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Research Article

Assessment Of Quality of Life in Post-Pulmonary Tuberculosis Patients in University of Nigeria Teaching Hospital, Enugu, Southeast Nigeria

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Abstract

Pulmonary tuberculosis is mainly caused by *Mycobacterium tuberculosis*, a rod-shaped, non-spore-forming, obligately aerobic, and facultatively intracellular pathogen [1-3]. It is the most important agent of human disease among the M. tuberculosis complex of the Mycobactericidal family which is of the order Actinomycetales [4]. Currently, much of the emphasis on Tuberculosis (TB) management is on microbiological treatment, while its impact on Health-Related Quality of Life (HRQoL) is either unrecognized or rarely considered [5]. Many studies [5-7], have evaluated the impact of active TB on HRQoL. These studies have demonstrated a significant drop in HRQoL, especially in their Physical Component Score (PCS) and Mental well-being Component Score (MCS) [5]. Tuberculosis is associated with constitutional as well as chest symptoms (cough, chest pain, and hemoptysis) which cause physical, psychosocial, and mental distress. This may further lead to work absenteeism resulting in loss of output and reduced monthly income [5].

Objectives: This study aims to determine the quality of life of post pulmonary tuberculosis patients in UNTH Enugu.

Methods: Individuals who have completed treatment for PTB were identified from the clinic register consecutively and called on phone to come for recruitment if they gave informed consent and if they met the inclusion criteria. Transportation fare was provided for the consenting individuals. Socio-demographic and other relevant clinical data of participants were collected using a researcher-administered structured questionnaire based on a modification of the validated United Kingdom Medical Research Council (MRC) respiratory symptoms questionnaire. The WHO Quality of Life BREF questionnaire was administered to assess the health-related quality of Life in these patients. This has 26 components and evaluates QOL using 24 items across "4 domains viz Physical, Psychological, Social relationships, and Environment, and 2 items on overall QOL and general health [8]. The domain scores will be transformed into a linear scale between 0 and 100 following the scoring guideline [9]. A greater score connotes a better QOL [9]. Breakdown of the factors incorporated within the domains and all questions and domains were scored based on the standard scoring scale.

Results: Quality of life was significantly lower in post-TB individuals across all domains ($p < 0.001$) with the physical and psychological domains being most affected. Also, the overall QoL perception and general health satisfaction were significantly lower in post-TB cases ($p = <0.001$). However, no significant association was found between chest x-ray scores and quality of life.

Conclusion: Overall, health-related quality of life was significantly reduced across all domains in post-TB individuals compared to healthy controls, emphasizing the substantial impact of pulmonary tuberculosis on affected individuals even after successful treatment.

Abbreviations: HRQoL: Health-Related Quality of Life; WHO: World Health Organization; QOL: Quality of Life; TB: Tuberculosis; PTB: Pulmonary Tuberculosis

Introduction

Pulmonary Tuberculosis (PTB) is a disease of global importance with significant morbidity and mortality. A third of the world's population is infected with mycobacterium tuberculosis and over 9 million new cases are reported annually. About 85% of drug-susceptible PTB cases were treated successfully between 1995 and 2015. However, up to half of these are noted to have persistent pulmonary dysfunction even after microbiological cure, with an associated reduction in quality of life and increased risk of death from pulmonary causes.

World Health Organization (WHO) defines quality of life as an "individual's perceptions of their position in life in the context of the culture and value systems in which they live and concerning their goals, expectations, standards, and concerns [10]. *Ijima, et al*,. [11] in a study in UNTH Enugu, Southeast Nigeria, noted that HRQoL is lower in patients with chronic diseases [11]. Health-related quality of life (HRQoL) is being considered to be a treatment goal for many diseases, including PTB [12]. WHO places much importance on patient-centered care in the End TB Strategy, and HRQoL is essential for evaluation of patient's perception of wellbeing. Therefore, in treatment of PTB, the HRQoL of the patient is an important endpoint in addition to microbiological cure [10]. Currently, much of the emphasis on TB management is on microbiological treatment, while its impact on health-related quality of life (HRQoL) is either unrecognized or rarely considered [5]. Many studies [5-7] have evaluated the impact of active TB on HRQoL. These studies have demonstrated a significant drop in HRQoL, especially in their Physical Component Score (PCS) and Mental well-being Comonent Score (MCS) [5]. TB is associated with constitutional as well as chest symptoms (cough, chest pain, and hemoptysis) which cause physical, psychosocial, and mental distress. This may further lead to work absenteeism resulting in loss of output and reduced monthly income [5].

