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Research Article

Factors Influencing Tuberculosis Knowledge among TB Patients in Gakenke District, Rwanda

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Abstract

Knowledge of tuberculosis has been shown to influence health seeking behaviour. The study aim was to assess knowledge of tuberculosis and identify the associated factors. This study was a cross sectional descriptive research design with a quantitative approach. The target population was the TB patients who visited health facilities in Gakenke District. A sample of 376 TB patients was randomly selected from three health centers. Interview-administrated structured questionnaire was used to collect data from 376 TB patients. Data was analyzed with SPSS-version 22. The study protocol was approved by Mount Kenya University Rwanda. The majority of respondents 71.0% were male, 51.6% were aged 45 years and above, 81.9% were married, and 65.2% had completed primary education. Few respondents identified a germ as the cause of TB (24.7%). This study revealed that 54.3% of TB patients had good knowledge about TB. The findings from multivariate analysis show that males were three times more likely to have good knowledge about TB compared to females (AOR=3.31, 95%CI: 1.98-5.53, p<0.001). Compared to TB patients aged 45 years and above, respondents aged 25-34 years old were more likely to have good knowledge about TB (AOR=38.71, 95%CI: 9.22-162.48, p<0.001). TB patients who live between 2-5 km from the nearest health facility were more likely to have good knowledge about TB compared to those who live at more than 5 km (AOR=33.58, 95%CI: 14.95-74.40, p<0.001). The ministry of health and other stakeholders in health sector need to continue the interventions that aim to reduce TB infection.

Keywords:
Tuberculosis; Healthcare seeking behavior; Knowledge; Patients

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Background

Tuberculosis (TB) is a major cause of illness even though drugs to cure this disease have been available for the past 60 years. Despite efforts which are invested in the monitoring and treatment of tuberculosis, it remains a major public health problem and 8.8 million cases have been estimated in which 1.7 million have died; 27% of these 8.8 million cases and 37% of all deaths were observed from Africa that houses 11% of the world's population. Tuberculosis kills someone approximately every 29 seconds, nearly 5,000 people every day, according to the World Health Organization [1].

Tuberculosis occurs in every part of the world. In the year 2010, the largest number of new tuberculosis cases occurred in Asia, accounting for 60% of new cases globally. However, Sub-Saharan Africa carried the greatest proportion of new cases per population with over 270 cases per 100 000 inhabitants in 2010 [2].

A study conducted in Ethiopia revealed that of the 476 pulmonary TB suspects, 395 (83.0%) had ever heard of TB; "evil eye" (50.4%) was the commonly mentioned cause of TB. Individuals who could read and write were more likely to be aware about TB ((crude OR = 2.98, (95%CI: 1.25, 7.08)) and more likely to know that TB is caused by a microorganism ((adjusted OR = 3.16, (95%CI: 1.77, 5.65)) than non-educated individuals. Males were more likely to know the cause of TB ((adjusted OR = 1.92, (95%CI: 1.22, 3.03)) than females. 51.3% of TB suspects perceived that other people would consider them inferior if they had TB. High stigma towards TB was reported by 199(51.2%). 220 (46.2%) did not seek help for their illness. Individuals who had previous anti-TB treatment were more likely to have appropriate health seeking behavior ((adjusted OR = 3.65, (95%CI: 1.89, 7.06)) than those who had not [3].

The Incidence of tuberculosis (per 100,000 people) in Rwanda was reported at 106.00 in 2010 and was about 123 in 2008 and 115 in 2009. A report from Rwanda Biomedical center (RBC) showed that incidence rate of tuberculosis infections reduced from 63 people per 100,000 in 2014 to 50/100,000 in 2017 [4]. However, no report indicated the factors associated with TB knowledge among TB patients in Rwanda.

In Gakenke District, the number of TB cases has been increasing from 145 cases in 2015, 157 cases in 2016 up to 3200 cases in 2017 whereas countrywide the number of TB cases is 3365 cases in the same year 2017.

