

Original Article

Knowledge, attitudes, and practices about tuberculosis and choice of communication channels in Thailand

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Abstract

Introduction: The aim of this study was to assess tuberculosis (TB) knowledge, attitudes, and practices in both the general population and risk groups in Thailand.

Methodology: In a cross-sectional survey, a general population (n = 3,074) and family members of a TB patient (n = 559) were randomly selected, using stratified multistage sampling, and interviewed.

Results: The average TB knowledge score was 5.7 (maximum = 10) in the Thai and 5.1 in the migrant and ethnic minorities general populations, 6.3 in Thais with a family member with TB, and 5.4 in migrants and ethnic minorities with a family member with TB. In multivariate linear regression among the Thai general population, higher education, higher income, and knowing a person from the community with TB were all significantly associated with level of TB knowledge. Across the different study populations, 18.6% indicated that they had undergone a TB screening test. Multivariate logistic regression found that older age, lower education, being a migrant or belonging to an ethnic minority group, residing in an area supported by the Global Fund, better TB knowledge, having a family member with TB, and knowing other people in the community with TB was associated having been screened for TB.

Conclusion: This study revealed deficiencies in the public health knowledge about TB, particularly among migrants and ethnic minorities in Thailand. Sociodemographic factors should be considered when designing communication strategies and TB prevention and control interventions.

Key words: tuberculosis; Thailand; knowledge, attitude and practice; sociodemographic determinants.

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Introduction

According to the World Health Organization (WHO), Thailand is a high-burden tuberculosis (TB) country [1]. The TB case detection rate was 80% and the TB treatment success rate was 81% in Thailand [1]. The TB cure rates for Thai TB patients ranged from 75%–84% compared to 65%–75% for non-Thai patients in four border provinces in Thailand [2]. Despite strong efforts to implement a TB control program in Thailand [3], gaps in the TB program seem to prevent the achievement of the required 85% treatment success rate of smear-positive TB cases [4]. Another weakness of the TB program in Thailand is that the needs of high-risk populations are not addressed [4]. There has been a general lack of resources to raise TB

awareness and support TB case finding among these high-risk populations [4].

Lack of knowledge about the symptoms, causes, and the required treatment of TB in the general population could lead to the delay in diagnosis and/or poor adherence to TB treatment [5,6]. Moreover, TB-stigmatizing community attitudes may negatively impact early diagnosis and treatment [7]. In encouraging early diagnosis and adherence to TB medication and community participation in TB control, TB health education may play an important role [8,9]. Several studies have identified sub-optimal TB knowledge in community populations [8,10,11]. A number of studies identified factors associated with TB knowledge. These include sociodemographic factors

such as age (younger age [8,12,13], age \geq 45 years [11]), being male [8,10,14,15] higher income/economic status [8,13,16], religion (Muslim/Hindu) [14], and rural residence [10-12]; and experiences with a TB patient (*e.g.*, a close personal relationship with a patient with TB) [18]. Negative attitude towards TB was found to be associated with low income, no schooling, not working respondents, young age (15–19 years), and residence in rural areas [12]. Intended TB health-seeking behavior was found to be associated with better education, higher income or economic status, and good knowledge about TB [16,17].

The aim of this study was to assess TB knowledge, attitudes, and practices in both the general population and in family members of a TB patient among Thais, migrants, and members of ethnic minorities in Thailand.

Methodology

Sample and procedure

The study design was a cross-sectional survey that use multi-stage stratified systematic sampling in Thailand (one province in each of the 12 disease control areas, 2 districts in each province, 100 people of the general population recruited from 100 households, and 15 family members of a person TB per district recruited from one health facility; in the case of the general population of the migrants and members of ethnic minorities, a similar sampling procedure was followed in 7 provinces, targeting areas with a high proportion of the target sample) [19]. The data was collected using a questionnaire administered by trained interviewers. Every person 18 years of age and older living in the randomly selected households in the study area, and family members of a TB patient selected consecutively from TB patients at the health facility who consented to participate in the study, were eligible for the study. Finally, from all the eligible participants in a household, one was randomly selected for the interview. The research project received ethical approval from the Research Ethics Committee of the Faculty of Social Sciences and Humanities, Mahidol University. Informed consent was obtained from all study participants.

