ORIGINAL ARTICLE

The social determinants of tuberculosis and their association with TB/HIV co-infection in Lusaka, Zambia

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ABSTRACT

Introduction: Tuberculosis (TB) is a major public health problem globally.Progress made in TB control through the implementation of the DOTS strategy, has been retarded by factors such as poverty, the HIV pandemic and the advent of multidrug resistant tuberculosis. There is currently an increasing shift in TB control strategies to emphasize the importance of social determinants of TB if notable impact has to be attained. However, limited data exist that describe these determinants in high burden settings such as Zambia. This study was conducted to explore the social determinants of TB and their association with TB/HIV co-infection, in order to inform TB control strategies that would lead to appropriate action for impact.

Method: A cross-section study of TB patients presenting to four peri-urban health facilities in Lusaka through administration of a standard structured questionnaire. *STATA 12* Version 1 was used for analysis.

Results: There were 1,259 TB patients enrolled. The median age was 35 (IQR; 29 – 41). The main determinants that were associated with TB/HIV co-infection were: being in the age-group 24-49 (p = 0.0001); being female (p = 0.0001); re-treatment (p = 0.0001); having extra-pulmonary TB (p = 0.02); being married or widowed (p = 0.05 and p = 0.01, respectively)

Conclusions: Describing the social determinants of TB and their association with TB/HIV co-infection highlighted a number of opportunities to strengthen control beyond the Stop TB Strategy.

INTRODUCTION

Tuberculosis (TB) in Zambia is a major public health problem with notification rates of 349/ 100,000 population [1, 2].The majority of cases appear in the young adult population groups aged 25-44 years, the same age group mostaffected by HIV/AIDS [3]. The rapid increase of tuberculosis case notification in Zambia from 1985 onwards is mainly attributed to the HIV epidemic, but other factors like population growth, urban overcrowding and improved access to health care have also contributed [4, 1].

Approximately 70% of TB patients in Zambia are co-infected with HIV; however this varies from the different provinces ranging from about 50% in North-Western Province to more than 80% in Lusaka province [5, 6].

Childhood TB cases (under 15 years of age) account only for 8% of the total burden of TB in Zambia, that is, 62/100, 000 population [7]. Challenges with diagnosis of TB in children have contributed to under reporting of cases and hence the burden of childhood TB in Zambia remains undefined[7].

The advent of MDR-TB and Extensively drug resistant (XDR) TB may retard the progress in TB control [8]. Nonetheless, few MDR TB cases have been reported in Zambia [1].

The TB burden in Zambia's Capital City, Lusaka, is the highest in the country reported at close to 30% of the total national notifications [9]. Lusaka City is growing rapidly with the highest population concentrated in the peri-urban

areas. Thus, the majority of the total population resides in informal settlements which are highly congested and mostly characterized by poor health living conditions which make the environment susceptible to various communicable diseases including TB. These vulnerable and marginalized populations bear an undue proportion of health problems and often TB which is referred to as a disease of poverty takes its toll.

There is limited information on social determinants of TB in Zambia. This article describes some of the main social determinants of TB and their association with TB/HIV. Consequently it provides baseline data on understanding the major issues that need to be addressed in TB control activities to inform policies that will ensure implementation of effective interventions for impact.

METHODS

This was a cross-section study of TB patients who presented to four peri-urban health facilities, that is, at Chawama, Chipata, George and Kanyama in Lusaka City. The data was collected from patients attending the four health facilities from February to May 2013 by administration of structured standard. Patients who were diagnosed to have TB were enrolled after informed consent was obtained. Tuberculosis cases were defined according tothe national TB guidelines.After data entry was completed and cleaned, it was exported into *STATA 12 Version 1* for analysis. Frequencies and proportions were calculated to describe the various variables. The *t-test* and chi square tests were used to analyse binary outcomes. Logistic regression was applied to ascertain relationship of binary outcomes with categorical variables. The analysis of variance (ANOVA) was used to determine differences among the four sites.To develop wealth status,the Principal Components Analysis (PCA) was used to assign the indicator weights. Wealth quintiles were generated using the asset index as: lowest, second, middle, fourth and highest wealth quintiles. The study protocol was submitted to the University of Zambia Biomedical Research Ethics Committee (UNZABREC) for ethical clearance.