Muhammad et al, [5] discovered that although HRQoL, following treatment for TB, was less than that of the general populace, there was a significant improvement from pretreatment levels [5]. Similar trend in the improvement of HRQoL scores in association with TB treatment was reported by *Muniyandi, et al* [13] in a TB center in southern India. Contrary to this, *Chamla, et al*. [14] in China showed no difference in HRQoL before and after TB treatment [14].

A study by Sule et al in-university Teaching Hospital Ilorin, Kwara state Nigeria, suggests that HRQoL of pulmonary tuberculosis patients was found to be fairly impaired in all the health domains despite at least two months of treatment with anti-tuberculosis drugs. The environment and psychological health of the patients were the most affected domains in the study [6]. Of the validated tools used for the assessment of HRQoL, the abbreviated World Health Organization Quality of Life scale (WHOQOL-BREF) has been widely used. It has 26 questions where 24 evaluates QOL across 4 domains - Physical, Psychological, Social relationships, and Environment and 2 assess overall QOL and general health [7,5]. Each question in the 4 domains is scored from 1-5. The domain scores are the sum of the scores for each question within the domain. Multiplying the mean of the domain by 4 is used to transform the WHOQOL-BREF scores into the longer form WHOQOL-100. Alternatively, the columns labeled "Transformed scores 4-20 and 20-100 on the WHOQOL-BREF scores tables can be used to directly transform the domain score.

Note that three of the questions (questions 3,4 and 26) are negatively phrased and so are reverse scored by subtracting the question score from 6. Thus, a score of 5 becomes 1 and vice versa, a score of 4 becomes a two and vice versa etc. This is done before calculating the total domain scores.

The questions that are added up for each domain are as follows.

a. The first domain is Physical Health and comprises 6-Q3, 6-Q4, Q10, Q15, Q16, Q17 & Q18.

b. Second, Psychological domain includes Q5, Q6, Q7, Q11, Q19, & 6-Q26

c. Third domain is Social Relationships and includes Q20, Q21 & Q22

d. The Fourth is Environmental which include Q8, Q9, Q12, Q13, Q14, Q23, Q24 & Q25 (Table 1).

Table 1: WHOQOL-BREF domains and questionnaire [8,13].

Domain	Facets Incorporated within Domains
1. Physical health	Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work Capacity

2. Psychological	Bodily image and appearance Negative feelings Positive feelings Self-esteem Spirituality / Religion / Personal beliefs Thinking, learning, memory and concentration
3. Social relationships	Personal relationships Social support Sexual activity
4. Environment	Financial resources Freedom, 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) Transport

The tables below detail how each of the 26 questions in the WHO-QOL will be scored and how the sum of each of the domains will be calculated. Higher scores suggest higher quality of life while lower scores suggest lower quality of life (Table 2).

The following questions ask about how much you have experienced certain things in the last four weeks (Table 3).

The following questions ask about how completely you experienced or were able to do certain things in the last four weeks (Table 4).

The following question refers to how often you have felt or experienced certain things in the last four weeks (Table 5).

The Table below was calculated after the questionnaire was filled (Table 6).

How the data was converted from raw scores to transformed scores in WHO-BREF (Figure 1).