Sample size

Sample size was calculated using Epi-Info version 7. The mid-year population age \geq 18 to 85 years was 50 million [20], expected frequency 50%, confidence limits 5%, confidence level 99%, and design effect 1. The sample size per cluster was 663. Data were collected from four regions of Thailand, counted as 4

clusters \times 663 = 2,552. The sample size was increased approximately 20% to prevent missing data, so the final sample size collected was 3,074. Considering that registered migrant workers were 1,559,909 in 2014 in Thailand [21], the sample size was calculated using Epi-Info version 7, expected frequency 50%, confidence limits 5%, the confidence level 95%, and design effect 1. The sample size per cluster was 384. The sample size was increased about 15% in the data collection to prevent missing data; thus, the final sample size of migrant workers was 559.

Measure

The questionnaire included questions from WHO guidelines [22] and other literature reviews [8,15,16,23] on sociodemographic characteristics of the participants and their TB knowledge, attitudes, and practices [19]. The English questionnaire was translated by independent bilingual translators into the major target languages, Thai, Burmese, Khmer, and Lao, and was pre-tested in a sample of randomly chosen persons from the study area who did not form part of the main study. In the pre-test, the questionnaire was assessed for its understandability, clarity, completeness, reliability, and sociocultural acceptability.

The following independent variables were included: sex, age, employment status, personal monthly income, religion, educational status, population group (general Thai population, general migrant and ethnic minority population, family member of a TB patient, and migrant and ethnic minority population), and Global Fund support status.

TB knowledge, TB attitudes, and TB practices were the main outcome variables.

TB knowledge was assessed based on overall knowledge and four sub-sections of TB knowledge [13,22]. Ten main questions were used to assess overall TB knowledge. Each item was scored with 0 = incorrect/don't know responses and 1 = correct responses. All items were added up to create a knowledge index ranging from 0 to 10. Cronbach's alpha for this TB knowledge index in this sample was 0.62. This TB knowledge index had a normal distribution, and the total index score was also dichotomized using the mean ($m = 5.74$) as a cut-off value, with 1 = above the mean value, indicating good, and 0 = a score below the mean value, indicating low or poor overall knowledge of TB [13].

TB attitudes were assessed with one question: "How is a TB patient regarded in your community?" Response options included: a) Most people reject them;

b) Most people are friendly but avoid them; and c) Most people support and help them [22].

TB practice was assessed with two questions: a) “Have you ever been screened for TB?” (response options were Yes or No); and b) intended health seeking behavior, “What would you do if you had TB symptoms?” (multiple responses were possible) [22].

Data analysis

Data were analyzed using the SPSS software package (SPSS, Chicago, USA). Descriptive statistics were used to describe the results and Pearson Chi-square test to test for differences in proportions. Multivariate linear and logistic regression analyses were used to assess the effect of sociodemographic characteristics of study respondents on TB knowledge, attitudes, and practices. Results were reported as statistically significant whenever *p* values were less than 0.05. Beta coefficients and odds ratios (OR) were used to report the strength of association between independent variables and the outcome variables.

Results

Sample characteristics

The sample of the general population included 3,074 adults: 2,762 Thais and 312 migrant (n = 249) workers and members of ethnic minorities (n = 63); the sample of family members of TB patients included 559 persons: 455 Thais and 104 migrant workers (n = 83) and members of ethnic minorities (n = 21). The response rates for the Thai general population was 87%, migrant and ethnic minority general population 85%, Thai family members of TB patients 76%, and migrant workers and members of ethnic minorities with a family member with TB 78%. The major migrant groups were from Myanmar, Cambodia, and Laos. About three quarters of the Thais were 35 years or older, while two-thirds of migrants and members of ethnic minorities were 18 to 34 years of age (see Table 1).

