

Exercise Capacity, Quality Of Life, And Social Participation In Patients With Post-Tuberculosis Sequelae: An Observational Analytical Study

Dr. Diksha Sonarkhan*, Dr. Mariya Jiandani**

*Post Graduate Student, **Associate Professor, Physiotherapy School & Centre, Seth G S Medical College & KEMH, Mumbai 400012

Abstract: **Background:** Tuberculosis (TB) is a major public health problem. Pulmonary TB sequelae can affect a person's physical and functional capacity leading to decreased quality of life and societal participation. The study aims at evaluating exercise capacity, quality of life, and social participation in patients with post-pulmonary tuberculosis. **Material And Methods:** An analytical cross-sectional study was carried out in 100 post-tuberculosis patients by convenient sampling. Quality of life was assessed using WHOQOL BREF and social participation was evaluated with the Impact on Participation and Autonomy Questionnaire (IPAQ). Exercise capacity was measured using a six-minute walk test (6MWT). **Result:** The mean 6MWT distance in males was 333.76 ± 47.10 meters and in females was 335.04 ± 52.34 meters. The mean VO₂ peak in males and females was 13.32 ± 2.37 ml/kg/min and 14.02 ± 2.84 ml/kg/min respectively. The quality of life and social participation in both males and females was good. There was a very weak positive correlation between 6MWT and WHOQOL BREF (spearman's rho=0.251) and a moderate negative correlation between WHOQOL BREF and IPAQ (spearman's rho= -0.663) There was no relationship between 6MWT and IPAQ score. **Conclusion:** The study concludes that the majority of the patients post pulmonary tuberculosis has fair effort tolerance and good quality of life. It also concludes that there is no statistically significant difference in the quality of life and social participation between males and females. [Sonarkhan D Natl J Integr Res Med, 2022; 13(4): 07-12, Published on Dated: 10/07/2022]

Key Words: Tuberculosis, Post TB Sequelae, Exercise Capacity, Quality Of Life, Social Participation

Author for correspondence: Dr. Mariya P Jiandani, Associate Professor, Department of Physiotherapy, Seth G S Medical College, Mumbai – 400012. E-Mail: mpjiandani@gmail.com

Introduction: Tuberculosis(TB) continues to be a major public health problem and India shares one-fifth of the global tuberculosis burden¹. Pulmonary Tuberculosis sequelae (PTB sequelae) are varied residual lesions that can occur in treated as well as untreated cases of PTB². Reduced alveolar ventilation and impaired gas exchange; muscle atrophy and physical deconditioning are commonly seen effects³. In an individual, the impact of any disease and its sequelae affects his physical, psychological, economic, and social well-being. TB also carries a social stigma due to the consequences of infection. Social participation is an indicator of an individual's integration into their community and is an important component of quality of life.

Social participation and inclusion play an important role in health promotion and public policy. Measuring health-related quality of life is useful in developing appropriate therapies and assisting in planning comprehensive strategies of care. Unlike COPD, we have little evidence to indicate the need for pulmonary rehabilitation in the treatment of patients with PTB sequelae. This study aims to assess the baseline impact of tuberculosis sequelae on exercise capacity,

quality of life, and social participation and study the relationship between these parameters.

Material & Methods: A cross-section analytical study was undertaken after obtaining ethical clearance from the Institutional Ethics Committee of the tertiary care hospital. A total of 100 patients (54 males and 46 females) between the age group of 30-60 years of either gender, diagnosed as PTB sequelae by a chest physician, and completing Anti Tuberculosis treatment (ATT) at least 3 months ago were included.

Patients on any structured exercise or rehabilitation program were excluded from the study. Patients having active tuberculosis, hemoptysis, or any other associated neurological or musculoskeletal disorder and who refused to consent were also excluded. Study participants were given detailed written information about the methods, aims, and the voluntary nature of participation in the study.

Demographic data and detailed history were noted. Quality of life (QOL) was assessed using WHOQOL BREF⁴. It contains a total of 26 questions under 4 domains consisting Physical

This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

health, Psychological health, Social relationships, and environment. The domain score was calculated using the mean score of items within each domain. The raw score was then converted into transformed scores using the standardized conversion table devised by the WHOQOL group.

A high score indicated better quality of life. The scores were divided as very poor (0-13), poor (13-38), moderate (38-68), good (63-88), and very good (>88).

