



Knowledge, Attitudes, and Practices Regarding Tuberculosis in Timor-Leste: Results From the Demographic and Health Survey 2016

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Objectives: The aim of this study was to assess knowledge, attitudes, and practices regarding tuberculosis (TB) in the general population in Timor-Leste.

Methods: In the nationally representative cross-sectional 2016 Timor-Leste Demographic and Health Survey, 4622 men (aged 15-59 years) and 12 607 women (aged 15-49 years) were randomly selected using stratified multistage sampling and interviewed.

Results: Overall, 66.9% of men and 62.8% of women were aware of TB, 4.4% of men and 12.6% of women had TB courtesy stigma, and 83.3% of men and 88.6% of women reported intention to receive TB treatment. The mean \pm standard deviation overall TB knowledge score was 3.9 ± 2.0 (out of 8) among men and 3.0 ± 1.8 among women. In a multivariable linear regression analysis, among both men and women, older age, higher education, rural residence, and sources of TB information (family/friends, school/workplace, health care provider, Internet, television, and newspaper) were associated with higher TB knowledge scores. In addition, among women, higher wealth status and having heard about TB from the radio were associated with higher TB knowledge scores. Negative associations with TB courtesy stigma were found for urban residence and having heard about TB from family or friends among men, and for older age, higher TB knowledge, and TB information sources (family/friends and school/workplace) among women. Among both men and women, higher TB knowledge scores and having heard of TB from a health care provider were associated with intention to receive TB treatment.

Conclusions: This study identified socio-demographic risk factors for deficiencies in population-based TB knowledge in Timor-Leste; these findings should be considered when designing TB communication, prevention, and control strategies.

Key words: Tuberculosis, Knowledge, Attitude, Timor-Leste

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INTRODUCTION

According to the World Health Organization (WHO), Timor-Leste (with a population of 1.27 million) is a high-burden tuberculosis (TB) Southeast Asian country, with an incidence rate of 498 per 100 000, which is the sixth highest in the world; in contrast, the highest incidence is in Lesotho (665 per 100 000), followed by South Africa (567 per 100 000) [1]. In Timor-Leste in 2016, the TB case detection rate was 61.0% and the TB treat-

ment success rate was 87.0% [1]. According to the Ministry of Health of Timor-Leste [2], "The high prevalence of TB is thought to be due to a combination of high poverty, low levels of literacy, low community awareness, insufficient access and poor health seeking with relatively poor use of health facilities and limited knowledge among the health staff for screening of TB in the health facilities as well as community." Timor-Leste has a 3-tiered government health system, including a national hospital, district hospitals, community health centres, health posts, and outreach centres [3]. In Timor-Leste, TB is the second most common cause of death in hospitals [2]. Barriers to accessing health services and treatment adherence include socioeconomic factors and other factors related to weak health systems [4].

In the Timor-Leste Demographic and Health Survey (TLDHS) 2009-2010, 83.0% of men and 78.0% of women had ever heard of TB, 2.1% of men and 10.2% of women had TB courtesy stigma, and various TB knowledge deficiencies were identified [5]. In the 2011 Demographic and Health Survey (DHS) Ethiopia, 89.9% of women and 95.1% of men had heard of TB, and 27.9% of women and 18.7% of men had TB courtesy stigma [6]. Rood et al. [7] found that on average, TB courtesy stigma was reported by 25.6% of respondents in 13 countries. In the Thai population, the average TB knowledge score was 5.7 (maximum, 10) [8]. Regarding TB treatment behaviour, no information could be found on Timor-Leste. In a study in Vietnam, 83.0% of the general population stated that they would seek care from health care services if they suffered from a cough for more than 2 weeks [9].