TB knowledge

Using a TB knowledge index of 10 items of correct answers, Thais in the general population scored, on average, 5.74, while migrants and ethnic minorities in the general population scored significantly lower (m = 5.09) (*p* < 0.001).

Table 1. Sociodemographic sample characteristics (N = 3,633).

	General population (N = 3,074)		Family member of TB patient (N = 559)	
	Thais (n = 2,762)	Migrants and ethnic minorities (n = 312)	Thais (n = 455)	Migrants and ethnic minorities (n = 104)
Age (years)				
18–34	756 (27.4)	209 (67.0)	114 (25.2)	63 (61.8)
35–54	1,289 (46.8)	81 (26.0)	224 (49.4)	28 (27.5)
55 or more	712 (25.8)	22 (7.1)	115 (25.4)	11 (10.8)
Gender				
Female	1,788 (64.7)	179 (57.4)	310 (68.1)	75 (72.1)
Male	974 (35.3)	133 (42.6)	145 (31.9)	29 (27.9)
Education				
None	69 (2.9)	63 (20.2)	24 (5.3)	23 (22.1)
Primary	1,124 (40.7)	122 (39.1)	229 (50.3)	34 (32.7)
Secondary or more	1,569 (56.8)	127 (40.7)	202 (44.4)	47 (45.2)
Employment status				
Not employed	435 (15.7)	44 (14.1)	56 (12.3)	0 (0.0)
Employed	2,327 (84.3)	268 (85.9)	399 (87.7)	104 (100.0)
Personal monthly income				
None	840 (33.5)	126 (42.3)	156 (39.3)	43 (43.9)
200–5,000 Bhat	856 (34.1)	137 (46.0)	146 (36.8)	33 (33.7)
5,001 or more Bhat	811 (32.3)	35 (11.7)	95 (23.9)	22 (22.4)
Religious affiliation				
Muslim, Christian, other	100 (3.6)	50 (16.0)	9 (2.0)	31 (29.8)
Buddhist	2,662 (96.4)	262 (84.0)	446 (98.0)	73 (70.2)
Global Fund program support				
Non-Global Fund-supported area	1,310 (47.4)	115 (36.9)	205 (45.1)	23 (22.1)
Global Fund-supported area	1,452 (52.6)	197 (63.1)	250 (54.9)	81 (77.9)

Table 2. Knowledge about TB.

Correct answers	General population (N = 3,074)		Family member with TB patient (N = 559)	
	Thais (n = 2,762)	Migrants and ethnic minorities (n = 312)	Thais (n = 455)	Migrants and ethnic minorities (n = 104)
	N (%)	N (%)	N (%)	N (%)
1) TB cause: Bacteria	1,594 (57.7)	80 (25.6)	232 (51.0)	44 (42.3)
2) TB symptoms: Cough > 2 weeks	2,184 (79.1)	187 (59.9)	390 (85.7)	68 (65.4)
3) TB transmission: Airborne	1,804 (65.3)	181 (58.0)	315 (69.2)	63 (60.6)
4) TB prevention: Cough hygiene	1,221 (44.2)	118 (37.8)	225 (49.5)	39 (37.5)
5) Who can get TB: Anybody	1,369 (49.6)	108 (34.6)	224 (49.2)	47 (45.2)
6) TB cure: TB is curable	1,898 (68.7)	184 (59.0)	343 (75.4)	66 (63.5)
7) Every hospital can treat TB	1,790 (70.9)	197 (69.4)	313 (74.7)	69 (67.6)
8) TB treatment duration: 6 months	596 (21.6)	107 (34.3)	226 (49.7)	56 (53.8)
9) If TB patients takes medication for more than 2 weeks, it will no longer spread	1,131 (44.8)	117 (41.3)	180 (43.0)	46 (45.1)
10) If TB medication is not taken continuously, there will be danger of drug resistance not possible to cure	1,710 (68.0)	182 (66.9)	290 (69.9)	58 (62.4)
	M (SD)	M (SD)	M (SD)	M (SD)
TB knowledge index (10 items)	5.74 (2.0)	5.09 (2.4)	6.30 (1.9)	5.37 (2.9)

Table 3. Associations with TB knowledge index.