Table 2

		Very poor	Poor	Neither poor nor good	Good	Very good
1	How would you rate your quality of life?	1	2	3	4	5
2	How satisfied are you with your health?	1	2	3	4	5

Table 3

		Not at all	A Little	A Moderate Amount	Very Much	An Extreme Amount
3	To what extent do you feel that physical pain prevents you from doing what you need to do?	5	4	3	2	1
4	How much do you need any medical treatment to function in your daily life?	5	4	3	2	1
5	How much do you enjoy life?	1	2	3	4	5
6	To what extent do you feel your life to be meaningful?	1	2	3	4	5
7	How well are you able to concentrate?	1	2	3	4	5
8	How safe do you feel in your daily life?	1	2	3	4	5
9	How healthy is your physical environment?	1	2	3	4	5

Table 4

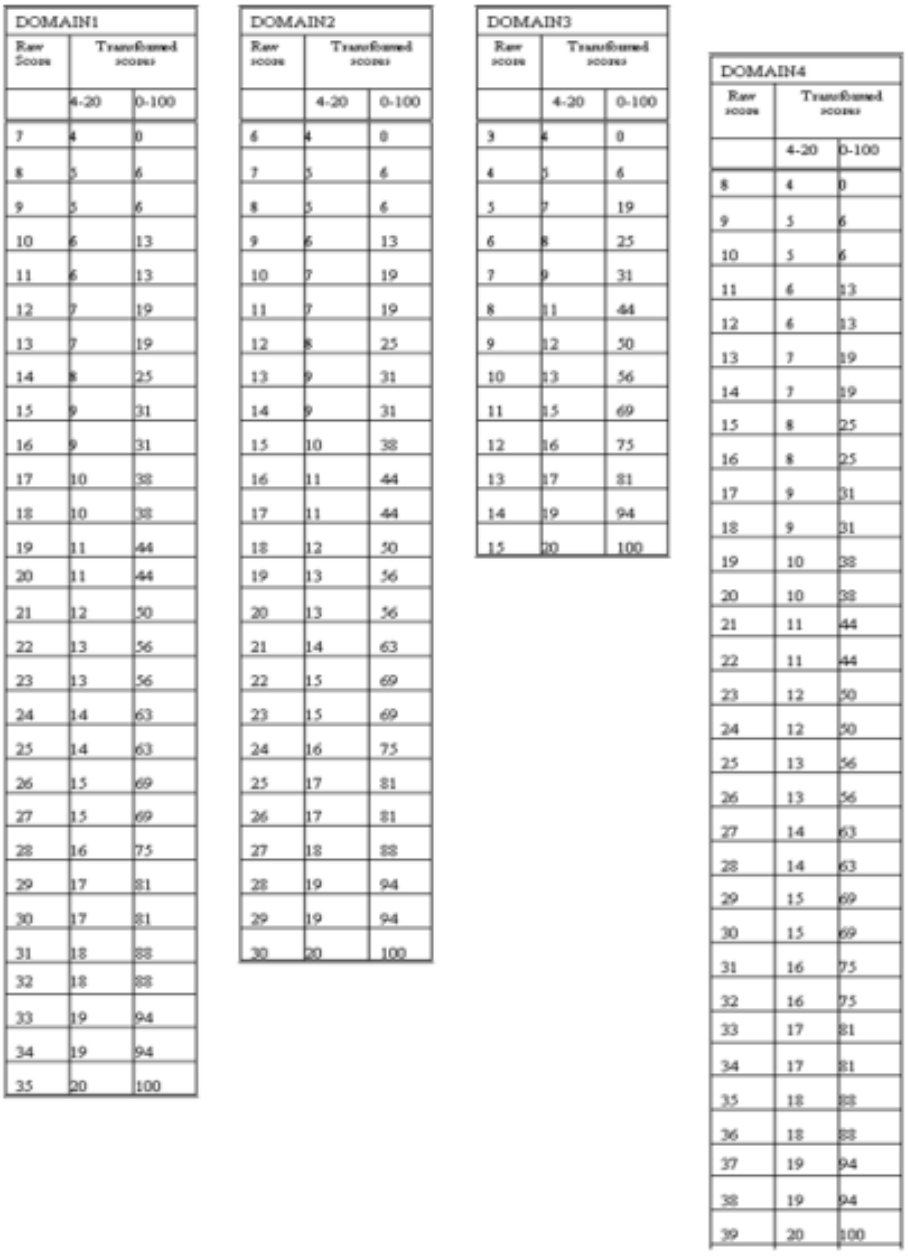
		Not at all	A little	Moderately	Mostly	Completely
10	Do you have enough energy for everyday life?	1	2	3	4	5
11	Are you able to accept your bodily appearance?	1	2	3	4	5
12	Have you enough money to meet your needs?	1	2	3	4	5
13	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5
15	How well are you able to get around?	1	2	3	4	5
16	How satisfied are you with your sleep?	1	2	3	4	5
17	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18	How satisfied are you with your capacity for work?	1	2	3	4	5
19	How satisfied are you with yourself?	1	2	3	4	5
20	How satisfied are you with your personal relationships?	1	2	3	4	5
21	How satisfied are you with your sex life?	1	2	3	4	5
22	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23	How satisfied are you with the conditions of your living place?	1	2	3	4	5
24	How satisfied are you with your access to health services?	1	2	3	4	5
25	How satisfied are you with your transport?	1	2	3	4	5