Relatively few studies have investigated the factors influencing the TB knowledge among TB patients, especially in highly endemic countries. Knowledge of tuberculosis has been shown to influence health seeking behavior, specifically among people infected by TB and live in rural area are at a higher risk of transmitting tuberculosis than the general population. The study aim was to assess knowledge of

tuberculosis and identify the associated that knowledge, in order to inform tailored interventions for advocacy, communication and social mobilization in rural communities of Rwanda.

Material and Methods

Study Design, Setting and Population

This study was a cross sectional descriptive research design using a quantitative approach. A cross-sectional study design was chosen because the present study compared a single point in time variables. A quantitative method was selected because these methods allowed researcher assess more variables at the same time.

This research targeted all TB patients that visited different health facilities in Gakenke District, Northern Province, Rwanda from April to December 2019. Randomly, three health centers from Gakeneke District were selected.

Gakenke District is one of five districts of the Northern Province of Rwanda, with 348,334 inhabitants (NISR, 2012). People survive mainly by agricultural, farming and commercial activities (selling of goods and services). Commonly, diseases like intestinal worms, diarrhea, malaria, HIV and AIDS, tuberculosis, as well as upper and lower respiratory tract infections are seen in the outpatient departments of health facilities of Gakenke District (Gakenke Annual Report, 2017).

Sample Size and Sampling Technique

The data was collected among TB patients that frequently utilize the different health facilities in the three sectors of Gakenke District. The sample size of 384 TB patients was dram by using Cochran formula. Cochran (1963:75) formula used to determine proportions in single cross-sectional surveys was used for sample size determination (Cochran, 1963).

$$n = \frac{z^2 p(1-p)}{d^2}$$

As there is no study in Rwanda showing the level of TB knowledge among TB patients, based on the above explanations the following assumptions were applied: p, level of knowledge 50%, d is the expected margin of error (5%), Z, the standard score corresponding to a 95% confidence interval (1.96).

$$n = \frac{1.96^2 \times 0.50 \times (1-0.50)}{0.05^2} = 384$$

However, 376 TB patients completed the questionnaire. This shows that the response rate was 97.9%.

Two-stage sampling method was used, in the following way:

Selection of Sectors

Three health centres were randomly selected among seven sectors of Gakenke District by simple random sampling. The selected health centres are Rutake, Rutenderi and Karambo.

Selection of clients: all adult clients frequenting the health center during the study period using a systematic sampling method. All new cases ranking second, fourth, and….ordered number in the exhaustive list of OPD service client register during open hours of the day.

Data Collection Methods

Data were collected by using a questionnaire adopted from a previous study conducted in Uganda. Eligible participants were interviewed face-to-face using a structured questionnaire with both open and closed questions to collect information on socio-demographics, socio-economic, TB related knowledge including cause of TB, TB symptoms, and TB prevention measures. The researcher provided a verbal introduction about the purpose of the study.

Data Analysis Procedures

Data was analyzed using SPSS version 22. Demographic and outcome data was summarized into frequencies, percentages and measures of central tendency. Responses to the 36 (including multiple response questions) questions about TB were scored (one point for correct and zero for incorrect) and categorized into 0–50, 51–75 and 76–100 percent corresponding to poor, moderate and high TB knowledge respectively as a composite outcome. The association between exposure variables and TB knowledge was explored by univariate analysis and Multivariate analysis. Tests were two-sided and considered significant if $P<0.05$. Potential determinants of TB knowledge with $P < 0.05$ at univariate level were included in a multivariable ordinal logistic regression model to estimate their adjusted odds ratios (aOR).

Ethical Consideration

Ethical clearance certificate was obtained from the Research and Ethical Clearance Board at Mount Kenya University Rwanda. Permission to collect data was obtained from the Director of Health unit at Gakenke District. The researcher informed the participants that their participation was voluntary and that they had to sign a consent form for confidentiality of data. No names of participants were put down but only codes were used and all information about this subject was kept confidentially.

Results

Demographic Characteristics of Respondents

The study is carried out in three health centres of Gakenke District (Rutake, Rutenderi and Karambo).