RESULTS

There were 1259 participants in the study. The median age was 35 years (IQR; 29 – 41). Generally there were more males (787/1,259) who were enrolled in the study, that is, 63% (95% CI; 59.8, 65.1) than the females, 37% (95% CI; 34.8, 40.2) as shown in table 1. 64% of the TB patients were co-infected with HIV.

The largest proportion of patients was within the age group between 18 and 47 years and the lowest proportion was in the age group above 88 years old which was only 0.2%.

55.4% (698/1,259) of the participants reported being married, 22.1% were single and had never been married before; whereas 14.5% reported having separated or divorced and 7.9% were widowed. There were significant differences in the marital status across the four sites (p = 0.0001). The study population was predominantly Christian (91.6%).

Table 1 Demographic characteristics of TB patients by facility

	Chawama (N = 252)	Chipata (N = 299)	George (N = 373)	Kanyama (N = 335)	Total (N = 1259)
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Sex					
Males	147 (58.0)	175 (59.0)	244 (65.0)	221 (66.0)	787 (63.0)
Females	105 (42.0)	124 (41.0)	129 (35.0)	114 (34.0)	472 (37.0)
Age Group					
18 - 47	219 (86.9)	256 (88.6)	325 (87.1)	292 (87.2)	1101 (87.5)
> 47	33 (13.1)	34 (11.4)	48 (12.9)	43 (12.9)	158 (12.6)
mean age	35	36	36	36	36
Marital status					
Never Married	60 (23.8)	79 (26.4)	75 (20.1)	64 (19.1)	278 (22.4)
Married	136 (54.0)	180 (60.2)	173 (46.4)	209 (62.4)	698 (55.7)
Separated/Divorced	35 (13.9)	24 (8.0)	91 (24.4)	33 (9.9)	183 (14.0)
Widowed	21 (8.3)	16 (5.4)	34 (9.1)	29 (8.7)	100 (7.9)
Religion					
No Religion	17 (6.8)	8 (2.7)	48 (12.9)	8 (2.4)	81 (6.2)
Christian	233 (92.5)	287 (96.0)	321 (86.1)	312 (93.1)	1153 (91.9)
Muslim	2 (0.8)	1 (0.3)	4 (1.1)	13 (3.9)	20 (1.5)
Other	-	3 (1.0)	-	2 (0.6)	5 (0.4)

Social economic characteristics

The proportion of study participants who had no form of education was 11.4% (144/ 1 259) whereas 44.5% (560/ 1 259) reported having primary level education; 41.3% had some secondary level education and only 3% had tertiary level education. There were 42.3% who reported having spent between 0 and 4 years in school; 48.2% reported having spent 5-9 years,

while only 8.3% reported to have spent more than 10 years. 42.9% of the TB patients were unemployed, 29.2% self employed, 21.5% had informal employment and only 6.4% were formally employed; there was variation (p = 0001) across the four facilities (table 2) although only the difference between Kanyama and George was statistically significant (p = 0. 008).