	Thai general population	Migrant and ethnic minority general population	Thai family member of TB patient	Migrant and ethnic minority family member of TB patient
	Adjusted coefficients B (CI 95%)	Adjusted coefficients B (CI 95%)	Adjusted coefficients B (CI 95%)	Adjusted coefficients B (CI 95%)
Age (years)				
18–34	Reference	Reference	Reference	Reference
35–54	-0.03 (-0.29 to 0.22)	0.37 (-0.36 to 1.10)	-0.06 (-0.58 to 0.47)	-0.33 (-1.65 to 0.99)
55 or more	-0.07 (-0.39 to 0.25)	-0.47 (-2.12 to 1.19)	-0.07 (-0.75 to 0.61)	-1.38 (-3.29 to 0.53)
Gender				
Female	Reference	Reference	Reference	Reference
Male	-0.16 (-0.37 to 0.05)	-0.24 (-0.90 to 0.43)	-0.22 (-0.69 to 0.24)	-0.05 (-1.18 to 1.18)
Education				
None or primary	Reference	Reference	Reference	Reference
Secondary or higher	0.39 (0.15 to 0.63)**	-0.28 (-1.00 to 0.44)	0.18 (-0.34 to 0.70)	-0.53 (-1.65 to 0.59)
Employment status				
Not employed	Reference	Reference	Reference	Reference
Employed	0.15 (-0.15 to 0.45)	0.29 (-0.58 to 1.17)	-0.11 (-0.77 to 0.54)	All employed
Personal monthly income				
None	Reference	Reference	Reference	Reference
200–5,000 Bhat	0.10 (-0.17 to 0.37)	1.46 (0.65 to 2.27)***	-0.21 (-0.76 to 0.54)	1.33 (0.01 to 2.65)*
5,001 or more Bhat	0.69 (0.40 to 0.97)***	1.62 (0.63 to 2.61)**	0.33 (-0.28 to 0.93)	1.60 (0.06 to 3.13)*
Religious affiliation				
Muslim, Christian, other	Reference	Reference	Reference	Reference
Buddhist	0.35 (-0.15 to 0.83)	0.62 (-0.66 to 1.89)	1.90 (0.36 to 3.44)	2.01 (0.66 to 3.36)**
Global Fund program support				
Non-Global Fund-supported area	Reference	Reference	Reference	Reference
Global Fund-supported area	-0.25 (-0.45 to -0.04)	0.05 (-0.66 to 0.75)	-0.79 (-1.27 to -0.32)***	0.78 (-0.57 to 2.13)
Knows other people in the community who had TB				
No	Reference	Reference	Reference	Reference
Yes	0.29 (0.07 to 0.50)**	0.38 (-0.30 to 1.05)	0.32 (-0.15 to 0.80)	-0.45 (-1.77 to 0.88)

***p < 0.001; **p < 0.01; *p < 0.05

Table 4. TB attitude and practices.

