

The Quality of Life of Tuberculosis Patients at Witbank TB Hospital, South Africa: A Cross-sectional Study

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Manuscript

The quality of life of tuberculosis patients at Witbank TB Hospital, South Africa: A cross-sectional study

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Abstract

Background: The quality of life (QoL) of tuberculosis (TB) patients may predict treatment outcomes. Little is known about the QoL of patients with TB and Human immunodeficiency virus (HIV) co-morbidity, especially in South African settings. We investigate the QoL of TB patients with and without HIV at the Witbank TB Hospital in Mpumalanga Province, South Africa.

Methods: In a cross-sectional analytical study, 124 patients with confirmed TB, with or without HIV co-infection, were recruited from September 2018 to October 2018. Trained interviewers conducted face-to-face interviews with participants, helping them to complete a standardized short form-12 (SF-12) QoL questionnaire. The data were analyzed using SPSS and SAS software. Differences between groups were quantified using t-test. Logistic regression analysis identified explanatory variables predicting mental (MCS) health and physical (PCS) health.

Results: For all sub-scales of the SF-12 instrument, Cronbach's alpha > 0.8 demonstrating high internal consistency. Patients with TB/HIV co-morbidity had lower scores in all dimensions ($p < 0.05$), indicating poor QoL compared to TB patients without HIV. In multivariate analysis, the family size was predictive of physical health QoL. TB patients who were staying in a household with more than four family members were 2.12 times more likely to have better QoL compared to TB patients living in households with fewer than four family members, OR= 2.33 (95% CI: 1.12 to 4.98); $p < 0.05$).

Conclusions: Patients who are co-infected with TB and HIV, in this setting, have poorer QoL than patients who are only infected with TB. Our results support the development of strategies to improve QoL that consider the physical and mental wellbeing of TB/HIV co-infected patients.

Keywords: Quality of life (QoL), Human immunodeficiency virus (HIV), Tuberculosis (TB), physical health and mental health

[Total words: 264]

Background

Globally, tuberculosis (TB) has been associated with 1.2 million deaths of people not infected with human immunodeficiency virus (HIV) and 251 000 deaths among people living with HIV.¹ In 2019, South Africa was ranked eighth among 30 World Health Organization (WHO) countries which have the highest TB disease burden worldwide.¹ In 2018, the WHO, cooperating with the Global Fund and Stop TB Partnership, launched a new joint initiative called “FIND. TREAT. All. #ENDTB” to close the gap between TB prevention, access to treatment and care. This initiative will be implemented over five years from 2018 to 2022. The initiative aims to detect, cure and report 40 million people with TB, including 3.5 million children as well as 1.5 million individuals with drug-resistant TB.² South Africa is one of the seven countries that are on track to achieve the 2020 milestones of the End TB strategy.¹

Recently, the QoL of TB patients has been identified as a factor influencing treatment outcomes.³ The WHO describes QoL “as a persons’ perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, anticipations, standards, and concerns”. From the patient’s perspective, QoL encompasses physical, social and psychological well-being.⁴ Understanding how TB disease affects QoL is important for successful treatment outcomes. People with TB suffer from impaired physical, social and mental well-being, which may hamper successful treatment leading to reduced QoL.⁴

Numerous international studies have measured health-related QoL among active TB individuals at different stages of treatment. In a prospective study, Dar et al.⁵ reported that physical well-being was mostly affected at the baseline, improving after intensive treatment. Using the short form-36 (SF-36) health survey questionnaire, Rajeswari et al.⁶ found that treatment significantly improved physical and mental well-being but did not influence social well-being. Deribew et al.⁷

compared the QoL of HIV-positive individuals with and without active TB and reported that poor physical and mental health was strongly associated with diminished QoL in co-infected patients.