Deficient TB knowledge and stigmatizing attitudes towards TB may lead to delays in the diagnosis and treatment of TB [10, 11]. TB knowledge and awareness of medical treatment are important for the success of TB prevention and control [10,11]. Various factors have been found to be associated with TB knowledge, stigma, and treatment, and understanding these factors is crucial for the implementation of TB prevention health education programmes. Agho et al. [12] found that higher wealth status, higher education, urban residence, and higher exposure to media sources were associated with having ever heard of TB. Factors associated with TB knowledge may include younger age [9,12], men [9,13], higher education [8], higher economic status [8,9], rural residence [12], and learning about TB from television, brochures, health workers, and teachers [14]. Factors negatively associated with TB courtesy stigma may include older age [7], men [15], higher wealth status [7], and TB knowledge [7]. Factors associated with intention to receive TB

treatment may include higher education, higher economic status, and better TB knowledge [16,17].

A five-year National TB Strategy was launched in January 2015 in Timor-Leste, including the training of all health workers on the new WHO protocol for drug regimens and treatment of TB and a focus on strengthening the diagnosis of the disease by improving the quality of laboratories and human resource capacity [18]. In addition, TB advocacy, communication, and social mobilization (ACSM) activities have been included, such as dissemination of ACSM materials through mass media (TV/local radio), TB messaging through billboards in urban areas, sensitization events involving village councils and other influence leaders, providing TB information in secondary schools, and training community volunteers on identifying individuals who may have TB [2]. Community messaging includes "if have a cough for more than 2 weeks, please come to the health centre for a TB sputum test, don't wait until the cough has blood. Even though TB is easy to transmit it is curable. Come to the community health centre and then get the treatment" [18]. In order to assess the progress of ACSM activities, we analysed knowledge, attitudes, and practices regarding TB in the general population from the 2016 TLDHS [19].

The aim of this study was to assess TB-related knowledge, attitudes, and practices in the general population in Timor-Leste.

METHODS

Study Design and Participants

Data from the 2016 TLDHS were analysed [19]. The 2016 TLDHS is a cross-sectional, nationally representative, population-based survey of 12 607 women respondents aged 15-49 years and 4622 men respondents aged 15-59 years [19]. It is part of the design of the DHS to have a much larger sample of women than of men. The TLDHS employed a 2-stage (455 enumeration areas and 26 households per enumeration area) stratified sampling design [19]. Informed consent was obtained from study participants prior to the study. The 2016 TLDHS was approved by the Ethics Committee of Macro International Inc. and the Ministry of Health of Timor-Leste [19]. Permission to use the TLDHS data in this analysis was obtained from Opinion Research Corporation Macro Inc.

Measures

Socio-demographic variables included age, gender, formal education, wealth status, and residence [19]. TB awareness

was investigated by asking the question, "Have you ever heard of an illness called tuberculosis or TB?" (yes, no) [19]. Sources of TB information were investigated by asking the question, "Where did you hear about tuberculosis or TB?" (family/friends, school/workplace, health care provider, television, radio, newspaper, and Internet) [19]. TB attitudes or stigma was assessed with the question, "If a member of your family got tuberculosis, would you want it to remain a secret or not? (yes, no, do not know) [19]. TB knowledge was assessed with 16

questions: 4 related to the cause of TB, 6 related to the transmission of TB, and 6 items related to TB symptoms (Cronbach alpha 0.70 for women and 0.68 for men). The correct responses were summed to give a total TB knowledge score. Intention to receive TB treatment was assessed with 2 hypothetical questions: (1) "If you have a cough for more than 2 weeks, would you seek treatment?" (2) "Where would you seek treatment for a cough lasting more than 2 weeks?" Respondents who responded "yes" to the first question and stated that they

Table 1. Sample characteristics and tuberculosis (TB) knowledge score by gender, Timor-Leste 2016

