Assessment of the Quality of Life of Patients with Mycobacterial Pulmonary Diseases

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Abstract

Introduction: Mycobacteria pulmonary diseases are chronic illnesses with various impacts on patients' health status, and wellbeing. These diseases currently represent a global health issue due to increasing burdens and the lack of new development on therapeutic options. Policies based on the quality of life may help to improve the management of this chronic respiratory disease; this study was designed to assess the quality of life of patients treated for the pulmonary mycobacterial disease. **Materials and Methods:** Participants diagnosed with a mycobacterial pulmonary disease were selected from the University Clinical Research Centers' (UCRC) 2019 mycobacterial cohort database. A telephone interview was conducted using the Medical Outcome Study Short Form (SF-36) which has 36 items evaluating physical and mental wellbeing. Scores range from 0 - 100, with higher scores indicating greater Health-related quality of life (HRQOL). Statistical analysis was performed with SPSS 23.0 and the Fisher test was used to compare percentages. A p-value less than 0.05 was considered significant. **Results:** A total of 26 participants were reached and interviewed by phone. The mean age was 42 ± 10.6 years, and 76.9% (20/26) were male. The most common cause of the mycobacterial pulmonary disease was *Mycobacterium tuberculosis*, with 84.6% (22/26). Four cases of Non-Tuberculous Mycobacteria (NTM) were diagnosed including one *Mycobacterium avium complex* strain (MAC). HIV-positive cases were 46.2% (12/26), and the main respiratory sign was cough for all the participants (100%), followed by dyspnea 46.2% (12/26), chest pain 38.5% (10/26). The mean BMI was 19.7 ± 6.9 kg/m^2, the mean respiratory rate was 24.7 ± 8.6, and the mean

hemoglobin was 11.8 ± 2.2 g/dl. The mean SF-36 score was 75.1 ± 16.6, and impairment was mainly related to mental problems in 59.6%. The mean total score was significantly lower with age more than 42 years than age less than 42 years. But HIV positive and BMI less than 18.5 do not lead to a significant change of mean total score. **Conclusion:** Patients with mycobacterial pulmonary diseases have more psychological problems than physical ones. Hence the importance of psychological support in their management to improve their quality of life. A large sample size with a deep interview component would be necessary to address limitations in this design.

Keywords

1. Introduction

Mycobacterial pulmonary diseases are due to infection with bacteria including *Mycobacterium tuberculosis* complex (MTBC), and Non-tuberculosis mycobacteria (NTM) strains [1]. MTBC is responsible for Tuberculosis (TB) that remains a public health concern due to the HIV pandemic and the surge of drug-resistant strains. Similarly, NTM can cause chronic pulmonary infection in HIV individuals and those having underlying pulmonary conditions [1] [2]. NTM is becoming a rising issue with an increasing prevalence and burdens in the last decade [2] [3]. Where TB strain becomes resistant to the usual drug, NTM strain has low susceptibility to the available drugs. Individuals with TB or non-tuberculosis mycobacteria pulmonary disease (NTM-PD) present similar cough, sputum production, breathlessness, fatigue, fever, and weight loss [3] [4] [5]. In addition, patient NTM diagnosed in Mali have a history of pulmonary TB and lung sequelae that often increase the misdiagnosis rate between TB and respiratory NTM [5] [6]. The NTM treatment is expensive, has no subventions for patients who often struggle with economic issues due to a prolonged illness [7].

World Health Organization (WHO) defines health as a state of complete physical, mental, and social wellbeing and not only an absence of disease or infirmity. Any chronic illness like tuberculosis or NTM-PD on an individual often impacts physical/psychological health while reducing economic and social wellbeing [8] [9]. Thus, this study aimed to assess the quality of life of patients treated for Mycobacterial diseases using the SF-36 questionnaire a Health Related Quality of life (HRQOL) assessment tools that involve the WHO health definition core elements.

2. Materials and Methods

A two-month-period cross-sectional study was conducted between 01 October and 30 November 2021 to survey patients recovered from mycobacterial lung

diseases. Participants selected from a cohort study database at the University Clinical Research Center (UCRC) which was conducted for a clinical evaluation of a Real-Time PCR test for simultaneous diagnosis MTB and NTM. Patients diagnosed with mycobacterial pulmonary diseases, including tuberculosis, and NTM were included in the study. UCRC database was used to collect demographic data including age, gender, marital status, clinical data such as symptoms and BMI, and laboratory data which are mainly sputum culture and mycobacterial strain (TB, NTM) identification and Complete Blood Cell Counts (CBC). A telephone call interview was conducted to evaluate the impact of the disease on their daily activities one year after the diagnosis of the disease. The SF-36 quality of life questionnaire was administered after the participant's verbal consent. It is a structured questionnaire with six components, the sum of the six scores represented the total score which reflects the level of the subject's quality of life. A score less than 50% was interpreted as poor quality of life.