In South Africa, few studies have assessed the health-related QoL of active TB patients. In a cross-sectional survey, Sineke et al.⁸ reported that patients who were co-infected with TB/HIV had lower QoL than HIV patients without TB. Babikako et al.⁹ reported that older men with TB were more likely to have a poor QoL for physical health irrespective of their HIV status. In a prospective cohort study, Louw et al.¹⁰ used the SF-12 instrument to assess QoL of TB patients, at the start of the treatment and on the sixth month of the treatment, reporting improved physical and mental health at the six month follow up. There is increased interest in assessing the QoL among TB patients, but little is known about the QoL of TB patients living with HIV. We investigate the QoL of TB patients in a low resource setting and compare the QoL of TB patients and TB/HIV co-morbidity patients. These results may be valuable for updating TB guidelines for improving QoL of TB/HIV co-infected patients.¹¹

Methods

Ethics approval and consent to participate

Ethical permission was granted from two ethics committees: The Faculty of Health Sciences Research Ethics Committee, certificate number: 418/2018 at the University of Pretoria and Mpumalanga Department of Health Research Committee.

Study Design

A cross-sectional analytical study conducted from 25 September until 14 October 2018 at the Witbank TB Hospital in South Africa.

Study participants

Patients who were being treated for TB and who attended the hospital from 25 September to 14 October 2018. In total, 124 out of 133 TB patients consented to participate. All participants were 18 years or older, being treated at Witbank TB Hospital and gave written consent. We excluded patients who were younger than 18 years old, unconscious and who did not sign consent forms.

Measurement instruments

Socio-Demographic characteristics

We formulated a questionnaire to collect data on participant's age, gender, district, marital status, educational level, employment status, weight and height, smoking status, HIV status, physical activities, history of TB, TB treatment, family size, family income and family type.

Health survey questionnaire (SF-12)

The data were collected using the SF-12 health survey questionnaire. This is a validated tool developed by Ware¹² and used to measure generic health outcomes. The 12-items consist of eight sub-dimensions: general health (GH, 1 item), physical functioning (PF, 2 items), physical role (PR, 2 items), vitality (VT, 1 item), bodily pain (BP, 1 item), emotional role (RE, 2 items), mental health (MH, 2 items) and social functioning (SF, 1 item). The SF-12 scoring for physical (PCS-12) and mental (MCS-12) component scores were created using norm-based methods. The weighted indicator variables and aggregated SF-12 scores were generated using two groups of regression weights: mental regression weights and physical regression weights. A mean SF-12 score greater than 50 indicates better QoL.¹²

Data management and analysis

Two trained interviewers collected data at the facility during the patient's monthly follow up and hospitalization. The two independent data typists captured, cleaned, and checked the data for completeness and accuracy. Data were analyzed using IBM®SPSS®Statistics version 25 and

SAS version 9.4. Data were described using descriptive statistics (standard deviation, frequencies and mean). Data were assessed for normality, and we used chi-square t-test to compare the SF-12 domains across difference groups: Age, gender, marital status, education level, smoking status, HIV status, Economic status, length of TB treatment and living conditions.

The MCS-12 and PCS-12 scores were calculated using the SAS Scoring Program. The PCS-12 and MCS-12 scores were dichotomized by taking the mean values as a cut-off point, where 0 = poor and 1 = good. We used multivariate logistic regression to identify associations between QoL and all the independent variables. The initial model was the full model, with all the independent variables. Non-significant variables were eliminated in a step-wise manner until the final model included only significant variables. Variables were significant if $p \leq 0.05$.

Results

Socio-demographic characteristics

From 133 TB patients, we recruited 124 participants (response rate 93%). Seven patients declined to participate, and two were unable to grant informed consent. Participants were on average 39.79 years old (SD=11.8), ranging from 19 to 63 years (Table 1). Two-thirds (60.8%) of men were between 19 and 45 years old. Of the men, 74.3% were unmarried or divorced and 63.5% were unemployed. Eighty-eight per cent of women never smoked. Most men (93.2%) were on the second stage (continuous phase) of TB treatment, and 54.0% of women had a family history of TB. The same proportion of men and women had TB/HIV co-infection (60.8% and 62.0%, respectively). The same proportion of men and women lived in homes with more than four members (56.8% and 64.0%, respectively) (Table 1).