Characteristics	Sample		TB knowledge score	
	Men (n=4622)	Women (n=12 607)	Men (n=3020)	Women (n=8058)
Socio-demographic factor				
Age (y)				
15-24	36.6 (34.9, 38.3)	40.8 (39.8, 41.9)	3.9±2.0	2.9±1.6
25-34	23.7 (22.2, 25.3)	30.0 (29.0, 31.0)	4.2±2.0	3.0±1.5
35-49	27.9 (26.4, 29.5)	29.1 (28.2, 30.1)	4.2±2.0	3.2±1.6
50-59	11.8 (10.8, 13.0)	-	4.3±2.4	-
Education				
None	22.7 (21.3, 24.2)	21.7 (20.8, 22.7)	3.8±2.0	2.8±1.5
Primary	19.0 (17.7, 20.4)	15.2 (14.5, 16.0)	3.9±2.1	2.8±1.6
Secondary	46.7 (44.9, 48.4)	52.0 (50.9, 53.2)	4.1±2.0	3.0±1.6
Post-secondary	11.6 (10.4, 12.8)	11.0 (10.1, 11.9)	4.5±1.9	3.2±1.6
Wealth quintile				
Lowest	16.4 (15.2, 17.7)	16.5 (15.6, 17.5)	4.2±2.0	2.6±1.6
Second	20.7 (19.4, 22.1)	18.1 (17.2, 19.2)	4.1±1.9	2.8±1.4
Middle	20.3 (18.9, 21.7)	19.2 (18.2, 20.3)	4.0±1.9	2.7±1.5
Fourth	20.6 (19.3, 22.1)	22.0 (20.7, 23.3)	4.1±2.1	3.1±1.9
Highest	22.0 (20.4, 23.6)	24.1 (22.7, 25.6)	4.1±2.0	2.8±1.5
Residence				
Rural	68.1 (66.4, 69.9)	66.8 (65.3, 68.4)	4.2±2.0	2.8±1.6
Urban	31.9 (30.1, 33.6)	33.2 (31.6, 34.7)	3.8±2.0	2.6±1.5
TB knowledge				
Overall			3.9±2.0	3.0±1.8
Awareness of TB	66.9 (65.3, 68.5)	62.8 (61.6, 64.0)	-	-
TB attitudes/stigma	4.4 (3.6, 5.3)	12.6 (11.6, 13.6)	3.6±1.9	2.5±1.5
Intention to receive TB treatment	83.3 (82.7, 84.8)	88.6 (87.5, 89.7)	4.2±2.0	3.0±1.6
Sources of TB information				
Family/friends	58.8 (56.6, 60.9)	59.9 (38.6, 41.5)	4.5±2.0	2.8±1.6
School/workplace	30.0 (28.1, 32.0)	24.2 (22.9, 25.5)	4.8±2.0	3.4±1.6
Health care provider	53.6 (51.4, 55.8)	47.2 (45.6, 48.7)	4.4±2.0	3.1±1.7
Internet	5.0 (4.1, 6.1)	3.8 (3.3, 4.4)	6.1±2.1	2.8±1.6
Television	28.1 (26.1, 30.1)	13.2 (12.1, 14.4)	4.8±2.2	2.9±1.5
Radio	17.0 (15.4, 18.7)	7.3 (6.6, 8.2)	5.0±2.1	3.0±1.3
Newspaper	5.9 (4.9, 6.9)	1.8 (1.4, 2.3)	5.8±2.0	3.5±1.5

Values are presented as % (95% confidence interval) or mean ± standard deviation.

would seek treatment at a health facility were coded as intending to receive TB treatment [19].

Data Analysis

Data analysis was performed with Stata version 13.0 (Stata Corp., College Station, TX, USA) considering the multistage study design. The sample was described using descriptive statistics. A multivariable linear regression analysis was conducted between the independent variables and the TB knowledge score, for men and women separately. Logistic regression analyses were performed between independent variables and 3 dependent variables (TB awareness, stigmatizing attitudes towards TB, and intention to receive TB treatment). The

p -values <0.05 were considered to indicate statistical significance.