Table 5

		Never	Seldom	Quite often	Very often	Always
26	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	5	4	3	2	1

Table 6

		Equations for computing domain scores	Raw score 4-20	Transformed scores* 0-100	
27	Domain1	(6-Q3)+(6-Q4)+Q10+Q15 +Q16+Q17+Q18 □ +□ + □ +□ +□ +□ +□	a.=	b:	c:
28	Domain2	Q5+Q6+Q7+Q11+Q19+(6-Q26) □ +□ +□ + □ + □ + □	a.=	b:	c:
29	Domain3	Q20+Q21+Q22 □ +□ +□	a.=	b:	c:
30	Domain4	Q8+Q9 +Q12 +Q13 +Q14+ Q23+Q24+ Q25 □ +□ +□ +□ +□ +□ +□ +□	a.=	b:	c:



DOMAIN1

Raw Scores	Transformed scores	
	4-20	0-100
7	4	0
8	5	6
9	5	6
10	6	13
11	6	13
12	7	19
13	7	19
14	8	25
15	9	31
16	9	31
17	10	38
18	10	38
19	11	44
20	11	44
21	12	50
22	13	56
23	13	56
24	14	63
25	14	63
26	15	69
27	15	69
28	16	75
29	17	81
30	17	81
31	18	88
32	18	88
33	19	94
34	19	94
35	20	100

DOMAIN2

Raw scores	Transformed scores	
	4-20	0-100
6	4	0
7	5	6
8	5	6
9	6	13
10	7	19
11	7	19
12	8	25
13	9	31
14	9	31
15	10	38
16	11	44
17	11	44
18	12	50
19	13	56
20	13	56
21	14	63
22	15	69
23	15	69
24	16	75
25	17	81
26	17	81
27	18	88
28	19	94
29	19	94
30	20	100

DOMAIN3

Raw scores	Transformed scores	
	4-20	0-100
3	4	0
4	5	6
5	7	19
6	8	25
7	9	31
8	11	44
9	12	50
10	13	56
11	15	69
12	16	75
13	17	81
14	19	94
15	20	100

DOMAIN4

Raw scores	Transformed scores	
	4-20	0-100
8	4	0
9	5	6
10	5	6
11	6	13
12	6	13
13	7	19
14	7	19
15	8	25
16	8	25
17	9	31
18	9	31
19	10	38
20	10	38
21	11	44
22	11	44
23	12	50
24	12	50
25	13	56
26	13	56
27	14	63
28	14	63
29	15	69
30	15	69
31	16	75
32	16	75
33	17	81
34	17	81
35	18	88
36	18	88
37	19	94
38	19	94
39	20	100