Social participation was assessed using the Impact on Participation and Autonomy Questionnaire (IPAQ)^{5,6}. It assesses a) perceived participation and b) perceived problems for each domain. Perceived participation was graded on a 5-point rating scale with discrete responses, ranging from 1(very good) to 5(very poor).

Perceived problem score was graded on a 3-point rating scale ranging from 0 (no problem) to 2 (severe problem). For each domain, the participation score and problem-experience score was calculated by summing the item scores.

Higher scores denote more restrictions in participation and/or a higher problem experience in the specific domain. Exercise capacity was assessed using a 6-minute walk test as per American Thoracic Society (ATS) Guidelines 2002⁷.

Statistical Analysis: Data were analyzed using SPSS Version 23. The population characteristics were studied using Descriptive Statistics. 6MWT, WHOQOL BREF, and IPAQ Scores were presented as mean and standard deviation. Based on score categories, the proportion of quality of life and social participation between males and females was compared using the chi-Square Test.

The relationship between 6MWT, WHOQOL BREF, and IPAQ score was evaluated using Spearman Rank Correlation.

Results: A total of 100 patients; 56 % (N=56) Males and 46% (N=46) females participated in the study. The mean age of males was 50.12 ± 10.2 and females 45.39 ± 8.53 years respectively.

The minimum weight in males was 35 kg and in females was 28 Kg with a Mean weight of 53.37 ± 8.98 kg and 49.91 ± 9.33 kg respectively. The chronicity was 12.63 ± 8.68 years in males and 11.52 ± 7.69 years in females. 52 % of patients were diagnosed as Post Tuberculosis (PTB) Sequelae, 35% as PTB with obstructive airways, 3% as PTB with Bronchiectasis, 4% as PTB with Destroyed lung, 3% as PTB with Fungal ball, 2% as PTB With interstitial lung disease (ILD), 1% as PTB with Bronchiolitis. 18% of the study population had comorbidities of hypertension, diabetes mellitus, or hypothyroidism. 37% were addicted to alcohol, tobacco chewing, cigarette smoking, gutka, or mishri.

The mean six-minute walk distance was 333.76 ± 47.10 meters with an interquartile range [(IQR) of 312, 360] for males, and 335.04 ± 52.34 meters (IQR 292,370) for females with a mean VO2 peak of 13.32 ± 2.37 (IQR 11.37, 14.78) ml/kg/min and 14.02 ± 2.84 (IQR 11.74,16.05)ml/kg/min respectively.

Table 1 shows the proportion of individuals with poor, moderate, and good quality of life along with the median values and inter quartile range. The overall quality of life was found to be good in 68 %, moderate in 30%, and poor in 2% of study participants. There was no statistically significant difference in the proportion of QOL between males and females for all four domains and overall (P value=0.636).

Table 1: WHOQOL BREF Median Scores And Proportion Of Males And Females

N=100	PH		PSYH		SR		E	
	M	F	M	F	M	F	M	F
Median (IQR)	69 (63, 75)	69 (63,81)	69 (56,75)	69 (69,81)	75 (69,75)	75 (56,75)	56 (50,69)	63 (56,69)
Good & Above%	63.0	67.4	61.1	76.1	85.2	73.9	27.8	34.8
Moderate%	35.2	32.6	35.2	21.7	14.8	17.4	64.8	63.0
Poor %	1.9	0	3.7	2.2	0	8.7	7.4	2.2
Chi-Square	0.975	2.562	5.193	1.766				
P Value	0.614	0.278	0.075	0.414				

PH: Physical Health, PSYH: Psychological Health, SR: Social Relationships, E: Environment QOL: Quality of life, IQR: Interquartile Range.

Table 2 shows the perception of participants with IPAQ scores as good and above and fair in various domains and their perceived problems. The overall perceived participation was good and above 21%, fair at 78%, and poor and below 1% of study participants. Only 6% of participants perceived minor problems with their disease condition. There was no statistically significant difference in IPAQ Scores between males and females. (P value=0.354).

The median score for autonomy indoors was 7 and family role was 8 indicating very good. The median score for autonomy outdoors was 12 (IQR 10, 13) for males and 11 (IQR 10, 12) for females. For social relationships, paid work, and education, the median score was 12. Out of the total participants, 85% had good and above participation and 15% had fair participation in paid work.