RESULTS

Sample Characteristics

The sample of the general population included 4622 men (aged 15-59 years), of whom 3020 were aware of TB, and 12 607 women (aged 15-49 years), of whom 8058 were aware of TB. The response rate was 95.0% for men and 97.0% for women. Overall, 66.9% of men and 62.8% of women were aware of TB, 4.4% of men and 12.6% of women had stigmatizing attitudes towards TB, and 83.3% of men and 88.6% of women intended

Table 2. Associations with awareness of TB and TB knowledge score¹

Variables	Awareness of TB				TB knowledge score			
	Men		Women		Men		Women	
	aOR (95% CI)	p -value	aOR (95% CI)	p -value	β (95% CI)	p -value	β (95% CI)	p -value
Age (y)								
15-24	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
25-34	1.77 (1.41, 2.22)	<0.001	1.20 (1.06, 1.35)	0.002	0.36 (0.18, 0.54)	<0.001	0.08 (-0.02, 0.18)	0.111
35-49	1.64 (1.34, 2.00)	<0.001	1.32 (1.18, 1.49)	<0.001	0.56 (0.38, 0.75)	<0.001	0.12 (0.02, 0.23)	0.023
50-59	1.63 (1.25, 2.12)	<0.001	-		0.64 (0.36, 0.92)	<0.001	-	
Education								
None	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Primary	1.33 (1.07, 1.66)	0.012	1.26 (1.09, 1.45)	0.002	0.03 (-0.23, 0.29)	0.822	0.08 (-0.07, 0.23)	0.289
Secondary	2.30 (1.87, 2.84)	<0.001	2.13 (1.86, 2.44)	<0.001	0.31 (0.09, 0.54)	0.007	0.21 (0.09, 0.34)	<0.001
Post-secondary	11.23 (6.85, 18.39)	<0.001	4.80 (3.69, 6.26)	<0.001	0.38 (0.10, 0.66)	0.008	0.28 (0.11, 0.44)	<0.001
Wealth quintile								
Lowest	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Second	1.28 (1.02, 1.59)	0.031	1.23 (1.05, 1.43)	0.008	-0.20 (-0.44, 0.04)	0.107	0.25 (0.08, 0.42)	0.004
Middle	1.64 (1.34, 2.00)	<0.001	1.47 (1.26, 1.73)	<0.001	-0.22 (-0.47, 0.03)	0.090	0.25 (0.10, 0.41)	<0.001
Fourth	1.56 (1.21, 2.01)	<0.001	1.79 (1.82, 2.74)	<0.001	-0.18 (-0.43, 0.08)	0.185	0.31 (0.15, 0.48)	<0.001
Highest	1.85 (1.34, 2.57)	<0.001	2.24 (1.82, 2.74)	<0.001	-0.19 (-0.47, 0.09)	0.190	0.21 (0.03, 0.39)	0.026
Residence								
Rural	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Urban	1.91 (1.51, 2.41)	<0.001	1.38 (1.19, 1.61)	<0.001	-0.31 (-0.49, -0.13)	<0.001	-0.20 (-0.31, -0.08)	<0.001
Sources of TB information								
Family/friends	-		-		1.04 (0.89, 1.18)	<0.001	0.60 (0.51, 0.70)	<0.001
School/workplace	-		-		0.94 (0.78, 1.10)	<0.001	0.64 (0.54, 0.74)	<0.001
Health care provider	-		-		0.68 (0.53, 0.82)	<0.001	0.82 (0.73, 0.91)	<0.001
Internet	-		-		1.25 (0.88, 1.61)	<0.001	0.57 (0.33, 0.82)	<0.001
Television	-		-		0.57 (0.39, 0.75)	<0.001	0.57 (0.32, 0.60)	<0.001
Radio	-		-		-0.08 (-0.27, 0.12)	0.433	0.46 (0.15, 0.45)	<0.001
Newspaper	-		-		0.42 (0.08, 0.75)	0.016	0.47 (0.14, 0.81)	0.006

aOR, adjusted odds ratio; CI, confidence interval.

¹Adjusted for all variables in the table.

to receive TB treatment. The mean \pm standard deviation overall TB knowledge score was 3.9 ± 2.0 among men and 3.0 ± 1.8 among women, out of a possible score of 8. The most common source of TB information was family and friends for men and women, followed by a health care provider, school or workplace, television, radio, Internet, and newspapers (Table 1).