The table 1 contains the demographic characteristics of the respondents which contain sex, age and education level. The findings show that out of 376 TB patients who participated in the study, 71.0% were male, 51.6% were aged 45 years and above, 81.9% of respondents were married, and 15.2% of respondents had no formal education. The results further showed that 30.9% of respondents were farmers, 72.9% were Christian, 74.5% never smoke, and 61.2% had ever drunk, 34.9% had more than 5 family members, 32.4% had less than 3 73.4% had the income. The majority of TB patients who participated in the study 326(86.7%) have tested for HIV, near a half of respondents 170(45.2%) live between 2-5 km from the nearest health facility.

Table 1. Socio-Demographic Characteristics of respondents

Variables	Frequency	Percentage
Sex		
Male	267	71.0
Female	109	29.0
Age group		
15-24	17	4.5
25-34	69	18.4
35-44	96	25.5
45 and more	194	51.6
Marital Status		
Single	68	18.1
Married	308	81.9

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Table 1 (continued)

Variables	Frequency	Percentage
Education level		
No formal education	57	15.2
Primary	245	65.2
Secondary	74	19.7
Occupation		
Farmer	116	30.9
Housewife	81	21.5
Self employed	86	22.9
Public Servant	32	8.5
Unemployed	61	16.2
Religion		
Christians	274	72.9
Muslims	102	27.1
Ever Smoke		
Yes	96	25.5
No	280	74.5
Ever drink		
Yes	230	61.2
No	146	39.8
Family members		
< 3	122	32.4
3-5	123	32.7
More than 5	131	34.9
Family income		
< 20,000	4	1.1
20,000-40,000	276	73.4
40,000-60,000	39	10.4
More than 60,000	57	15.1
Ever tested for HIV		
Yes	326	86.7
No	50	13.3

Table 1 (continued)

Variables	Frequency	Percentage
Distance to nearest Health facility		
Less than 2 km	97	25.8
Between 2-5 km	170	45.2
More than 5 km	109	29.0

Source: Primary data

The Level of TB Knowledge among TB Patients

The individual questions about the TB knowledge including the knowledge of groups at risk to be contaminated by TB, the fact of being informed on how TB is transmitted, knowledge on mechanisms to prevent and manage TB by different independent variables. (Table 2)

Table 2. TB knowledge among TB patients in Gakenke District

Knowledge scale	Response	Frequency	Percentage
TB cause	Germs	93	24.7
	Smoking	112	29.8
	Alcohol	37	9.8
	Malnutrition	58	15.4
	Witchcraft	52	13.8
	Don't know	24	6.4
TB symptoms	Coughing over 15 days	127	33.8
	Any cough	143	38.0
	Weight Loss	101	26.9
	Chest Pain	138	36.7
	Coughing up blood	163	43.4
	Shorten of breath	109	29.0
	Vomiting	101	26.9
	Fever > 14 days	119	31.6
	Fatigue	97	25.8
	Don't Know	43	11.4
TB Transmission	Airborne	168	44.7
	Sharing Utensils	183	48.7
	Sharing Meals	259	68.9
	Shaking hands	156	41.5

Table 2 (continued)

Knowledge scale	Response	Frequency	Percentage
	Touching public items	191	50.8
	Don't know	174	46.3
TB prevention	Not sharing the same eats and drink with a person who has TB	178	47.3
	Not sharing a bedroom with a person who has TB	75	19.9
	Take a well-balanced diet	87	23.1
	Closing home windows	105	27,9
	Not to spit anyhow	145	38.6
	Don't know	98	26.1
Who can get TB	Anybody	152	40.4
	Alcoholics	110	29.0
	Drug users	72	19.1
	Poor	28	7.4
	Prison History	14	3.7
TB is curable	Yes	214	56.9
	No	162	43.1
How is TB cured	With specific drugs	130	34.6
	Treatment in community	50	13.3
	Herbs	117	31.1
	Home rest alone	47	12.5
	Prayer	7	1.9
	Don't know	25	6.6
How long is TB treatment	< 1 month	17	18.9
	1-3 months	52	13.8
	3-6 months	58	15.4
	6-8 months	128	34.0
	>8 months	22	5.9
	Don't know	45	12.0

