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Research Article

The Aftermath of Pulmonary Tuberculosis: Predictors of Severe Pulmonary Sequelae and Quality of Life of Patients Visiting a Tertiary Level of Care in Rwanda, East Africa

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Abstract

From January to June 2014, a study was conducted in a teaching Hospital located in the southern part of Rwanda to identify factors predicting severe tuberculosis sequelae and assess the quality of life of patient leaving with tuberculosis sequelae.

A total of 202 patients were included in the study and focus group discussion organized with 50 participants. Results from this study showed that chronic cough (196/202), abundant expectorations (106/202) and hemoptysis (123/202) were the main symptoms reported by participants. Predictors of severe tuberculosis sequelae were smoking history (OR: 4.12; 95% CI: 1.88-8.50; p = 0.004), being HIV negative (OR: 3.06; 95% CI: 1.80-5.13; p = 0.003), history of tuberculosis (OR: 3.77; 95% CI: 1.51-7.51; p = 0.002) and lower level of education (OR: 2.10; 95% CI: 1.70 - 4.13; p = 0.022).

In conclusion, smoking history, HIV status, level of education and history of pulmonary tuberculosis were the main predictors of severe tuberculosis sequelae. Stigma and poverty were the principal factors undermining the quality of life of patient with tuberculosis sequelae.

Keywords: Pulmonary; Tuberculosis; Rwanda

Abbreviations

CD4: Cluster of Differentiation 4; CHW: Community Health Workers; CI: Confidence Interval; CT: Computed Tomography; COPD: Chronic Obstructive Lung Disease; DOT: Direct Observed Treatment; FGD: Focus Group Discussion; HIV: Human Immunodeficiency Virus; MDG: Millennium Development Goals; MDR TB: Multidrug Resistant Tuberculosis; mMRC: modified Medical Research Council scale; OR: Odds Ratio; SPSS: Statistical Package for the Social Sciences; TB: Tuberculosis; USA: United States of America; WHO: World Health Organization

Introduction

Tuberculosis (TB) remains a major public health problem with around 2 million people dying each year from the disease [1]. The World Health Organization (WHO) estimates that TB is the second leading cause of death from infectious diseases worldwide after the Human Immunodeficiency Virus (HIV) [2]. In 2012, WHO estimated 8.6 million people developed TB and 1.3 Million died from the disease (including 320 000 deaths among HIV positive people) worldwide [3]. The number of TB deaths is unacceptably large given that most are preventable [3]. The WHO declared TB a "global health emergency" in 1993 [4], and in 2006, the Stop TB Partnership developed a global plan to stop TB that aims to save 14 million lives between its launch and 2015, major progress has been made towards 2015 global targets set within the context of the Millennium Development Goals (MDG) [4].

Despite the widespread of various new diagnostic methods, delays in diagnosis and treating tuberculosis are still considerable in many developing countries. This can lead to various complications including high mortality, spreading of the disease and severe TB sequelae [5].

In 2005, Rwanda has adopted the community Directly Observed Treatment (DOT) and this was a big success, in 2013, 51.2 % of TB suspect and 30% of sputum smear positive patients were referred to health facilities by Community Health Workers (CHW). Tuberculosis treatment success rate in the country is 89.6% and new diagnostic tools such as Gene X-pert cover around 70% of all health facilities [3]. The country has many patients with post-TB complications who are treated especially in teaching hospitals of the country.

This study aimed to assess the predictors of severe post-TB sequelae, determine the prevalence of respiratory symptoms and quality of life of patients with TB sequelae consulting a tertiary level of care in Rwanda. Findings from the study will help health planners to identify areas of intervention and set up strategies to improve the management and quality of life of patients living with tuberculosis sequelae.

Material and Methods

From January to June 2014, a total of 206 patients with a history of

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Table 1: Description of the sample according to socio-demographic characteristics, clinical and radiological findings.

Sex	N (%)
Male	119 (58.9%)
Female	83 (41.1%)
Mean age	38.6 years
Age groups	
15-30	69 (34.1%)
30-45	98 (48.5%)
>45	35 (17.4%)
History of TB	
One episode of TB	79 (39.1%)
Two episodes of TB	98 (48.5%)
Three episodes of TB and above	25 (12.4%)
Respiratory symptoms	
Cough	196 (97%)
Fever	38 (18.8%)
Expectorations	106 (52.4%)
Weight loss	88 (43.5%)
Hemoptysies	123 (60.9%)
Dyspnoea	97 (48%)
Chest pain	41 (20.3%)
Night sweats	51(25.2%)
Smoking history	
Never smoked	99 (49.1%)
Current smokers	44 (21.7%)
Ex-smokers	59 (29.2%)
HIV serostatus	
Positive	59 (29.2%)
Negative	143 (70.8%)
Radiological findings	
Retraction and Fibrosis	130 (64.3%)
Bronchiectasies	116 (57.4%)
Cavities	83 (41.1%)
Emphysematous bullae	21 (10.4%)
Patchy infiltrates	17 (8.4%)
Fungus ball	11 (5.4%)
Affected side	
Right lung	72 (35.6%)
Left lung	56 (27.7%)
Both lungs	74 (36.7%)
Level of Education	
None	78 (38.6%)
Primary	77 (38.1%)
Secondary	40 (19.8%)
University	7 (3.5%)

pulmonary tuberculosis were referred to Butare University Teaching Hospital, a 500 bed hospital located in the southern province of Rwanda.