Table 2 Social economic characteristics of TB patients by facility

	Chawama (N = 252)	Chipata (N = 299)	George (N = 373)	Kanyama (N = 335)	Total (N = 1259)
	Number (%)	Number (%)	Number (%)	Number (%)	Number (%)
Education Level					
No Education	19 (7.5)	20 (6.7)	38 (10.2)	67 (20.0)	144 (11.1)
Primary	101 (40.1)	148 (49.5)	142 (38.1)	169 (50.5)	560 (44.5)
Secondary	117 (46.4)	125 (41.8)	182 (48.8)	95 (28.4)	519 (41.3)
Tertiary	15 (6.0)	6 (2.0)	11 (3.0)	4 (1.2)	36 (3.0)
Years spent in School					
0 - 4 years	43 (17.1)	145 (48.5)	174 (46.6)	191 (57.0)	553 (42.3)
5 - 9 years	138 (54.8)	144 (48.2)	176 (47.2)	143 (42.7)	601 (48.2)
> 10 years	71 (28.2)	10 (3.3)	23 (6.2)	1 (0.3)	105 (9.5)
Employment status					
Not Employed	118 (46.8)	127 (42.5)	172 (46.1)	121 (36.1)	538 (42.9)
Self	55 (21.0)	104 (34.8)	121 (32.4)	96 (28.7)	374 (29.2)
Informal	56 (22.2)	50 (16.7)	60 (16.1)	104 (31.0)	270 (21.5)
Formal	25 (9.9)	18 (6.0)	20 (5.4)	14 (4.2)	77 (6.4)
Five	3 (1.2)	17 (5.7)	18 (4.8)	38 (11.3)	76 (5.8)
More than Five	3 (1.2)	13 (4.3)	4 (1.1)	32 (9.6)	52 (4.0)

Factors associated with TB/HIV Co-infection

The males were found to be less likely to be TB/HIV co-infected than their female counterparts (OR; 0.63, p = 0.004).

The patients within the age group of 25-49 were twice as likely to be TB/HIV co-infected as compared to those in the younger age group of 18-24. The patients who were in the much older age group of more than 50 years were less likely to be TB/HIV co-infected than the ones within the age category of 18-24.

The respondents who indicated to have any kind of education were less likely to have TB/HIV co-infection than those who indicated to have no education at all. However, this association was not statistically significant. The self employed or those in informal employment were less likely to be TB/HIV co-infected than the patients who were not employed. However, those who were in formal employment were more likely to be TB/HIV co-infected than those who were unemployed.

The patients who were married were 39% more likely to have TB/HIV co-infection than those who were single. Similarly the widows were twice as likely to be TB/HIV co-infected and this was statistically significant (p = 0.01). The Muslims were less likely to be TB/HIV co-infected.

History of previous TB treatment (re-treatment) was more associated with TB/HIV co-infection than being a new patient (OR; 1.82) and this was significant (p = 0.0001). Similarly having extra-pulmonary TB was more associated with being co-infected with HIV (OR; 1.55) than being smear positive (p = 0.02). There was no significant association with the different wealth quintiles when compared to the lowest one (Table 3).

Table 3 Analysis of the Social determinants and their association with TB/HIV Co-infection

Co-infection	Prevalence (%)	Odds Ratio	P>z	95% Conf.	Interval
Sex					
Females	41.7	1.00			
Males	58.3	0.63	0.00	0.47	0.84
Age Group					
18-24	9.35	1.00			
25-49	81.8	2.01	0.00	1.37	2.93
50+	8.85	0.87	0.60	0.51	1.47
Level of education					
No education	12.3	1.00			
Primary	46.4	0.98	0.91	0.64	1.49
Secondary	38.9	0.80	0.33	0.50	1.26
Tertiary	2.49	0.59	0.23	0.25	1.39
Employment status					
No Employment	44.5	1.00			
Self employment	27.9	0.88	0.44	0.64	1.22
Informal employment	21.1	0.96	0.84	0.67	1.38
Formal employment	6.48	1.46	0.21	0.81	2.63
Marital Status					
Single	19.1	1.00			
Married	56.4	1.39	0.05	1.01	1.92
Separated/ Divorced	15.6	1.47	0.08	0.96	2.25
Widowed	8.98	2.12	0.01	1.20	3.72
Religion					
No Religion	5.86	1.00			
Christian	92.6	1.18	0.50	0.73	1.92
Muslim	1.12	0.56	0.28	0.20	1.60
Other	0.37	0.78	0.80	0.12	5.22
History of Previous treatment					
New	67.2	1.00			
Re-treatment	32.8	1.82	0.00	1.38	2.40
Type of TB					
Sputum Smear Positive	42.1	1.00			
Sputum Smear negative	41.8	1.17	0.23	0.90	1.53
Extra-pulmonary	16.1	1.55	0.02	1.06	2.26
Wealth Quintile					
Lowest	20.7	1.00			
Second	21.6	1.16	0.45	0.79	1.71
Middle	20.1	1.04	0.86	0.70	1.54
Fourth	20.0	1.08	0.71	0.72	1.62
Highest	17.7	0.79	0.27	0.53	1.20