The findings on TB knowledge among TB patients from Gakenke District show that 93(24.7%) knew the real cause of TB (germs), 127(33.8%) knew that coughing over 15 days is one of the TB symptoms, 168 (44.7%) respondents knew that TB is transmitted through airborne, 178(47.3%) knew that not sharing the same eats and drink with a person who has TB is one way of TB prevention, the majority 162(56.9%) TB patients knew that TB is a curable disease, A total of 128 (34.0%) of TB patients knew that TB treatment can last between 6-8 months, 17(18.9%) knew that TB treatment can last less than one month while some of the respondents 45(12.0%) don't know the duration of TB treatment. (Figure 1)

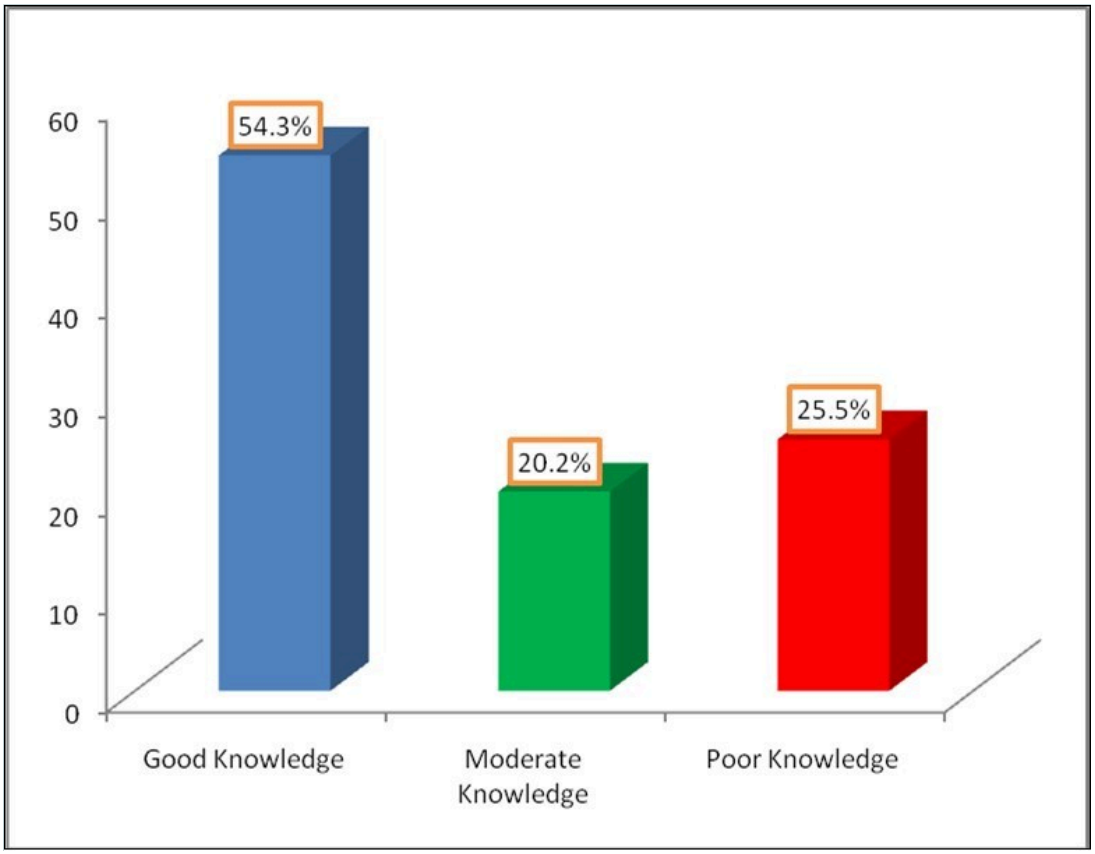

Figure 1. Level of TB knowledge among TB patients in Gakenke District

To determine the level of knowledge, total scores were estimated from 36 questions (considering multiple responses) related to TB. The mean score was 23, considering the mean score; respondents with a score of above the mean score were considered as having good knowledge, respondents with a score between 18-22 were considered to have moderate knowledge, and respondents with a score less than 18 were considered to have poor knowledge. The findings presented in Figure 1 show that the majority 204(54.3%) of respondents demonstrated a good knowledge about TB, 20.2% demonstrated a moderate knowledge while 25.5% of respondents had a poor knowledge.

