per the International Diabetes Federation included North America, Western Pacific (which includes Australia and China), South East Asia, North Africa, and Middle East Asia.[4]

The current study has been undertaken to evaluate the impact of pulmonary rehabilitation on the quality of life of post-pulmonary tuberculosis patients with and without chronic obstructive pulmonary disease.

RATIONALE:

Post-Pulmonary Tuberculosis Sequelae remain a major cause of reduced exercise tolerance and impaired quality of life, even more so in high-burden countries such as India.

The benefits of Pulmonary Rehabilitation on the exercise tolerance and quality of life in patients with Type II Diabetes Mellitus has been studied.

However, further study can help emphasize the benefit of pulmonary rehabilitation in Post Pulmonary Tuberculosis patients with Type II Diabetes Mellitus.

AIM:

To assess the role of Pulmonary Rehabilitation on the Quality of Life of Post Pulmonary Tuberculosis Patients With Type II Diabetes Mellitus.

PRIMARY OBJECTIVES:

To assess the change in Quality of Life of Post-PTB patients after Pulmonary Rehabilitation using St. George Respiratory Questionnaire

SECONDARY OBJECTIVES:

To compare the change in Quality of Life of Post-PTB patients with Type II Diabetes Mellitus to that of patients without Type II Diabetes.

INCLUSION CRITERIA:

1. Patients aged >18 years.
2. Patients presenting with respiratory symptoms (such as cough, dyspnea, chest pain, wheeze) 1 month after the completion of Anti-Tubercular Therapy

EXCLUSION CRITERIA:

1. Patients of Extrapulmonary Tuberculosis
2. Patients who have tested positive on Sputum AFB Staining at present
3. Defaulters to Anti-Tubercular Therapy
4. Patients having active hemoptysis
5. Patients diagnosed with active respiratory infections or exacerbations
6. Patients having a history of acute cardiac events in the past 6 weeks
7. Pregnant Women
8. Patients who do not consent to the study.

METHODOLOGY:

Type of Study: Prospective Observational Study

Area of Study: Tertiary care center in South India

Duration of Study: 6 months

Materials and Methods:

88 participants who met the required criteria were enrolled in a 12-week structured Pulmonary Rehabilitation Program.

Demographic details (such as Age, Sex, BMI) were recorded. The study participants' Clinical History was also recorded, as well as any known comorbidities (such as Diabetes, Hypertension, and Dyslipidemia) and risk

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factors (such as Smoking, Alcohol use, Biomass Fuel Exposure).

The Quality of Life of the study participants was recorded using St. George Respiratory Questionnaire before the initiation of Pulmonary Rehabilitation.

88 participants completed the 12-week Pulmonary Rehabilitation Program, following which the participants continued unsupervised rehabilitation techniques such as breathing exercises, nutritional advice, etc. For 3 more months.

The Quality of Life of the study participants was again recorded at the end of the Pulmonary Rehabilitation Program, and then 3 months later as follow-up.

RESULTS

Demography

Table 1. Age Distribution of the Study Population

Age (in years)	N	%
21-30 years	6	6.82
31-40 years	11	12.50
41-50 years	18	20.45
51-60 years	19	21.59
61-70 years	34	38.64

Fig 1. Age Distribution of the Study Population

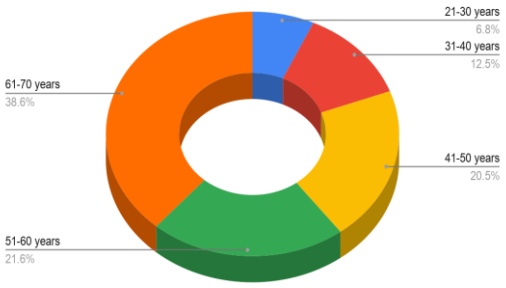

Table 1 and Fig 1 illustrate the age distribution of the study population. The majority of the study population belonged to the 61-70 age group (34 participants, 6.82 %). 19 participants (21.59%) belonged to the 51-60 year age group and 18 participants (20.45%) belonged to the 41-50 year age group.