Figure 1

Methods

Individuals who have completed treatment for PTB were identified from the clinic register consecutively and called on phone to come for recruitment if they gave informed consent and if they met the inclusion criteria. Transportation fare was provided for the consenting individuals. Socio-demographic and other relevant clinical data of participants were collected using a researcher administered structured questionnaire based on a modification of the validated United Kingdom Medical Research Council (MRC) respiratory symptoms questionnaire. There are no clinically validated tools for the description or severity scoring of structural pathology on imaging, after pulmonary tuberculosis disease. However, changes seen on chest radiographs and CT were assessed and measured including residual cavitation, bronchiectasis, and fibrotic changes, as well as anatomical distortion and lung tissue destruction. Chest x-ray: posterior-anterior view, was done and reported by a radiologist with me in attendance, assessing for opacities, infiltrates or cavities. Radiographic abnormalities were scored using a validated

scoring classification for evaluation of radiographic features of TB [15].

Grading of Anatomical Extent of Disease (W.H.O., 1960) [13,16].

a. Trivial: that is, minimal lesions which the assessor regarded, purely on radiographic grounds, as inactive.

b. Slight: that is, minimal or rather larger lesions which he regarded as radiographically active.

c. Limited: that is, lesions of greater extent than in (2) but involving a total area of lung less than that occupied by the right upper lobe as visualized on a posterior-anterior radiograph.

d. Moderate: that is, lesions of greater extent than in (3) but whose total extent, even if bilateral, did not exceed an area equivalent to the whole of one lung.

e. Extensive: that is, lesions that involve an area of more than the whole of one lung.

f. Gross: that is, very extensive bilateral disease.

Radiographic abnormalities were graded into two (a), for a score ≤ 3 and (b) for a score > 3

The WHO Quality of Life BREF questionnaire will be administered to assess the health-related quality of Life in these patients. This has 26 components and evaluates QOL using 24 items across "4 domains viz Physical, Psychological, Social relationships, and Environment" and 2 items on overall QOL and general health [8]. The domain scores will be transformed into a linear scale between 0 and 100 following the scoring guidelines [9]. A greater score connotes a better QOL [9].

Data analysis

Data was stored electronically. Variables were classified into continuous and qualitative variables. Continuous variables were measured using measures of central tendency while qualitative variables will be measured as discrete variables. Data was analyzed using the Statistical Package for Social Science (SPSS) version 23.0 (IBM Inc USA). Results were expressed as mean ± standard deviation at 95% Confidence Interval (CI).

Results

Quality of life score was higher across all four domains assessed in control participants who never had Pulmonary TB than in post-TB patients. This difference was statistically significant with p value < 0.001 as shown in (Table 7). Also, in the assessment of overall quality of life perception and general health satisfaction, post-TB cases had statistically significant (p=0.001) lower scores than their healthy counterparts who never had PTB as shown in (Table 8) below. Among post TB patients, 130 (65%) had good or very good overall quality of life perception compared to 25(12.5%) of them who had poor or very poor perception. Similarly, greater percentage of post-TB cases, 123(61.5%) were satisfied or very satisfied with their general health whereas only 44(22%) were dissatisfied or very dissatisfied. However, chest x-ray radiographic score had no statistically significant association with the quality of life of post-TB cases across all domains as shown in (Table 9) above.

Table 7: Quality of Life domains in study participants.

QoL DOMAIN	CASE n = 200 Mean ± SD	CONTROL n = 200 Mean ± SD	Mean Difference (95% Confidence Interval)	p-value†
Physical	58.30 ± 10.93	62.52 ± 7.33	-4.23 (-6.06 – -2.40)	<0.001
Psychological	59.00 ± 12.16	65.33 ± 8.92	-6.33 (-8.43 – -4.23)	<0.001
Social	61.39 ± 17.63	67.95 ± 12.01	-6.56 (-9.53 – -3.59)	<0.001
Environment	62.33 ± 13.43	70.39 ± 10.00	-8.06 (-10.39 – -5.73)	<0.001

Note*: † Independent Student t-test.