Factors Associated with TB Knowledge among TB Patients in Gakenke District

Both bivariate and multivariate analyses were performed to estimate socio-demographic factors associated with TB knowledge. Socio-demographic factors associated with TB knowledge are presented in table 3. For analysis purposes, in both bivariate and multivariate analysis moderate and poor knowledge were combined.

Table 3. Bivariate analysis of socio-demographic factors associated with TB knowledge

	Level of Knowledge		P-value
Variables	**Good knowledge**	**Poor/Moderate knowledge n(%)**	
	n(%)		
Sex			**<0.001**
Male	163(79.9)	104(60.5)	
Female	41(20.1)	68(39.5)	

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Table 3 (continued)

	Level of Knowledge		P-value
Variables	**Good knowledge**	**Poor/Moderate knowledge n(%)**	
Age group			**<0.001**
15-24	2(1.0)	15(8.7)	
25-34	67(32.8)	2(1.2)	
35-44	45(22.1)	51(29.7)	
45 and more	90(44.1)	104(60.5)	
Marital Status			**<0.001**
Single	0(0)	68(39.5)	
Married	204(100)	104(60.5)	
Religion			**<0.001**
Christians	203(99.5)	71(41.3)	
Muslims	1(0.5)	101(58.7)	
Ever Smoke			**<0.001**
Yes	0	96(55.8)	
No	204(100)	76(44.2)	
Ever drink			**<0.001**
Yes	42(20.6)	104(60.5)	
No	162(79.4)	68(39.5)	
Family members			0.872
< 3	64(31.4)	58(33.7)	
3-5	67(32.8)	56(32.6)	
More than 5	73(35.8)	58(33.7)	
Ever tested for HIV			0.969
Yes	177(86.8)	149(86.6)	
No	27(13.2)	23(13.4)	
Distance to nearest Health facility			**<0.001**
Less than 2 km	1(0.5)	96(55.8)	
Between 2-5 km	162(79.4)	8(4.7)	
More than 5 km	41(20.1)	68(39.5)	

Findings on the socio-demographic factors associated with TB knowledge show that out of 204 respondents who demonstrated good knowledge about TB, 163(79.9%) were male, and out of 172 respondents with poor/moderate knowledge, 68(39.5%) were female. The findings show that gender was associated with TB knowledge ($p<0.001$). The majority of respondents with good knowledge were aged 45 years

Table 4. Bivariate analysis of Socio-economic factors associated with TB knowledge among TB patients

Variables	Level of knowledge		P-value
	Higher knowledge n(%)	Poor/Moderate knowledge n(%)	
Education level			**<0.001**
No formal education	56(27.5)	1(0.6)	
Primary	147(72.1)	98(57.0)	
Secondary	1(0.5)	73(42.4)	
Occupation			**<0.001**
Farmer	108(52.9)	8(4.7)	
Housewife	81(39.7)	0	
Self employed	0	86(50.0)	
Public Servant	1(0.5)	31(18.0)	
Unemployed	14(6.9)	47(27.3)	
Family income			0.872
< 20,000	3(1.5)	1(0.6)	
20,000-40,000	149(73.0)	127(73.8)	
40,000-60,000	21(10.3)	18(10.5)	
More than 60,000	31(15.2)	26(15.1)	

and above 90(44.1%), with this age group 104(60.5%) demonstrated poor/moderate knowledge. Age group of respondents were significantly related to TB knowledge (p<0.001). The findings show that all respondents (204) with good knowledge were married, 68(39.5%) of respondents with poor/knowledge were single; marital status was significantly related to TB knowledge (p<0.001). Religion, smoking, drinking, and distance to health facility were significantly associated with TB knowledge (p<0.001). Factors such as ever tested for HIV and number of family members were not significantly associated with TB knowledge.