Table 1: The socio-demographic characteristics of TB patients from Witbank TB Hospital

Variables	Male (n=74) n (%)	Female (n=50) n (%)	χ^2	P-value
Age:				
≤ 45 years	45 (60.8)	42 (84.0)		
> 45 years	29 (39.2)	8 (16.0)		
Mean age (SD),	39.79 (11.8), 19 to 63 years		7.664	0.006
Level of education:				
None / Primary	28 (37.8)	8 (16.0)		
Secondary	38 (51.4)	38 (76.0)		
Tertiary	8 (10.8)	4 (8.0)	8.103	0.017
Marital status:				
Unmarried/ divorced	55 (74.3)	49 (98.0)		
Married/ widowed	19 (25.7)	1 (2.0)	12.364	0.000
Smoking Status:				
Current smoker	14 (18.9)	3 (6.0)		
Ex-smoker	27 (36.5)	3 (6.0)		
Never	33 (44.6)	44 (88.0)	24.149	0.000
Employment status:				
Employed	27 (36.5)	5 (10.0)		
Unemployed	47 (63.5)	45 (90.0)	10.933	0.001
On TB Treatment:				
Intensive Phase	5 (6.8)	10 (20.0)		
Continuous Phase	69 (93.2)	40 (80.0)	4.921	0.027
Family history of TB:				
Yes	18 (24.3)	27 (54.0)		
No	56 (75.7)	23 (46.0)	11.365	0.001
HIV status:				
Positive	45 (60.8)	31 (62.0)		
Negative	29 (39.2)	19 (38.0)	0.018	0.894
Family Size:				
≤ 4	32 (43.2)	18 (36.0)		
> 4	42 (56.8)	32 (64.0)	0.651	0.420
Family Income:				
≤ R15 000	68 (91.9)	46 (92.0)		
> R15 000	6 (8.1)	4 (8.0)	0.000	0.983

χ^2 = Chi Square; %= Percentage; SD= Standard Deviation; n= Sample Size

Comparing means of SF-12 survey scale

The mean PCS-12 and MCS-12 scores for all participants were 41.6 and 43.5, respectively. The general health, emotional role and physical role sub-scales scored the lowest. The highest sub-scale scores were recorded for physical functioning, social function, mental health, vitality, and bodily pain. Compared to patients with TB only, patients who had TB/HIV co-infection scored significantly lower in the domains of general health, physical functioning, social function, mental health, and emotional role ($p < 0.05$). Patients with TB only and patients with TB/HIV co-infection had similar scores for vitality, physical role, and bodily pain ($p > 0.05$). Overall, patients with TB/HIV co-infection had lower scores for PCS-12 and MCS-12, indicating poor QoL (Table 2).

Table 2: The SF-12 health survey scale means for TB patients with and without HIV.

SF-12 Subscales	TB-HIV co-morbidity (n= 76) Mean (SD)	TB (n= 48) Mean (SD)	P-value	Total sample (n= 124) Mean (SD)
GH	42.4 (26.3)	56.9 (24.7)	<0.05	48.0 (26.6)
PF	49.3 (29.1)	66.7 (31.1)	<0.05	56.1 (30.9)
SF	61.3 (29.9)	76.3 (29.4)	<0.05	67.1 (30.5)
MH	56.7 (22.7)	66.7 (19.4)	<0.05	60.6 (21.9)
ER	36.2 (46.6)	57.3 (48.4)	<0.05	44.4 (48.2)
VT	52.4 (31.5)	60.8 (30.9)	0.144	55.7 (31.4)
PR	38.2 (46.1)	44.8 (46.4)	0.438	40.7 (46.1)
BP	69.7 (3.3)	75.5 (3.6)	0.256	71.9 (27.5)
SF-12				
PCS	40.0 (11.0)	44.1 (9.9)	<0.05	41.6 (10.8)
MCS	42.1 (9.0)	45.5 (9.3)	<0.05	43.5 (9.3)

GH-General health, PF-physical functioning, SF-social functioning, MH-mental health, ER-emotional role, VT-vitality, PR-physical role, BP-bodily pain, SD = standard deviation; n = sample size. Means were compared using t-tests.

Predictors of physical health-related QoL

In the multivariate analysis, larger family size (OR = 2.33, 95% CI = 1.12 - 4.98) was predictive of good PCS QoL ($p < 0.05$) (Table 3).

Table 3: Predictors of PCS QoL among TB patients attending the Witbank TB hospital in South Africa.