	Thai general population (N = 2,762)			Migrants and ethnic minorities general population (N = 317)			Thai family member of TB patient (N = 455)			Migrant and ethnic minority family member of TB patient (N = 104)		
	N (%)	Good TB knowledge (%)	P value	N (%)	Good TB knowledge (%)	P value	N (%)	Good TB knowledge (%)	P value	N (%)	Good TB knowledge (%)	P value
<i>How is a TB patient regarded in your community?</i>												
Most people reject them	603 (23.2)	288 (20.6)		70 (23.0)	27 (21.6)		79 (19.3)	50 (17.3)		23 (22.7)	6 (11.9)	
Most people are friendly but avoid them	1,193 (45.9)	679 (48.5)		79 (25.7)	33 (26.1)		182 (44.4)	141 (48.4)		23 (22.7)	12 (23.8)	
Most people support and help them	803 (30.9)	434 (31.0)	0.004	157 (51.3)	66 (52.3)	0.700	149 (36.3)	100 (34.2)	0.189	55 (54.7)	32 (64.3)	0.026
<i>Have you ever had a TB screening test?</i>	414 (15.0)	193 (13.8)	0.505	79 (25.3)	59 (46.5)	< 0.001	140 (30.8)	98 (33.7)	0.187	41 (39.4)	27 (55.1)	0.003
<i>What would you do if you had TB symptoms?*</i>												
Go to a health facility	2,088 (75.6)	1,163 (83.1)	< 0.001	220 (70.5)	121 (95.3)	< 0.001	362 (79.6)	254 (87.3)	< 0.001	73 (70.2)	49 (100)	< 0.001
Go to a pharmacy	172 (6.2)	103 (7.4)	< 0.004	13 (4.2)	9 (7.1)	0.018	18 (4.0)	8 (2.7)	0.503	2 (1.9)	1 (1.0)	0.341
Go to a traditional healer	117 (4.2)	75 (5.4)	0.020	32 (10.3)	1 (0.8)	< 0.001	10 (2.2)	6 (2.1)	0.776	30 (28.8)	0 (0)	< 0.001
Self-treatment	330 (11.9)	206 (14.7)	0.002	9 (2.9)	2 (1.6)	0.208	39 (8.6)	26 (8.9)	0.979	5 (4.8)	0 (0)	0.015
Go to temple/church/masjid	804 (29.1)	285 (20.4)	< 0.000	91 (29.2)	1 (0.8)	< 0.001	121 (26.6)	48 (16.5)	< 0.001	25 (24.0)	0 (0)	< 0.001

*Multiple responses

Table 5. TB attitude and practice: multivariate logistic regression.

	Attitude		Practice	
	Community TB stigma	Ever had TB screening test	Would go to health facility if had TB symptoms	
	Adjusted odds ratio ^a	Adjusted odds ratio ^b	Adjusted odds ratio ^c	
Age (years)				
18–34	1.00	1.00	1.00	
35–54	1.13 (0.86–1.49)	1.25 (0.93–1.68)	0.74 (0.37–1.49)	
55 or more	1.54 (1.10–2.17)*	1.60 (1.11–2.31)*	1.25 (0.49–3.20)	
Gender				
Female	1.00	1.00	1.00	
Male	1.37 (1.09–1.71)**	0.98 (0.77–1.25)	0.88 (0.49–1.56)	
Education				
None or primary	1.00	1.00	1.00	
Secondary or higher	1.06 (0.82–1.37)	0.71 (0.54–0.93)*	0.68 (0.36–1.28)	
Employment status				
Not employed	1.00	1.00	1.00	
Employed	1.01 (0.74–1.39)	0.97 (0.69–1.35)	0.61 (0.24–1.53)	
Personal monthly income				
None	1.00	1.00	1.00	
200–5000 Bhat	0.81 (0.61–1.07)	0.77 (0.57–1.03)	1.86 (0.94–3.69)	
5001 or more Bhat	0.83 (0.61–1.13)	0.82 (0.59–1.13)	1.40 (0.64–3.04)	
Religious affiliation				
Muslim, Christian, other	1.00	1.00	1.00	
Buddhist	0.98 (0.59–1.62)	1.28 (0.75–2.21)	0.67 (0.19–2.40)	
Population group				
Migrant or ethnic minority	1.00	1.00	1.00	
Thai	0.97 (0.65–1.46)	0.48 (0.35–0.64)***	5.51 (2.50–12.18)***	
Global Fund program support				
Non-Global Fund-supported area	1.00	1.00	1.00	
Global Fund-supported area	0.93 (0.74–1.16)	1.74 (1.36–2.22)***	0.92 (0.51–1.65)	
TB knowledge index	0.88 (0.82–0.94)***	1.16 (1.10–1.23)***	1.72 (1.45–2.03)***	
TB contact				
General population	1.00	1.00	1.00	
Has family member with TB	1.10 (0.84–1.43)	1.84 (1.43–2.36)***	2.23 (1.00–4.89)*	
Knows other people in the community who had TB	0.60 (0.47–0.75)***	2.38 (1.96–2.91)***	1.51 (0.81–2.83)	
Community TB stigma	---	1.14 (0.86–1.51)	0.46 (0.25–0.82)**	