Economic Factors Associated with TB Knowledge among TB Patients in Gakenke District

The relationship between factors such as education level, occupation and family income and TB knowledge was investigated. (Table 4)

Regarding socio-economic factors (education, occupation and income), the findings show that 147 (72.1%) respondents with good knowledge had primary education level, 98(57.0%) of respondents with poor/knowledge had primary education; education level was significantly related to TB knowledge (p<0.001). The findings show that 149(73.0) of respondents with good knowledge had the income of 20,000-40,000 Rfws, 127(73.8%) of respondents with poor knowledge had the income between 20,000-40,000 Rfws. But no significant relationship was observed between family income and TB knowledge (P=0.872). A total of 108 (52.9%) respondents with good knowledge were farmers, 86(50%) of respondents with poor TB knowledge were self-employed. (Table 5)

None of the socio-economic factors were taken into multivariate analysis. Socio-demographic factors such as gender, age group, drinking, distance to health facility were included in multivariate analysis. The findings show that males were three times more likely to have good knowledge about TB compared

Table 5. Multivariate analysis of factors associated with TB knowledge

	Good knowledge		P-value
Variables	**AOR**	**95%CI**	
sex			
Male	3.31	1.980-5.533	**<0.001**
Female	Ref.		
Age group			
15-24	0.154	0.034-0.692	**0.015**
25-34	38.711	9.223-162.486	**<0.001**
35-44	1.020	0.625-1.665	0.938
45+	Ref.		
Ever drink			
Yes	0.148	0.091-0.239	**<0.001**
No	Ref.		
Distance to nearest health facility			
Less than 2 km	0.017	0.002-0.129	**<0.001**
Between 2-5 km	33.585	14.959-74.403	**<0.001**
More than 5 km	Ref.		

to females (AOR=3.31, 95%CI: 1.98-5.53, p<0.001). Compared to TB patients aged 45 years and above, respondents aged 25-34 years old were more likely to have good knowledge about TB (AOR=38.71, 95%CI: 9.22-162.48, p<0.001). Respondents who ever drink alcohol were less likely to have good knowledge about TB (AOR=0.148, 95%CI: 0.091-0.239, p<0.001). TB patients who live between 2-5 km from the nearest health facility were more likely to have good knowledge about TB compared to those who live at more than 5 km (AOR=33.58, 95%CI: 14. 95-74.40, p<0.001).

Discussion

Knowledge of tuberculosis has been shown to influence health seeking behavior. In this study we report sub-optimal knowledge about TB in the general population of Gakenke District. The researcher also identified that younger age, having primary education, ever drinking, marital status, and distance to health facility, religion and occupation were associated with a good level of TB knowledge in the bivariate model. In multivariate analysis, being male, aged 25-34 years old, and living at a distance of 2-5 km were significantly associated with good TB knowledge.

In contrast to the findings from this study where the researcher observed that 54.3% of TB patients had good TB knowledge, a study conducted in Uganda found that only 208(18.3%) respondents demonstrated good knowledge, the majority 358(31.4%) demonstrated moderate knowledge [5]. Comparing individual variables on TB knowledge, this study found that 24.7%, in line with this finding a study conducted in Uganda found that few respondents identified a germ as the cause of TB (26.7%).

A study conducted in Ethiopia found that 74.4% of respondents were found to have good knowledge [6], compared to this study which found 54.3% of respondents with good TB knowledge. The difference between TB knowledge reported in Ethiopia and in Rwanda may be due to the study area and study

participants, in Ethiopia the study was conducted in an urban area and among health care professionals while this study was conducted in a rural area (Gakenke) and among TB patients.