Variables	PCS		Adjusted OR (95% CI)	P-value
	Poor (n=64) n (%)	Good (n=60) n (%)		
Age:				
≤ 45 years	42 (65.6)	45 (75.0)	0.68 (0.24 to 1.98)	0.482
>45 years	22 (34.4)	15 (25.0)	—	
Gender:				
Male	33 (44.6)	41 (55.4)	0.70 (0.22 to 2.28)	0.556
Female	19 (38.0)	31 (62.0)	—	
Marital status:				
Married	10 (15.6)	10 (16.7)	0.82 (0.23 to 2.99)	0.769
Unmarried	54 (84.4)	50 (83.3)	—	
Level of				
None/Primary	18 (28.1)	18 (30.0)	0.67 (0.22 to 2.02)	0.477
Secondary	39 (60.9)	37 (61.7)	0.50 (0.09 to 2.76)	0.423
Tertiary	7 (10.9)	5 (8.3)	—	
Smoking				
Current	9 (14.1)	8 (13.3)	—	
Ex-smoker	19 (29.7)	11 (18.3)	0.77 (0.17 to 3.47)	0.738
Never	36 (56.3)	41 (68.3)	1.35 (0.34 to 5.34)	0.673
Employment				
Employed	20 (31.3)	12 (20.0)	—	
Unemployed	44 (68.8)	48 (80.0)	1.69 (0.58 to 4.93)	0.339
HIV Status:				
Positive	43 (67.2)	33 (55.0)	1.62 (0.69 to 3.82)	0.267
Negative	21 (32.8)	27 (45.0)	—	
Family size:				
≤4	32 (50.0)	18 (30.0)	—	
>4	*32 (50.0)	42 (70.0)	2.33 (1.12 to 4.98)	0.024
Family income:				
≤15 000	59 (92.2)	55 (91.7)	1.20 (0.22 to 6.50)	0.829
>15 000	5 (7.8)	5 (8.3)	—	

%= percentage, n= sample size, Hosmer and Lemeshow Test Chi-square 9.656; df 8, 0.292; Cox & Snell.R² 0.137; Nagelkerke R² 0.183 *p<0.05

Predictors of mental health-related QoL

Mental health QoL was not associated with any demographic factors ($p>0.05$) (Table 4).

Table 4: Predictors of MCS QoL among TB patients attending the Witbank TB hospital in South Africa

Variables	MCS		Adjusted OR (95% CI)	P-value
	Poor (n=62) n (%)	Good (n=62) n (%)		
Age:				
≤ 45 years	38 (61.3)	49 (79.0)	0.61 (0.21 to 1.77)	0.364
>45 years	24 (38.7)	13 (21.0)	—	
Gender:				
Male	39 (62.9)	35 (56.5)	1.04 (0.32 to 3.39)	0.947
Female	23 (37.1)	27 (43.5)	—	
Marital status:				
Married	11 (17.7)	9 (14.5)	1.54 (0.40 to 5.89)	0.526
Unmarried	51 (82.3)	53 (85.5)	—	
Level of				
None/Primary	22 (35.5)	14 (22.6)	1.07 (0.36 to 3.17)	0.902
Secondary	36 (58.1)	40 (64.5)	2.45 (0.38 to 15.97)	0.350
Tertiary	4 (6.5)	8 (12.9)	—	
Smoking				
Current	12 (19.4)	5 (8.1)	—	
Ex-smoker	16 (25.8)	14 (22.6)	1.51 (0.33 to 6.99)	0.599
Never	34 (54.8)	43 (69.4)	1.99 (0.48 to 8.22)	0.342
Employment				
Employed	17 (27.4)	15 (24.2)	—	
Unemployed	45 (72.6)	47 (75.8)	0.99 (0.35 to 2.83)	0.996
HIV status:				
Positive	43 (69.4)	33 (53.2)	1.61 (0.68 to 3.83)	0.281
Negative	19 (30.6)	29 (46.8)	—	
Family size:				
≤4	28 (45.2)	22 (35.5)	—	
>4	34 (54.8)	40 (64.5)	2.25 (0.79 to 6.45)	0.131
Family income:				
≤15 000	58 (93.5)	56 (90.3)	0.58 (0.10 to 3.56)	0.557
>15 000	4 (6.5)	6 (9.7)		

%= percentage, n= sample size, Hosmer and Lemeshow Test Chi-square 11.761; df 8, 0.162;

Cox & Snell. R^2 0.151; Nagelkerke R^2 0.202 $p<0.05$.