A systematic sampling method was used to enroll subjects in the study. A list of patients included in the UCRC study was used to call each patient and the study participation was proposed by the same clinician who followed the participant until their recovery in the previous study. The call period for the interview lasted for approximately two months, two missing calls in a one-week interval were the non-inclusion criteria for this survey. The first call was used to explain the study, obtain volunteer consent, and make an appointment for the questionnaire administration. During the second call, the answers to the questions were recorded on paper then transferred into an excel sheet. Statistical analyses were done using SPSS 23.0 for Windows. Fisher exact test result was used for statistical significance with a level of significance set at $p < 0.05$. The study was approved by the ethics committee of the Faculty of Medicine, Odonto-Stomatology, and Pharmacy of the University of Sciences, Techniques, and Technologies of Bamako (USTTB). Additional approval was obtained to conduct this survey.

3. Results

Of 60 mycobacterial respiratory diseases patients, 26 were reached and enrolled in the study, and they have consented to participate in the call interview. The patient under Antiretroviral treatment (ART) representing 19.2% (5/26), and 50% (13/26) had a history of TB short regiment treatment failure (Table 1). The means SF-36 score was 78.32 for NTM and 74.48 for TB patients after one year treatment.

Fifty-seven 57.7% of participants stated that their health was good, and 19.2% very good, while 57.7% felt much better than one year ago. Participants that said that their general health was currently good were more likely to affirm that they feel much better than one year ago ($p = 0.030$). The general health change after the treatment was 87.1 ± 17.5 (Table 2).

Body mass index and HIV were not associated with poor quality of mean SF-36 score. But, Age more than 42 years was significantly associated with a lower total mean score ($p = 0.008$) (Table 3).

Table 1. Baseline characteristics of patients with pulmonary tuberculosis and non-tuberculosis mycobacteria pulmonary disease.

Variables	Categories and modalities	N	Percentage (%)
Gender	Female	6	23.1
	Male	20	76.9
Age (years): mean 42 ± 10.6	≤40 years	12	47.2
	>40 years	14	53.8
Marital status	Single	4	15.4
	Married	22	84.6
Mycobacterial strains	NTM	4	15.4
	TBC	22	84.6
HIV	Negative	14	53.8
	Positive	12	46.2
BMI (means 19.7 ± 6.9 kg)	<18.5	14	53.8
	≥18.5	12	47.2
Clinical signs	Cough	26	100
	Dyspnea	12	46.2
	Chest pain	10	38.5
Respiratory rate (means 24.7 ± 8.6 cycles/min)	25≤	20	77%
	>25	06	23%
Complete Blood cells count (CBC)	Mean Hemoglobin (g/dl)		11.8 ± 2.2
	Mean White cells Count (10^3 cell/mm³)		7.1 ± 3.6
	Platelet		387 ± 174

Table 2. Mean of scores for each dimension of the SF-36 dimension study by the questionnaire.

Quality dimensions	Means SD
Physical function	84.04 ± 20
Limited physical activity following mental problems	59.62 ± 48.5
Limited physical activity following physical problems	84.62 ± 36.8
Energy and fatigue	72.9 ± 24
Mental health	61.9 ± 16.3
Social functioning	94.2 ± 11.8
Bodily pain	83.8 ± 20.5
General health	71.3 ± 21.4
Health change	87.1 ± 17.5
Total score	75.1 ± 16.6

Table 3. Association of population SF-36 total score with age, BMI, and HIV status.