Associations With Awareness of Tuberculosis (TB) and TB Knowledge Score

In the multivariable logistic regression analysis, among both men and women, older age (odds ratio [OR], 1.63; 95% confi-

dence interval [CI], 1.25 to 2.12; OR, 1.32; 95% CI, 1.18 to 1.49 for men and women, respectively), higher levels of education (OR, 11.23; 95% CI, 6.85 to 18.39; OR, 4.80; 95% CI, 3.69 to 6.26, respectively), higher wealth status (OR, 1.85; 95% CI, 1.34 to 2.57; OR, 2.24; 95% CI, 1.82 to 2.74, respectively), and urban residence (OR, 1.91; 95% CI, 1.51 to 2.41; OR, 1.38; 95% CI, 1.19 to 1.61, respectively) were associated with TB awareness. In the multivariable linear regression analysis, among both men and women, older age (β , 0.64; 95% CI, 0.36 to 0.92; β , 0.12; 95% CI, 0.02 to 0.23, for men and women, respectively), higher education (β , 0.38; 95% CI, 0.10 to 0.66; β , 0.28; 95% CI, 0.11 to

Table 3. Associations with TB attitude/stigma and intention to receive TB treatment¹

Variable	TB attitude/stigma				Intention to receive TB treatment			
	Men		Women		Men		Women	
	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value
Age (y)								
15-24	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
25-34	0.85 (0.51, 1.44)	0.553	0.74 (0.61, 0.91)	0.003	1.24 (0.90, 1.69)	0.182	1.08 (0.87, 1.34)	0.485
35-49	1.02 (0.63, 1.66)	0.922	0.82 (0.67, 0.99)	0.043	1.35 (0.99, 1.84)	0.059	1.24 (0.98, 1.57)	0.076
50-59	0.71 (0.32, 1.60)	0.424	-		1.17 (0.76, 1.81)	0.468	-	
Education								
None	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Primary	0.87 (0.44, 1.71)	0.680	0.95 (0.73, 1.25)	0.727	0.90 (0.62, 1.32)	0.607	0.98 (0.68, 1.41)	0.911
Secondary	1.16 (0.65, 2.04)	0.616	1.11 (0.67, 1.35)	0.402	0.95 (0.68, 1.33)	0.768	1.31 (0.91, 1.88)	0.140
Post-secondary	0.82 (0.34, 1.99)	0.664	0.95 (0.67, 1.35)	0.778	0.93 (0.58, 1.50)	0.771	1.59 (0.99, 2.55)	0.052
Wealth quintile								
Lowest	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Second	1.56 (0.77, 3.17)	0.218	1.51 (1.09, 2.09)	0.013	1.14 (0.80, 1.62)	0.482	0.78 (0.56, 1.08)	0.138
Middle	0.73 (0.34, 1.58)	0.424	1.35 (0.99, 1.83)	0.057	1.39 (0.94, 2.05)	0.098	0.86 (0.57, 1.25)	0.450
Fourth	0.54 (0.23, 1.24)	0.146	1.05 (0.76, 1.46)	0.749	0.93 (0.63, 1.35)	0.689	0.73 (0.53, 1.03)	0.070
Highest	0.59 (0.23, 1.50)	0.266	0.90 (0.63, 1.30)	0.570	1.24 (0.70, 2.00)	0.373	1.07 (0.72, 1.57)	0.750
Residence								
Rural	1.00 (reference)		1.00 (reference)		1.00 (reference)		1.00 (reference)	
Urban	0.54 (0.32, 0.93)	0.025	0.95 (0.74, 1.20)	0.646	2.33 (1.68, 3.23)	<0.001	0.68 (0.49, 0.94)	0.020
TB knowledge	0.97 (0.87, 1.08)	0.604	0.75 (0.71, 0.80)	<0.001	1.19 (1.11, 1.28)	<0.001	1.28 (1.14, 1.30)	<0.001
TB attitudes/stigma	-		-		1.36 (0.78, 2.35)	0.280	0.68 (0.54, 0.85)	<0.001
Sources of TB information								
Family/friends	0.33 (0.20, 0.55)	<0.001	0.67 (0.56, 0.82)	<0.001	0.97 (0.75, 1.25)	0.797	1.47 (1.19, 1.82)	<0.001
School/workplace	0.71 (0.43, 1.16)	0.170	0.70 (0.55, 0.88)	0.003	1.52 (1.13, 2.04)	0.006	1.01 (0.80, 1.28)	0.910
Health care provider	0.68 (0.43, 1.06)	0.090	1.18 (0.98, 1.43)	0.087	1.66 (1.29, 2.15)	<0.001	1.61 (1.30, 2.02)	<0.001
Internet	0.83 (0.25, 2.81)	0.766	0.75 (0.43, 1.31)	0.311	0.81 (0.36, 1.79)	0.596	1.16 (0.66, 2.04)	0.604
Television	0.69 (0.38, 1.26)	0.227	1.05 (0.79, 1.38)	0.749	2.19 (1.51, 3.18)	<0.001	1.31 (0.91, 1.89)	0.143
Radio	0.56 (0.29, 1.07)	0.081	0.72 (0.50, 1.03)	0.074	1.42 (0.98, 2.04)	0.060	1.46 (0.98, 2.16)	0.060
Newspaper	1.88 (0.81, 4.33)	0.139	0.60 (0.26, 1.38)	0.229	0.62 (0.31, 1.24)	0.175	0.76 (0.36, 1.61)	0.469