Discussion

We assessed the QoL of TB patients with and without HIV at the Witbank TB Hospital in South Africa. Using the SF-12 questionnaire, we found that 124 TB patients had low QoL scores (PCS-12 = 41.6 and MCS-12 = 43.5). These QoL scores appear to be markedly lower than scores reported in other TB studies in South Africa,¹⁰ and for HIV-infected people in Uganda.⁹ As expected, patients with TB/HIV co-infection had lower QoL scores compared to patients with TB only. Other studies have reported similar results.⁷ In a systematic review,⁴ TB patients with HIV have lower QoL compared to the general population. Patients who have TB/HIV co-infection are more likely to have poorer physical health, social functioning and mental well-being, resulting in diminished QoL.⁷

We further assessed the predictors associated with QoL in both mental and physical health domains. In our study, better physical health QoL was associated with larger family size (household with more than four members). This contrasts with our expectations because overcrowded households have been documented to be a high-risk factor for TB, especially in populations where TB is prevalent. Previous evidence also suggests that living in households with few individuals may lead to better QoL.^{10,13-16} Our study findings are in agreement with the study reported in India, that patients who have family support are more likely to have better QoL compared to their counterparts.¹⁷

In our study, neither physical nor mental QoL were associated with age, gender, educational level, HIV status, employment status, marital status, family income, and smoking. Previous studies have also reported no associations between QoL and age, gender, educational level, HIV status, employment status, marital status, family income or smoking.^{9,18-19} Other studies have reported associations between QoL and level of education, smoking, being HIV positive and marital status.^{7,14,20-21} Often poor indicators are associated with poor outcomes and specific interventions

should target patients from overcrowded households, with low education, smokers and alcohol users.^{10,21-22}

We compared the QoL of TB patients with and without HIV, and found that TB/HIV co-infected patients had poor QoL for all domains of the SF-12 instrument (general health, physical functioning, physical role, bodily pain, emotional role, mental health, social functioning and vitality). The SF-12 instrument had a strong interdomain correlation and high internal consistency to assess the QoL of TB/HIV co-infected patients.

We are confident that the SF-12 instrument used in this study yielded accurate results. The English version of the SF-12 instrument had a good internal consistency, with a Cronbach's alpha of 0.88. All eight sub-scales had a Cronbach's alpha > 0.8. Usually, the minimum recommended internal coefficient is 0.7. Previous studies using the SF-12 instrument have also reported a Cronbach's alpha > 0.7.²³⁻²⁴

The validity of SF-12 has been reported in previous studies.²⁵⁻²⁶ We found strong inter-domain correlations in the SF-12 instrument, where VT was strongly correlated with PCS. Other studies have reported VT being strongly correlated with MCS, which may be due to the different cultural settings of the study.¹² We found that PCS was not correlated with MCS, which agrees with other studies.^{12,25-26} Our results support using the SF-12 instrument to assess the QoL of TB patients and TB/HIV co-morbidity patients.

Study Limitations

Our study findings should be interpreted with caution due to some limitations. We only partially evaluated the criterion validity and content of the instrument even though the English form of the SF-12 health survey questionnaire was previously used in South African studies. In addition, our

results cannot be generalized beyond the 124 TB patients from Witbank TB Hospital, a specialized facility which caters for the province of Mpumalanga, South Africa.

Conclusion

This study showed that patients with TB disease and HIV had diminished QoL in all the domains of the SF-12 instrument. This provides evidence that TB and HIV affect the mental well-being and physical health of the individuals and impairs their quality of life. Therefore, it is imperative to develop strategies to improve the physical and mental of TB patients living with HIV.

Declarations:

Availability of data and materials

The datasets analysed during the current study are not publicly available as the data is stored in the University of Pretoria storage for confidential purposes but are available from the corresponding author on reasonable request.

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Authors' contributions

RTM was involved in developing the protocol, training of the interviewers, data collection data, compiling data, data interpretation and wrote the manuscript. FK was involved in proposal development and proof-read the manuscript. AB led the proposal development, the conceptualisation of the study, and the write up of the manuscript. All authors read and accepted the final manuscript.

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Consent for publication

Not applicable

Competing Interests

No competing interests exist in the study.

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