All patients willing to participate in the study were accepted as long as they presented with a history of pulmonary tuberculosis, declared cured or treatment completed. Those under retreatment were also included and all patients were requested to give a written or verbal consent. Recruitment was done among subjects consulting the Outpatient Department and those hospitalized. Of 206 patients who were referred over a period of 6 months, only 4 were excluded because they were in a coma status, we remained with 202 participants.

Socio-demographic data, respiratory symptoms and chest X-ray findings were registered in a pre-designed data collection form. Severity of sequelae lesions was estimated using the classification of the National Tuberculosis and Respiratory Disease Association of the USA (United States of America), into four groups: minimal lesion, moderate, moderate advanced and far advanced [6]. Severe TB sequelae were defined as groups 3 and 4 (Moderate advanced and far advanced). Dyspnea was graded using the modified Medical Research Council scale (mMRC) and hemoptysis was considered as expectoration of gross blood or blood-streaked sputum. All patients were given a small container to allow quantification of expectorations. Patient's files were also consulted to see the final diagnosis of included patients. In addition to the questionnaire, Focus Group Discussions (FGD) were organized with 50 patients chosen randomly among participants, these sessions helped researchers to get testimonies from patients regarding their disease and daily life in the community. FGD were conducted by 2 trained facilitators with one note-taker. Small groups of 6-8 participants were made to allow a safe environment where people could give their opinion confidently.

Data processing and statistical analysis have been performed using SPSS software (window version 16.0). Approval to carry out this research was obtained from Butare University Ethics Committee and was approved by the research committee of the School of Medicine and Pharmacy.

Results

Of the 206 patients initially recruited for the study, 4 (1.9%) were excluded because their clinical condition could not allow interviews, we remained with 202 participants. The group was composed on 119 men and 83 women, mean age was 38.6 years. Majority of participants (54.9%) were aged below 40 years, the oldest was aged 82 years.

196 (97%) participants reported chronic cough, 106 (52.4%) described abundant expectorations and 123 (60.8%) had hemoptysis (anyone was under anticoagulation treatment). Dyspnea was reported by 97 (48%) patients, 21 (10.3%) patients had oxygen saturation below 90%. 98 (48.5%) participants reported at least 2 episodes of antiTB treatment, 11 (5.4%) had received a total of 6 courses of antiTB drugs and 3 (1.5%) had a history of Multidrug Resistant Tuberculosis (MDR TB). All participants had abnormal chest radiographs, retraction and fibrosis were the most common radiological findings (64.3%) followed by bronchiectasies. (57.4%) and cavities (41%) (Table 1).

In bivariate analysis of characteristics correlated with severe TB sequelae (moderate advanced and far advanced), our results showed that they were commonly found among smokers and ex-smokers

Table 2: Risk factors for severe tuberculosis sequelae.

Risk factor	Adjusted OR (95% CI)	P value
Gender		
Female	1	
Male	0.59 (0.32-1.24)	0.212
HIV status		
Positive	1	
Negative	2.98 (1.98-4.12)	0.011
Level of Education		
University	1	
Secondary	2.11 (1.35-4.06)	
Primary	3.77 (1.92-6.16)	
None	4.13 (1.84-6.12)	0.002
History of tuberculosis		
Had TB once	1	
Had TB twice	2.04 (1.11-4.09)	
Had TB 3 times and above	3.91 (1.29-5.52)	0.0125

than in non smokers (OR: 2.10; 95% CI: 1.70-4.13; p = 0.022), HIV negative patients (OR: 3.06; 95% CI: 1.80-5.13; p = 0.003), those who had TB infection several times (OR: 3.77; 95% CI: 1.51-7.51; p = 0.002) and among patients with lower education level (OR: 4.12; 95% CI: 1.88-8.50; p = 0.004). We did not find any correlation with age (Table 2).

Focus Group Discussions

During focus group discussions, three themes were considered as most emergent

a. Disappointment of post TB therapy results

"When I completed my TB treatment, I was very happy, I had gained weight and I was no longer coughing, but one year later I restarted coughing and became breathless, unfortunately my doctor failed to find TB in sputum, he decided to restart anti TB drugs but I did not improve" (Patient P05, history of pulmonary tuberculosis).

Another one added: *"Since I finished TB treatment I kept coughing and the doctor told me that my lungs are completely destroyed, I don't understand why because I did not miss a single dose of my treatment, I am afraid I will die while sleeping at night"* (P04, history of pulmonary tuberculosis).

Many participants to FGD expressed their non satisfaction after antiTB treatment because, as they explained, symptoms especially cough did not disappear and some other symptoms like shortness of breath and hemoptysis occurred shortly after the TB treatment.

b. Stigma

During Focus group discussion, participants revealed that they were stigmatized and were afraid to join and participate in activities organized by the community. A young lady declared that she was living home only for going to the hospital; she was avoiding to join other members of the community because she felt she was not going to be well received.