Table 2: Proportion And Comparison Between Males And Females For Impact On Participation And Autonomy Questionnaire Scores

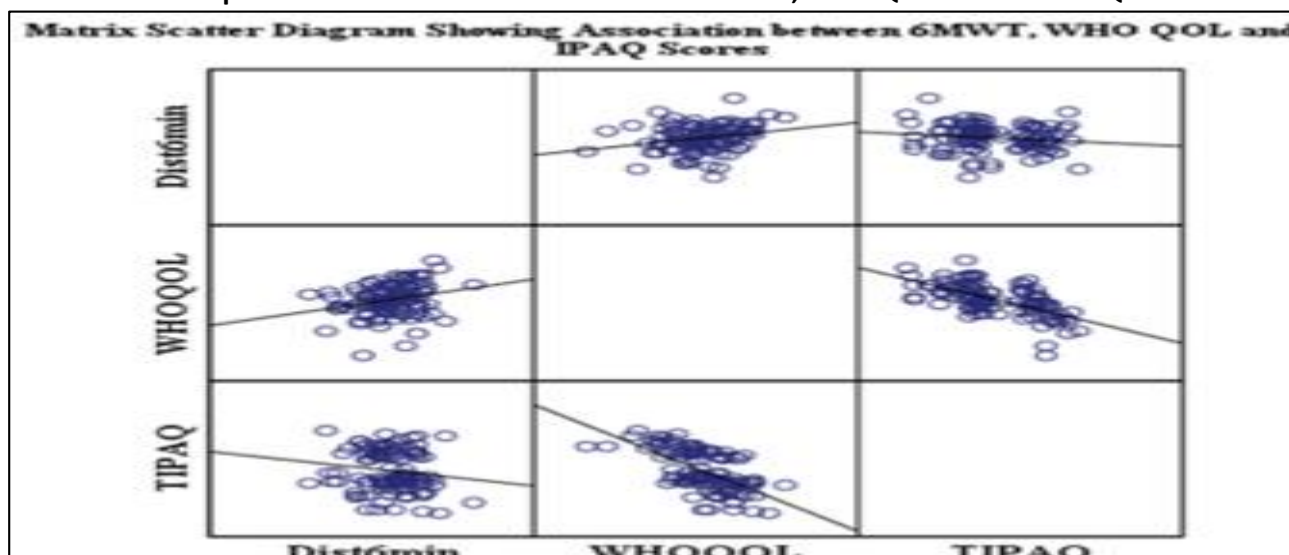
A. Perceived Participation %						
	Good And Above		Fair		Chi-Square	P Value
	M	F	M	F		
AI	100	100		0	0	0
FR	98.1	100	1.9	0	0.86	0.354
AO	63.0	78.3	37	21.7	2.76	0.096
SR	100	100	0	0	0	0
PW	87.0	82.6	13	17.4	0.38	0.537
B. Perceived Problem						
No Problem		Minor Problem		Chi-Square	P Value	
M	F	M	F			
94.4%	93.5	5.6	6.5	0.041	0.839	

AI: Autonomy Indoor, FR: Family role, AO: Autonomy outdoor, SR: Social Relationship PW: Paid work and education* Level of significance set at P < 0.05.

The correlation between 6MWT, WHOQOL, and IPAQ scores is seen in Graph 1. There was a weak positive correlation between distance walked in six minutes and quality of life indicating improving exercise capacity also improves WHOQOL score. (Spearman’s rho=0.251). There

was a moderate negative correlation between WHOQOL BREF and IPAQ score indicating as the WHOQOL BREF score becomes higher, the IPAQ score becomes lesser. Less IPAQ score means more social participation (spearman's rho= - 0.663).

Graph 1: Correlation Of Distance Walked In 6 Mins, WHOQOL BREF And IPAQ



Dist 6min-Six minute walk distance, WHOQOL _world health organization quality of life, TIPAQ-Total Impact of Participation and Autonomy questionnaire. There was no relationship observed between the distance walked in six minutes and the IPAQ score.

Discussion: The study aimed to evaluate exercise capacity, quality of life, and social participation in patients with post-pulmonary tuberculosis sequelae. The 6MWT indicates the ability to ambulate and is an inexpensive measure of physical function. It also reflects the capacity for doing everyday activities⁸. The Mean distance covered was 61.93 ± 9.55 % and 57.81 ± 7.36 % of the predicted distance in males and females with a derived mean VO₂ peak of 13.32 ± 2.37 ml/kg/min and 14.02 ± 2.84 ml/kg/min respectively.