Table 2. Gender Distribution of the Study Population

Sex	N
Male	53
Female	35

Fig 2. Gender Distribution of the Study Population

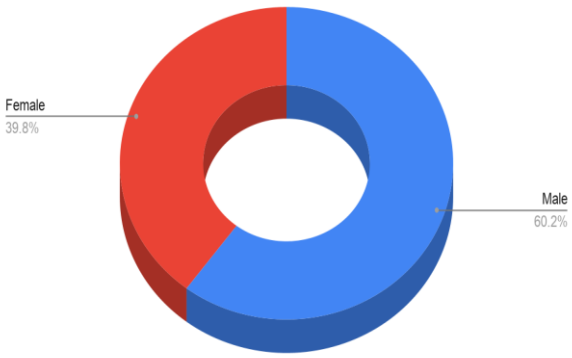

Table 2 and Fig 2 illustrate the gender distribution of the study population. 53 participants (60.23%) were males and 35 participants (39.77%) were females.

Table 3. Smoking Status

Smoking Status	N	%
Active Smokers	6	6.82
Former	10	11.36

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Smokers		
Never Smokers	72	81.82

Diabetes & Dyslipidemia		
Hypertension & Dyslipidemia	1	1.14

Fig 3. Smoking Status

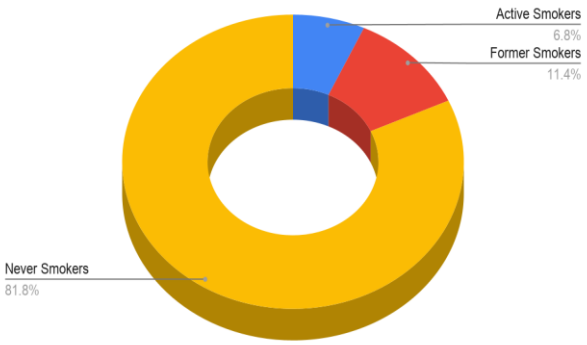
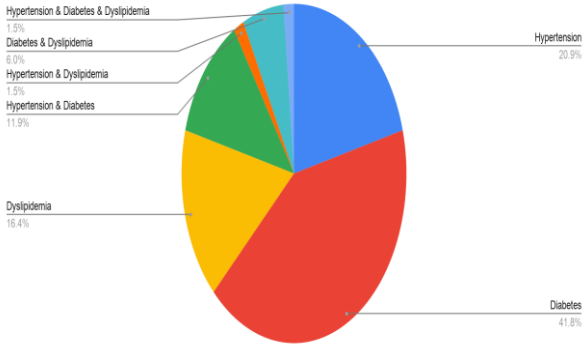


Fig 4. Distribution of Study Participants based on Comorbidities



A detailed smoking history was obtained from the study participants. As demonstrated by Table 3 and Fig 3, 72 participants (81.82%) reported as never smokers, 10 participants (11.36%) reported as former smokers, and 6 participants (6.82%) reported as active smokers.

Table 4. Comorbidities and Environmental Factors

Comorbidities	**N**	**%**
Diabetes	28	31.82
Hypertension	14	15.91
Dyslipidemia	11	12.50
Hypertension & Diabetes	8	9.09
Diabetes & Dyslipidemia	4	4.55
Hypertension &	1	1.14

History of known comorbidities was also recorded from the study participants, as shown in Table 4 and Fig 4. 28 participants (31.82%) reported as known cases of Type II Diabetes Mellitus, 14 participants (15.91%) reported as known cases of Systemic Hypertension, 11 cases (12.50%) reported as known cases of Dyslipidemia, 8 participants (9.09%) reported as known cases of both hypertension and diabetes, 4 participants (4.55%) reported as known cases of both diabetes and dyslipidemia, 1 participant (1.14%) reported as a known cases of hypertension, diabetes, and dyslipidemia, and 1 case (1.14%) reported as a known case of both hypertension and dyslipidemia.

Table 5. Course of Quality of Life over Pulmonary Rehabilitation

Time		
Baseline	41.85 ± 9.50	-
12 Weeks	28.65 ± 5.64	**<0.0001**
3 Months' Follow Up	25.17 ± 7.38	**<0.0001**

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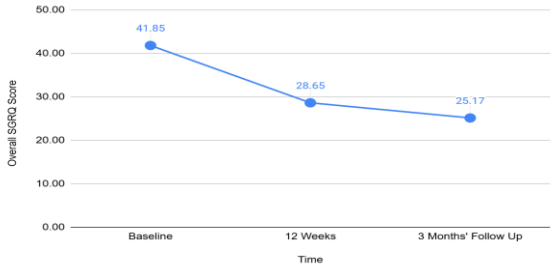
Fig 5. Course of Quality of Life over Pulmonary Rehabilitation