Factors	Means SD		P-value
Age	≤42	>42	0.008
	82.7 ± 12.41	66.2 ± 16.8	
BMI	≤18.5	>18.5	0.7
	74 ± 18	76.3 ± 15.5	
HIV	Negative	Positive	0.8
	74.4 ± 17.5	75.9 ± 16.1	

4. Discussion

We analyzed the quality of life of 26 patients with mycobacterial pulmonary disease one year after diagnosis and treatment. Health-related quality of life (HRQOL) assessment is used to evaluate health care system performances and treatment outcomes of diseases and help policymakers update health issues' management. Several tools are used, such as the Saint George respiratory questionary, the SF-36, and the Euro-QOL. Whatever scale used to evaluate the quality of life, biases due to participants' selection criteria, degree of literacy, questionnaire self-administration, or interview by the investigator can interfere with the result [10]. Our survey used the SF-36 to assess participants' QOL because of its usefulness and it is easy to use and interpret the result. After a year from the diagnosis, the health status change. This change can be scored. In this study, the score was 87.1 ± 17.5, whereas the SF-36 total score was 75.1 ± 16.6. As reported by the literature, this result shows an improvement of QOL after treatment for patients with mycobacterial pulmonary disease [9] [10]. Moreover, total score found in our study is closed to the average QOL of 74.26 for the general population of several countries reported in a meta-analysis study. This result could be a reference for either national programs against TB or health system effectiveness [11].

The average total score of the SF-36 in this study was higher than that of *Shahriar et al.* [12]. As survey was done a year after treatment in our case in the contrary of them, we assume that our participants have had more time for recovery. Nonetheless, this difference is an argument for TB treatment efficacy as participant felt improvement in their health status [1]. Psychological effects of the disease, including emotional and mental health, had a lower mean score. Similar to Shahriar et al study, mycobacterial pulmonary diseases negatively impact emotional wellbeing regardless of physical improvement [10] [11] [12].

Forty-six percent (46%) of our participants were HIV positive, but no statistically significant difference was found between QOL scores regarding HIV status. The result is similar to *Babikako et al.*'s study results in Uganda [13]. After the diagnosis of HIV, participants were transferred into the national health system for Antiretroviral (ART) management. Other studies conducted in South Africa and Ethiopia have shown a significant improvement among patient with or without HIV when treatment was prescribe earlier [14] [15]. Participants' CD4 count could explain the variation of QOL score during coinfection at treatment initiation and if adverse events occurred with ART or TB treatment.

The SF-36 has several dimensions to evaluate the physical and psychological effects of chronic disease and seek for health improvement. For TB and NTM-PD patients, even though QOL impairment was higher for physical function, social function, and mental health and may continue even after treatment, the mean score is improving with treatment [16] [17]. In our study, activities were limited mainly by a mental problem, while mental health scores is low, as found by studies. Social functioning scored was relatively high in our survey 94%, while similar surveys conducted in Iran and India scored under 75% [12] [18]. Maybe so-

ciocultural differences and the participant's educational level could explain these differences.

Several factors can influence QOL during mycobacterial pulmonary diseases, such as age, gender, socio-economic status, and underlying comorbidities. Female and older age was associated with a low mental score of QOL, while a close, supportive social environment was associated with a higher score [19] [20]. In addition, being part of a research protocol that gives access to accurate information and early diagnosis leads to less self-discrimination due to disease. As found in the research cited above, our participant QOL was significantly greater with age under 43 years (p = 0.008). This relation between QOL and age goes alongside the study of *Muilu et al.* in Kinshasa with a population of multidrug-resistant TB [21]. Type of TB may be an increasing factor of poorest QOL as treatment are longer, and the patient could experience more sides side effects besides psychological effect.

This study showed the quality of life after treatment of mycobacterial pulmonary disease dominated by TB in Mali, including HIV coinfected patients. However, this study has some limitations due to its cross-sectional design. More inferences may have been drawn if follow-up QOL assessments were repeated at a different time during and after the treatment initiation. In addition, the response rate was lower due to phone numbers not being accessible, which may be due to number changes, losses, or death of the patient.

5. Conclusion

Our study shows a good quality of life in patients with mycobacterial pulmonary disease one year after treatment. QoL of TB and NTM-PD are close in the context of a research study. A large sample size in a cohort study with an in-person assessment of the QOL will have more accurate results that will be helpful for policymakers for the management of mycobacterial pulmonary disease.

Strengths and Limitations

This survey reveals the crucial role of diagnosis tools, active diagnosis, and early disease management in the outcomes/quality of life.

Despite these strengths, the sample size for this study was relatively small; an imbalance in gender and NTM case compared to TB cases also biased our analysis. In addition, the participant mainly was unreachable, as the survey occurred one year after treatment which could hardly assess the immediate impact of treatment outcome.

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Conflicts of Interest

We have no conflict of interest to disclose.

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