aOR, adjusted odds ratio; CI, confidence interval.

¹Adjusted for all variables in the table.

0.44, respectively), urban residence (β , -0.31; 95% CI, -0.49 to -0.13; β , -0.20; 95% CI, -0.31 to -0.08, respectively), and sources of TB information (family/friends, school/workplace, health care provider, Internet, television, and newspaper) were associated with higher TB knowledge scores. In addition, among women, higher wealth status (β , 0.21; 95% CI, 0.03 to 0.39) and hearing about TB from the radio were associated with higher TB knowledge scores (Table 2).

Associations With Tuberculosis (TB) Courtesy Stigma and TB Treatment

In the multivariable logistic regression analysis, among men, urban residence (OR, 0.54; 95% CI, 0.32 to 0.93) and hearing about TB from family or friends (OR, 0.33; 95% CI, 0.20 to 0.55) were negatively associated with TB courtesy stigma. Among women, older age (OR, 0.82; 95% CI, 0.67 to 0.99), higher TB knowledge (OR, 0.75; 95% CI, 0.71 to 0.80), and TB information sources (family/friends and school/workplace), were negatively associated with TB courtesy stigma.

In the multivariable logistic regression analysis, among both men and women, higher TB knowledge scores (OR, 1.19; 95% CI, 1.11 to 1.28; OR, 1.28; 95% CI, 1.14 to 1.30, respectively), and having heard of TB from a health care provider (OR, 1.66; 95% CI, 1.29 to 2.15; OR, 1.61; 95% CI, 1.30 to 2.02, respectively) were associated with intention to receive TB treatment. In addition, among men, urban residence (OR, 2.33; 95% CI, 1.68 to 3.23) was positively associated with intention to receive TB treatment, while among women, urban residence (OR, 0.68; 95% CI, 0.49 to 0.94) and stigmatizing attitudes towards TB (OR, 0.68; 95% CI, 0.54 to 0.85) were negatively associated with intention to receive TB treatment. Further, sources of information about TB (school/workplace and television for men; family/friends for women) were associated with intention to receive TB treatment (Table 3).