Hemodynamic response as heart rate and blood pressure were within normal physiological limits. All patients maintained oxygen saturation above 90% throughout the test and were able to complete the test with a fair effort tolerance. The VO₂max in post-TB sequelae is found to be below 21 ml/kg/min and a significantly lower mean 6MWD and VO₂max than in the older healthy group². Our study population showed even lower mean 6MWD and VO₂ Peak in both males and females compared to other studies in the literature⁹ indicating a limited cardiorespiratory endurance.

The persistence of complaints of fatigue on exertion and sometimes cough as seen in these patients has an impact on exercise capacity. All patients were in the chronicity of the disease with a range of 5- 30 years. They weighed less and had a varied presentation with a chronic lung problem as obstructed airway disease (OAD), destroyed lung, bronchiectasis, and forms a part of chronic lung disorder. 6MWD is a better predictor of mortality in chronic pulmonary disease than FEV₁. At a cut-off value of 240 meters, the sensitivity and specificity of 6MWT in predicting mortality were 71.05% and 81.94% respectively¹⁰. This study showed mean 6MWD was above the given cutoff value for both males and females.

The effect of disease on one's various dimensions in life can be studied using QOL instruments. In the present study, WHOQOL (BREF), which has four domains, was used to assess the impact of

TB on the QOL and to have an in-depth understanding of the effect of disease on various dimensions of a patient's health. The overall QOL was good in 68%, moderate in 30%, and very poor for 2% of participants only. Physical health, Psychological, and Social relationship domains showed a greater percentage of participants having good QOL whereas 69% of the population showed moderate to poor QOL in the environmental domain.

The environmental domain includes varied facets ranging from financial resources, physical safety and security, health and social care: accessibility and quality, home environment, opportunities for acquiring new information and skills, participation in and opportunities for recreation/leisure activities, physical environment (pollution/noise/traffic/climate) and transport.

In the study population, most of the participants had problems with financial resources, physical safety, security, and the physical environment. Earlier studies have found Psychological and environmental domains are more affected in the PTB group when compared with the control group¹¹. Health-related QOL one year after successful completion of treatment is normal for most of the domains studied (physical, mental, social, and economic)¹² whereas it is affected in patients with PTB sequelae compared to the general population¹³. Lifestyle characteristics, comorbidities, and addictions may also affect QOL. There has been no statistically significant difference between the quality of life in males and females in any of the domains indicating equal affection irrespective of gender and roles.

Addressing the need of pulmonary rehabilitation for pulmonary rehabilitation irrespective of gender. Pulmonary tuberculosis in India does carry a social stigma due to the perceived consequences of infection. Social participation is an integral component of quality of life. In our study, the participants had regular follow-ups in the outpatient department (OPD) and were compliant with the treatment follow-up in chest medicine and physiotherapy for breathing exercises.

They were well-educated in terms of both pharmacological and non-pharmacological management. Also, compensations in the physiological system and work efficiency may

have brought about positive change over the period of years. Hence though not on any structured exercise programs probably compliance with other factors such as regular visits could be an important reason for overall good quality of life and no participation restricted.

The study population did not show any limitation in any domains Autonomy indoors, family role, or social relations. Autonomy outdoors paid work, and education was perceived as mildly limited.

Only 6% of the population had minor problems with their disease condition due to financial resources.

No statistically significant difference was found between males and females in any of the domains of quality of life or IPAQ.

A very weak positive correlation between 6MWT and WHOQOL BREF was found (Spearman's $\rho=0.251$). Heni Retnowulan et al¹⁴ found a significant negative correlation between the 12-minute walking distance and activity domain ($r = .336$) and a significant negative correlation between the 12-minute walking distance and quality of life as assessed by questionnaire St. George Respiratory Questionnaire (SGRQ). WHOQOL BREF and IPAQ score showed a moderate negative correlation (spearman's $\rho= -0.663$). Improved quality of life indicates better participation socially in the family and work and increased autonomy both indoors and outdoors.

Conclusion: Exercise capacity is reduced in patients with post-pulmonary tuberculosis sequelae. The quality of life and social participation was good in a greater proportion of participants and there was no significant difference in exercise capacity, quality of life, and social participation between males and females.