"I am coughing the whole day and people in the village are afraid of approaching me, they say that I may have resistant tuberculosis […] I gave several samples of sputum for TB screening but it was always negative, I prefer to stay home, I know people do not like my presence" (Patient P20, patient with TB sequelae).

Many others reported that they were not well accepted in the society because of symptoms related to pulmonary tuberculosis.

"I am coughing out blood since 3 years, doctors told me that I have scars on my lungs, no one can approach me in the village, even my husband left me for another woman, I know yourself cannot stay near someone who is coughing out blood" (P07, patient with TB sequelae).

Some participants reported that they were rejected by their families because they had frequent and abundant bad smelling expectorations sometimes mixed with blood, members of their families were afraid of being contaminated with TB. However, they explained that the level of stigma had reduced in some places due to regular visits of Community Health Workers to conduct educational sessions on tuberculosis.

c. Poor quality of life

Majority of participants in FGD highlighted that they were living in difficult conditions because they were not able to work and gain money.

"I am so breathless that I cannot even work 20 meters without sitting down, life is very hard, I am a widow and my children stopped to go to school, I cannot afford school fees, this disease has extremely impoverished my family" (P11, patient with history of MDR TB).

Others explained that it was even difficult for them to get money to come to the hospital; some patients revealed that they were treated for depression.

"I am always at the hospital, I have to pay a motorbike to go there, before this disease I had a small shop and could earn money for my family […] now I miss money for paying drugs, I spend sleepless nights despite all drugs given by the Mental Health doctor, I wish I could die and stop suffering" (P02, Patient with TB sequelae and heart failure).

Discussion

The objective of this study was to determine the predictors of severe post TB sequelae among patients consulting a tertiary level of care in Rwanda and understand their quality of life using a questionnaire and through focus group discussions. To our knowledge, this is the first study in the country which focuses on the daily life of patients with tuberculosis sequelae.

Cough, hemoptysis and dyspnea were among the main symptoms presented by patients in our study, other authors [7-9] have also described similar symptoms in patients with TB sequelae. Different etiologies can explain those symptoms, cough and dyspnoea may result from extended parenchymal destruction leading to a poor pulmonary compliance but also endobronchial involvement which can cause localized or even generalized bronchial obstruction [10,11]. Bronchiectasies, aspergillomas and other parenchymal, airway and vascular lesions are potential sources of hemoptysis [12-15].

10.4% of participants had a chest x-ray showing emphysematous bullae mainly in both lung apexes. All those patients had a history of

heavy smoking, though no spirometry was performed, we concluded to coexistence with Chronic Obstructive Lung Disease (COPD). Different authors had discussed the role of tobacco smoking not only in the genesis but also in the clinical presentation and healing process of pulmonary tuberculosis [16,17]. In their study done in India, Agarwal et al. [18] concluded that tobacco smoking was an important risk factor for developing pulmonary tuberculosis; it plays a role in the severity of the disease and can increase risk of relapse. Authors argued that there is impairment of the innate defense of the lungs caused by nicotine, destruction of tight junctions that form the epithelium barrier, reduced lysozymes activity and decreased CD4, thus, easy invasion of the lungs by mycobacterium tuberculosis [18,19].

Fibrosis is a common finding in tubercular sequelae, there is often atelectasis of the upper lobe and retraction of the hilum, compensatory lower lobe hyperinflation, and a mediastinal shift toward the fibrotic lung [10].

In this study, patients infected with HIV presented with less severe sequelae lesions compared to those who were immunocompetent, this is linked with the poor inflammatory response found in HIV patients. It was expected to find severe tuberculosis sequelae among patients with already a history of tuberculosis, despite chemotherapy TB healing can be associated with important lung destruction and extensive fibrosis [20].

Discussions with patients in the current study revealed that they were victims of stigma in their families and villages. Different authors [21-23] showed that patients with tuberculosis are often experiencing rejection and social isolation. Our patients did not have active TB but presented TB-like symptoms and were suspected by their neighbors as potential TB carriers. Lack of knowledge on TB transmission and the perceived contagiousness of the disease are among the main causes of stigmatization. Frequent co-infection between TB and HIV is another factor which can increase the level of stigmatization. Some authors noted that patients with TB-like symptoms tend to hide them fearing discrimination and/or isolation and end up in a self-exclusion which is dangerous regarding continuation of care [24,25].

Participants in this study did not directly associate TB with poverty but argued that TB is a cause of poverty because of the length of the treatment and post treatment complications which do not allow any remunerated activity. The WHO showed that there is a symbiotic relationship between TB and poverty and made estimates that the average TB patient loses three to four months of work-time each year and experiences a loss of up to 30% in yearly household earnings [2].

The main limitation of this study is that majority of participants were coming from one region mainly rural and were farmers with low level of schooling, comparison with other groups (Eg. Urban/rural) could give additional information.

Conclusion

HIV status, level of education and history of pulmonary tuberculosis were the main predictors of severe tuberculosis sequelae. Stigma and poverty were the principal factors undermining the quality of life of patient with tuberculosis sequelae.

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