^aHosmer and Lemeshow test: Chi-square = 6.38, p = 0.605; Nagelkerge R² = 0.05; ^bHosmer and Lemeshow test: Chi-square = 10.50, p = 0.232; Nagelkerge R² = 0.11; ^cHosmer and Lemeshow test: Chi-square = 7.63, p = 0.470; Nagelkerge R² = 0.26; ***p < 0.001; **p < 0.01; *p < 0.05.

Table 6. Sources of TB information (multiple responses possible) (N = 3,633).

Source of TB information	Sources of TB information ever received			Perceived credible source of TB information			Media/channel/ methods preferred to receive TB information		
	Total	Thais	Migrants	Total	Thais	Migrants	Total	Thais	Migrants
Newspaper/journals	41.2	42.3	29.2	10.1	10.4	6.4	18.7	19.3	11.7
Radio	38.1	39.1	27.2	11.5	11.8	8.1	24.6	25.1	18.8
Television	50.3	51.8	33.2	20.4	21.1	22.8	44.1	45.3	31.5
Posters, billboards	39.4	40.8	25.2	12.7	13.2	7.4	23.1	24.2	11.1
Leaflets, flyers	40.8	41.6	31.9	13.4	13.5	12.4	24.2	24.3	22.5
Teachers, lecturers	17.2	17.8	11.1	10.4	10.5	9.1	17.8	18.6	9.7
Health workers	38.1	38.7	31.2	39.2	39.6	35.6	48.1	47.9	49.7
Other health volunteers	28.3	29.2	18.8	19.1	19.3	16.8	34.7	35.7	24.2
Family, friends, peers	19.7	20.2	14.8	10.4	10.3	11.7	16.0	16.7	8.1
Religious leaders	12.4	12.8	8.1	7.8	8.1	4.4	11.5	12.1	5.4
Community leaders	13.5	13.9	9.1	10.5	10.9	5.7	17.3	18.3	5.7
Websites, emails	25.3	26.5	11.7	21.6	22.7	10.1	23.0	24.0	11.7
SMS, telephone	15.1	15.9	6.4	10.2	10.8	44.0	14.6	15.6	4.4
Other	7.0	7.4	2.7	2.4	2.5	1.0	5.5	5.2	8.4

Likewise, compared to migrants and ethnic minorities with a family member with TB ($m = 5.37$), Thais with a family member with TB scored significantly higher on the TB knowledge index ($m = 6.30$) ($p < 0.001$). Family members of a TB patient ($m = 5.82$, standard deviation [SD] = 2.0) scored significantly higher on the TB knowledge index than did persons in the general population ($m = 5.16$, SD = 2.6) ($p < 0.001$). Overall, poorer correct TB knowledge was found for TB treatment duration (27.1%), TB prevention (cough hygiene) (44.1%), and period of infectiousness in TB patients (44.3%) (Table 2).

In multivariate linear regression among the Thai general population, higher education, higher income, and having known other people (outside own family) in the community who had TB were all associated with the TB knowledge index. In multiple linear regression among the migrants and ethnic minorities in the general population, higher income was associated with the TB knowledge index. Furthermore, in multivariate linear regression among Thai family members of a TB patient, residing in an area not receiving support by the Global Fund was associated with the TB knowledge index, and among migrant and ethnic minority family members of a TB patient, higher income and being a Buddhist was associated with the TB knowledge index (Table 3).