In contrast to our findings, a study conducted in Brazil found 67% knew how tuberculosis is transmitted, 87% knew its key symptoms and 81% declared they would take preventive therapy if prescribed. Among KAP-interviewed index cases, 67% knew they could spread tuberculosis, 70% feared for the health of their families and 88% would like their family to be evaluated in the same services [7]. In contrast to our findings a study conducted in Pakistan found overall lower knowledge on TB where cough was the most commonly stated symptom in both the urban (66.2%) and rural (63.4%) areas. Other symptoms cited were: coughing up blood (urban 56.5%, rural 50.0%), weight loss (urban 57.4%, rural 38.0%). Possible modes of transmission indicated by the respondents were sharing food utensils (urban 35.6%, rural 29.6%), eating in the same plate (urban 44.7%, rural 44.1%), shaking hands (urban 3.0%, rural 5.4%) and touching items in the public places (urban 0.0%, rural 1.7%) [8].

Inconstancy between these previous studies and the present study regarding the factors associated with TB knowledge may be due to the study design, study population and geographical location.

Regarding the factors associated with TB knowledge, this study found that males are more likely (AOR=3.31, 95%CI: 1.98-5.53, p<0.001) to have good knowledge compared to female respondents, younger respondents were more likely to have good knowledge about TB (AOR=38.71, 95%CI: 9.22-162.48, p<0.001). Respondents who live between 2-5 km from the nearest health facility were more likely (AOR=33.58, 95%CI: 14.95-74.40, p<0.001) to have good knowledge about TB.

A study conducted in Uganda found that independent determinants of poor knowledge of TB in the multivariable analysis included (aOR, 95% CI) lack of formal education (0.56; 0.38 – 0.83, P = 0.004), unemployment (0.67; 0.49 – 0.90, P = 0.010) and never testing for HIV (0.69; 0.51 – 0.92, P<0.012). Whilst, older age (1.73; 1.30 – 2.29, P<0.001) and residing in Lira (2.02; 1.50 – 2.72, P<0.001) were independent determinants of higher knowledge of TB [5].

A study conducted in Ethiopian revealed that training is the strongest determinant of knowledge, AOR 3.386 and 95% CI (1.377, 8.330). On the other hand, job location and age category, AOR 0.592 and 95% CI (0.286, 1.223) and 0.913 95% CI (0.649, 1.284), respectively, were not found to be associated with TBIC knowledge in the multivariate models [6].

A study conducted in Brazil found that illiterate relatives (adjusted OR = 4.39; 95%CI 1.11 – 17.36), those who do not watch or watch little television (adjusted OR = 3.99; 95%CI 1.2 – 13.26), and also those who do not have the Internet access (adjusted OR = 5.01; 95% CI 1.29 – 19.38) were more likely to have low knowledge regarding tuberculosis [9]. A study conducted in Philippine revealed that a wide lack of knowledge was found about the link between HIV/AIDS infection and TB among individuals with medium and low socio-economic status and non-college educational background. Several other studies found that Individuals who could read and write were more likely to know the cause of TB which is consistent with our findings with previous reports [10],[11]. Males were more likely to know the cause of TB compared with females. The poor knowledge among women and non-educated individuals concerning the cause of TB will result in inappropriate health care seeking behavior [12].

Limitation of the Study

The sample size was not exhaustive to be a holistic sample of the country as the participants were from only one district. However, the selected patients were closely reflecting the majority of outpatient department clients and were selected in different health centers. Therefore, the limited number of respondents did not compromise the validity of the findings as the results of the quantitative data were not meant to be projected to the broader population but instead to provide information that could be used to improve programming and planning of TB interventions in Rwanda.

Conclusion and Recommendations

This study reveals more than a half of TB patients from selected health facilities have good knowledge about TB. The factors that influence TB knowledge include gender, age group, marital status and education level. The results revealed that male respondents were more likely to have good knowledge about TB when compared to females. Younger respondents were more likely to have good knowledge

of TB compared to older respondents. Patients who live within 2-5 km from the nearest health facilities were most likely to have good knowledge about the cause of TB, symptoms of TB, and TB prevention measures.

Recently, despite Government effort in promoting diagnosis and treatment, the number of tuberculosis cases is still high in the general population. Community sensitization about different measures and practices of prevention and transmission can contribute a lot in reducing and eradicating tuberculosis. The ministry of health and other stakeholders in the health sector need to continue the interventions that aim to reduce TB infection.

Competing Interests

The authors have declared that no competing interests exist.

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