There is a very weak positive correlation between the six-minute walk distance and WHOQOL BREF and a moderate negative correlation between WHOQOL BREF and IPAQ score.

Clinical Implication: Exercise capacity, quality of life, and social participation should be assessed in PTB sequelae patients to design strategies of care and therapy and enrol them in a pulmonary rehabilitation program as per need irrespective of gender.

Limitations: The study was carried out in a single tertiary health care center in western Maharashtra. The association between lifestyle characteristics, comorbidities, addictions, disease chronicity, and severity with a six-minute walk distance or quality of life was not studied which could affect the quality of life. Also, the extent of structural involvement using spirometric and radiologic data was not studied.

Acknowledgments: Dr. Amita Athavale, Prof & Head, Department of Chest Medicine, Seth GSMC &KEMH, Prof Amita Mehta, Ex HOD, Department of Physiotherapy, Seth GSMC &KEMH.

References:

1. Chakraborty AK. Epidemiology of tuberculosis: Current status in India. Indian Journal Medicine Res 2004; 120(4):248-76.
2. Kim HY, Song KS, Goo JM, Lee JS, Lee KS, Lim TH. Thoracic sequelae and complications of tuberculosis. Radiographics 2001; 21:839-60.
3. Sivaranjini S, Vanamail P, Eason J. Six minute walk test in people with tuberculosis sequelae. Cardiopulmonary Physical Therapy Journal 2010; 21:5-10.
4. <https://www.who.int/tools/whoqol/whoqol-bref>. Last accessed on 15 september 2022
5. Kersten P, Cardol M, George S, Ward C, Sibley A, White B. Validity of the impact on participation and autonomy questionnaire: a comparison between two countries. Disabil Rehabil. 2007 Oct 15;29(19):1502-9. doi: 10.1080/09638280601030066. PMID: 17852246.
6. Sibley A, Kersten P, Ward CD, White B, Mehta R, George S. Measuring autonomy in disabled people: Validation of a new scale in a UK population. Clin Rehabil. 2006 Sep;20(9):793-803. doi: 10.1177/0269215506070808. PMID: 17005503.
7. ATS Statement: Guidelines for the Six-Minute Walk Test Am J Respir Crit Care Med, 2002 Vol 166.pp 111–117.
8. Enright PL, Sherril DL. Reference equations for the six minute walk in healthy adults. Am J Respir Crit Care Med. 1998; 158:1384–1387.
9. Adedoyin, RA, Erhabor GE, Ojo OD, Mbada CE, Awotidebe TO, Obaseki DO, Awofolu OO. 2010. Assessment of Cardiovascular Fitness of Patients with Pulmonary Tuberculosis Using Six Minute Walk Test. TAF Preventive Medicine Bulletin. 9(2):99-106.
10. Karanth MS, Awad NT. Six Minute Walk Test: A Tool for Predicting Mortality in Chronic

Pulmonary Diseases. J Clin Diagn Res. 2017 Apr;11(4):OC34-OC38. doi: 10.7860/JCDR/2017/24707.9723. Epub 2017 Apr 1. PMID: 28571188; PMCID: PMC5449834.

11. Sharma R, Yadav R, Sharma M, Saini V, Koushal V. Quality of Life of Multi Drug Resistant Tuberculosis Patients: a Study of North India. Acta Med Iran. 1;52(6):448-453.
12. Muniyandi M, Rajeswari R, Nirupa C, Gopi PG, Jaggarajamma K, Sheela, Narayan PN. Evaluation of post-treatment health-related quality of life among tuberculosis patients. INT J Tuber Lung Dis 11(8):887–892.
13. Meyyappan, Deepaselvi & Chockalingam, Palaniappan. (2018). Evaluation of respiratory impairment and health related quality of life in pulmonary tuberculosis sequelae patients. International Journal of Advances in Medicine. 10.18203/2349-3933.ijam20180492..
14. Retnowulan H, Achadiono DW, Rahmatullah AI. The relationship between 12MWD and quality of Life in tuberculosis sequelae patients. Acta Interna The Journal of Internal Medicine Vol. 6 No. 1 June 2016

Conflict of interest: None
Funding: None
Cite this Article as: Sonarkhan D, Jiandani. Exercise Capacity, Quality Of Life, And Social Participation In Patients With Post-Tuberculosis Sequelae: An Observational Analytical Study. Natl J Integr Res Med 2022; Vol.13(4): 07-12