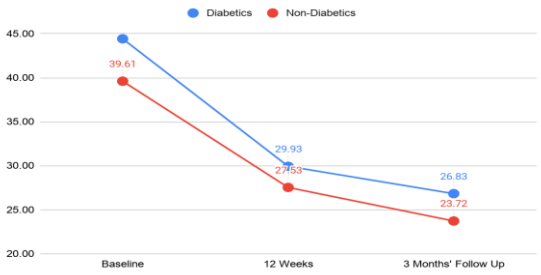


The symptomatic status of the study participants was recorded via St. George Respiratory Questionnaire at baseline, at 12 weeks' (at the completion of the pulmonary rehabilitation program) and 3 months later at a follow-up visit, recorded in Table 5 and Fig 5. The mean SGRQ score at baseline was 41.85 ± 9.50, 28.65 ± 5.64 at 12 weeks, and 25.17 ± 7.38 at 3 months follow up. There was a statistically significant reduction in the SGRQ score of the participants at 12 weeks and at 3 months follow up after pulmonary rehabilitation ($p < 0.0001$).

Table 6. Course of Quality of Life in Diabetic Patients

	Baseline	**12 Weeks**	
Diabetics	44.42 ± 10.34	29.93 ± 6.00	26.83 ± 6.16
Non-Diabetics	39.61 ± 9.18	27.53 ± 5.46	23.72 ± 7.63
p-value	**0.018**	**0.046**	**0.051**

Fig 6. Course of Quality of Life in Diabetic Participants



The SGRQ scores of diabetic participants were compared with those of non-diabetics. As shown in Table 6 and Fig 6, the mean SGRQ score of diabetic participants was 44.42 ± 10.34, 29.93 ± 6.00, and 26.83 ± 6.16 at baseline, 12 weeks, and 3 months' follow-up respectively, whereas the mean SGRQ score of non-diabetic participants was 39.61 ± 9.18, 27.53 ± 5.46, and 23.72 ± 7.63 at baseline, 12 weeks, and 3 months' follow-up respectively.

Table 7. Percentage Change in Quality of Life of Diabetic Participants

	Baseline	**12 Weeks**	
Diabetics	0.00	32.62	39.61
Non-Diabetics	0.00	30.48	40.11

Fig 7. Percentage Change in Quality of Life of Diabetic Participants

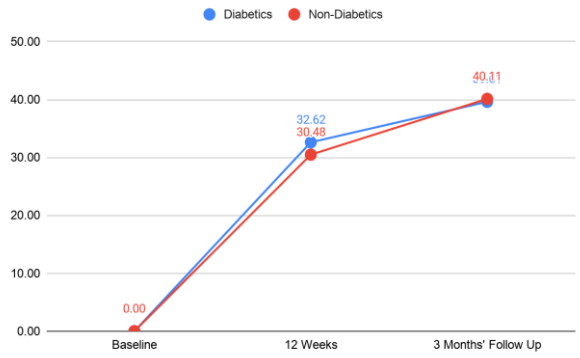


Table 7 and Fig 7 illustrate the percent improvement in symptom status as recorded by SGRQ in known cases of diabetes compared with non-diabetic participants. Diabetic participants reported 32.62% improvement and 39.61% improvement at 12 weeks and 3 months' follow-up respectively after pulmonary rehabilitation, whereas non-diabetic participants reported 30.48% improvement and 40.11% improvement at 12 weeks and 3 months' follow-up respectively after pulmonary rehabilitation.

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CONCLUSIONS:

In our study we conclude that statistically significant improvement was observed in the Quality of Life of Post-Pulmonary Tuberculosis patients after 12 weeks of Pulmonary Rehabilitation. [Two-tailed P value < 0.0001]

The benefits were sustained after 3 months of unsupervised rehabilitation (such as breathing techniques and nutritional advice), emphasizing the role of Pulmonary Rehabilitation for a better Quality of Life.

This improvement was also observed in study participants suffering from various comorbidities such as diabetes and hypertension.

Additionally, the improvement in quality of life of non-diabetic participants was found to be statistically significantly better than in diabetic participants at 12 weeks ($p < 0.05$) with weak statistically significantly better improvement at 3 months' follow up ($p = 0.051$).

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