DISCUSSION

In the nationally representative 2016 TLDHS in Timor-Leste, poor TB knowledge was identified. Only 66.9% of men and 62.8% of women were aware of TB, reflecting a decrease from the 2009-2010 TLDHS, in which 83.0% of men and 78.0% of women were aware of TB [5]. This proportion was lower than, for example, the findings of the 2011 DHS Ethiopia, in which 89.9% of women and 95.1% of men had heard of TB [6]. The mean overall TB knowledge score was low (3.9 ± 2.0 among

men and 3.0 ± 1.8 among women, out of a maximum score of 8). This score was lower than that reported in a study in Thailand (5.7 of 10 points) [8]. It appears that ACSM activities, such as dissemination of ACSM materials through mass media (only 28.1% of men and 13.2% of women had heard about TB from the TV and 13.2% of men and 7.3% from the local radio), did not reach certain communities, resulting in an even lower TB awareness in 2016 than in 2009-2010. The study found low TB courtesy stigma (4.4% of men and 12.6% of women), which is similar to the findings of the 2009-2010 TLDHS (2.1% of men and 10.2% among women) [5], and much lower than was reported in another study of participants from 13 countries (25.6%) [7]. Intention to receive TB treatment was 83.3% among men and 88.6% among women in this study; these values are somewhat higher than the finding of a study in Vietnam (83.0%) [9]. Given that the ACSM in Timor-Leste included community sensitization on TB treatment-seeking [18], it is possible that the high rate of intention to receive TB treatment can be attributed to ACSM. The sources of TB information in this study were similar to those reported by other surveys in the region [8,9]. However, in Thailand and Vietnam [6,7], TV, radio, and Internet were much more prominent sources of information on TB than in this study. This may be because of the lack of penetration of telecommunications to the general population in Timor-Leste. The most commonly reported sources of information about TB in our study were family or friends and health care providers, meaning that these ways of delivering or sharing TB information should be strengthened. In addition, schools and workplaces continued to play an insufficient role as sources of information about TB, suggesting that their roles should be strengthened. TB education for the public needs to achieve broad dissemination through multimedia and other channels in order to continue TB control improvement [20].

This study found that older age, higher levels of education, higher wealth status, and urban residence were associated with TB awareness. Similar results were found in a study in Nigeria [11]. Possible reasons for this finding include better media access to TB information [11]. Consistent with previous studies [8,11-14], this study found that men, higher education, higher wealth status, rural residence, and various sources of TB information, including family/friends, school/workplace, health care providers, Internet, radio, television and newspaper, were associated with higher TB knowledge scores. It is possible that among rural dwellers who were aware of TB, the ACSM community sensitization on TB treatment-seeking [18] contributed to better TB knowl-

edge scores. Contrary to previous studies [11,12], this study found that older age was associated with higher TB knowledge.

In agreement with previous studies [7,15], this study found that older age, men, and higher TB knowledge were negatively associated with TB courtesy stigma. Consistent with previous research [8,16,17], this study found that higher TB knowledge and lower TB stigma were associated with intention to receive TB treatment at a health facility. Fear of TB stigma among women and poor TB knowledge may delay the diagnosis of TB, which should be addressed in health education [12]. ACSM activities should help reduce social stigma by reinforcing the belief that TB is curable and improving TB knowledge among the general population [20].

A limitation of this study is that it had a cross-sectional design, so no causal conclusions can be drawn. Further, stigmatizing attitudes towards TB were only measured with a single question and intention to receive TB treatment was only assessed with 2 hypothetical questions. There was a large sample size difference between men and women in this survey, which may suggest certain limitations. Future studies should include multi-item measures of TB attitude or stigma and direct questions on TB treatment behaviour.

In conclusion, the results showed an overall below medium level of TB knowledge, low levels of TB courtesy stigma, and moderately high intentions to receive TB treatment at a health facility. Efforts to improve knowledge, attitudes, and treatment intention regarding TB in Timor-Leste should focus on women, younger and older age groups, those with poorer wealth status, and those with less formal education. In order to increase early TB health care-seeking behaviour, TB knowledge among the general population needs to be increased. Health education activities need to be strengthened using effective multimedia-based ACSM reaching the whole population. Early health care-seeking behaviour may reduce the incidence of TB, thereby helping Timor-Leste to achieve the Millennium Development Goal 6. Similar studies need to be conducted in order to assess and monitor changes in TB knowledge, attitudes, and practices in response to the Timor-Leste TB control and prevention programme.

CONFLICT OF INTEREST

The authors have no conflicts of interest associated with the material presented in this paper.

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