Table 8: Overall Quality of life perception in study participants.

QOL DOMAIN	CASE n=200 (n, %)	CONTROL n=200 (n, %)	Chi-square	p-value
Overall quality of life perception				
Very poor	3 (1.5)	0 (0)		

Poor	22 (11.0)	3 (1.5)	43.2 (4)	<0.001
Neither good nor poor	45 (22.5)	21 (10.5)		
Good	109 (54.5)	119 (59.5)		
Very good	21 (10.5)	57 (28.5)		
General Health satisfaction				
Very dissatisfied	10 (5.0)	0 (0)		
Dissatisfied	34 (17.0)	6 (3.0)		
Neither dissatisfied nor satisfied	33 (16.5)	29 (14.5)	43.6 (4)	<0.001
Satisfied	114 (57.0)	134 (67.0)		
Very satisfied	9 (4.5)	31 (15.5)		

Table 9: Association of radiographic scores and QoL scores of post TB cases.

QoL DOMAIN	Score ≤ 3 n = 148 Mean ± SD	Score >3 n = 21 Mean ± SD	Mean Difference (95% Confidence Interval)	p-value†
Physical	59.06 ± 10.73	54.81 ± 10.40	4.25 (-0.67 – 9.17)	0.09
Psychological	59.22 ± 12.06	54.05 ± 14.48	5.18 (-0.52 – 10.87)	0.075
Social	60.89 ± 17.16	61.95 ± 23.16	-1.07 (-9.35 – 7.21)	0.799
Environment	62.43 ± 13.65	61.43 ± 12.23	1.00 (-5.20 – 7.21)	0.75

Note*: † Independent Student t-test.

Discussion

In this study, Health-Related Quality of Life (HRQoL) was significantly lower across all domains in post-TB patients than in the control group [13]. Physical domain score was 58.30 for cases and 62.52 for control, psychological was 59.00 for cases and 65.33 for control, social domain was 61.39 for cases and 67.95 for control while the environmental domain score was 62.39 for cases and 70.39 for control. This agrees with findings by *Ojuawo, et al,. [17] and Ozoh, et al., [12]. In Malaysia, Atif, et al*. [5] noted that although HRQoL improved with the treatment, the scores showed compromised physical and mental health. This was similar to finding in this work which noted the physical and psychological domains to be the most affected. This could be because, in addition to the impact of PTB on the patient's physical health and fitness, the infectious nature of the disease could cause the individual to be stigmatized in the society even after successful treatment causing significant psychological trauma.

Also, in the assessment of overall quality of life perception and general health satisfaction, post-TB cases had statistically significantly lower scores than their healthy counterparts. This can be explained by the high socioeconomic and health-related impact of the disease on patients. However, among post-TB patients, a greater percentage; 65% (130) had good or very good overall quality of life perception compared to (12.5% (25) of them who had poor or very poor perception. Similarly, a greater percentage of post-TB cases, 123 (61.5%) were satisfied or very satisfied with their general health whereas only 44 (22%) were dissatisfied or very dissatisfied. These findings point to the positive impact of successful TB treatment on these individuals. Nonetheless, these numbers that remained dissatisfied with poor perception of quality of life could be due to poor drug adherence during treatment. Also, some individuals have a genetic predisposition for more severe lung damage with subsequent impairment of lung function and quality of life [4].

Although patients with higher radiographic scores had lower QoL, there was no statistically significant association between chest x-ray abnormality and HRQoL of post-TB patients. A better radiographic modality like high resolution CT scan could have yielded a different outcome as structural lung damage would be better delineated. These findings underscore the need for follow up and holistic care of post-TB patients as sequel of pulmonary TB can lead to impaired lung function and reduced quality of Life.

Conclusion

Health related quality of life was significantly reduced across all domains in post-TB individuals with significant difference when compared with healthy controls underlining the extent of the impact of PTB on affected individuals.

Acknowledgement

None.

Conflict of Interest

None.

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