Discussion

This study highlighted some of the social determinants of health, particularly those related to tuberculosis that prevails in the high TB burden district of Lusaka. Social determinants of TB are important to understand in order to mitigate the TB problem [10]. Some of the findings in the study were that, the younger age-group was mainly affected by TB with the majority of cases in the reproductive age of 18 to 47 years old. This is not only the most active and economically productive age group but also the group in which the HIV burden is highest [11]. There were more males affected with TB than females. This finding is consistent with what is observed at the global level in terms of TB notifications and as seen at the national level generally. Several studies have also shown male gender association with active tuberculosis [2, 1, 12, 13].

The fact that the most affected age group is the economically productive one, it is necessary to ensure that health and functionality are restored to these patients as soon as possible in order to avoid or minimize loss of income [14]. It is therefore important to establish mechanisms of social protection to support these individuals and their families as most of them are likely to have children [15]. As this is also the sexually reproductive age group, TB and pregnancy may be an important factor to consider as TB is one of the major causes of non-obstetric morbidity in this group [16, 1]. HIV/AIDS is also highest in this age group making it therefore an important group for focussed and integrated approaches [11].

It was observed that the gender dimensions of TB disease changed in the event of TB/HIV co-infections; females were more associated with the co-infection than their male counterparts (Table 3). Interventions that specifically address women, for this reason, may be essential and key to improve TB control programme outcomes.

At least 83% of the patients had either a primary or secondary level education. However, most of the patients did not spend many years at school and the majority (42.3%) of the ones with a primary school education only went as far as the lower primary school level whereas most of those who reached secondary level (48.2%) only had junior secondary education. The patients who had no education were also found be the ones who were poorest. Notable was the finding that the level of education was not significantly associated with TB/HIV co-infection in the study population. Nevertheless, the patients who had any kind of education were less likely to have TB/HIV co-infection, that is, the higher the education level the less likelihood of being co-infected.

Unemployment was another finding that was present in a high proportion of the study participants. The high level of unemployment coupled with low educational achievement may indicate poor social economic status in a large percentage of patients thereby predisposing them to vulnerability and economic hardships. According to the results from this study, those who were unemployed were among the poorest and belonged to the lowest wealth quintile; the ones who were in informal employment were also within the lowest wealth group. TB pushes affected individuals further into poverty, creating a vicious circle of poor nutrition, forgone education and loss of income which eventually leads to other illnesses–all of which undermine development and the economic growth that is necessary, although not sufficient, for widespread improvements in the social determinants of health [17]. Social protection and economic support through various interventions are needed to ensure the impact of TB disease on such individuals is reduced and groups like these should be deliberately targeted[10, 15]. Other interventions such as insurance, loan schemes and micro finances

have been advocated for by others to improve health outcomes [15].

The patients who were self employed were among those who were economically sound and were within the highest wealth category. These patients were also significantly associated with being less likely to be co-infected with TB/HIV (Table 3).

The prevalence of HIV in the study participants was very high at 64% and did not differ from the national average. The TB/HIV rates and proportion of the patients affected were similar across all the wealth categories implying that the dual disease burden was the same whether one was rich or poor. In addition, re-treatment was associated with TB/HIV co-infection (Table 3).

The majority of the patients were Christians. However, there was no significant association between TB/HIV co-infection and belonging to any religious grouping.

CONCLUSION

This study showed that the social determinants of TB need to be explored and their association with TB/HIV co-infection is important to address in order to have maximum impact in TB control. The study had limitations because it was conducted in an urban setting only; more population based household survey is recommended that would include rural settings as well. Qualitative studies are also recommended as follow-up studies to interrogate an in-depth understanding of the prevailing determinants of TB and treatment seeking behaviours of TB patients.

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