TB attitudes and practices

Across different study populations (Thais, migrants and ethnic minorities, and family members of a TB patient), a significant proportion (22.6%) indicated that most people in the community would reject a TB patient. Among the Thai general population and migrants and ethnic minority family members of a TB patient a stigmatizing community attitude toward a TB patient decreased with better TB knowledge, while this did not differ among migrants and ethnic minorities in the general population and among Thais with a family member with TB.

Across the different study populations, 18.6% indicated that they had ever undergone a TB screening test. In the general Thai population, it was 15.0%; in the general migrant and ethnic minority population, 25.3%; in the Thai family members of a TB patient, 30.8%; and in the migrant and ethnic minority family members of a TB patient, 55.1%. Among migrants and ethnic minorities in both the general population (46.5%) and with a family member with TB (55.1%), the TB screening rates increased with better TB knowledge, while this did not differ among Thais in the general population and those with a family member with TB.

Patients' intended health-seeking behavior was determined by their answer to what they would do if they thought they had TB symptoms. Most (75.5%) responded that they would attend a healthcare facility; 28.7% a religious institution; 10.5% would self-treat; 5% would visit a pharmacy (5.6%), and 5.5% would visit a traditional healer. Across the different study groups, participants with better TB knowledge indicated that they consulted a healthcare facility more frequently and traditional or complementary medicine (religious institution and traditional healer) less frequently than did participants with lesser TB knowledge (Table 4).

Multivariate logistic regression with the whole sample found that older age, being male, having poorer TB knowledge, and not knowing other people in the community with TB were all associated with a community stigmatizing attitude toward TB. Furthermore, older age, lower education, being a migrant or belonging to an ethnic minority group, residing in an area supported by the Global Fund, better TB knowledge, having a family member with TB, and knowing other people in the community with TB were all associated with ever having been screened for TB. That is, those with better TB knowledge, who had a family member with TB, and whose communities had less TB stigma had higher odds of consulting a healthcare facility if they had TB symptoms (Table 5).

TB communication channels

The most common media channels through which TB information had ever been received included mass media and healthcare workers, and the most credible and preferred source of TB information was healthcare workers. It appears the Thai population had better access to various TB sources of information than did migrants and ethnic minorities (see Table 6).

Discussion

In this national study, among different population groups (Thais, migrants and ethnic minorities, and family members of a TB patient) in Thailand, the overall TB knowledge score was similar to that identified in some previous community studies [8,10,11] and higher than in studies in Uganda and Ethiopia [10,11,15], indicating areas of sub-optimal TB knowledge. Within the different study groups in this study, migrants and members of ethnic minorities had lower TB knowledge than did the general population, and family members of a TB patient had significantly higher TB knowledge than did people in the general population. Contrary to this finding, Boonchalaksi *et al.*

[24] found, in a 2011 survey in Thailand, that the TB knowledge gap seems to be greater among Thais than migrants and members of ethnic minorities. Migrants and members of ethnic minorities had lower TB knowledge, which may be attributed to their lower economic status, lack of access to health information due to language difficulties [25], and, as found in this study, less access to various media channels compared to the Thai population.

The study found, in agreement with previous studies [8,13-18], that sociodemographic factors such as higher education, higher income, and having known other people (outside of one's own family) in the community who had TB were all associated with TB knowledge. It was also found that experiences with a TB patient, e.g., a close personal relationship with a patient with TB [18] was associated with better TB knowledge. Unlike some other studies [8,10-15], this study did not find an association between younger or older age and sex.

In agreement with a previous study [12], this study found that sociodemographic factors such as older age, being male, and having poorer TB knowledge were all associated with a community stigmatizing attitude toward TB. Fear of TB stigma, especially among the elderly, men, and those with poorer TB knowledge, may delay a patient's diagnosis with TB at a health facility and may result in affected patients consulting traditional or complementary medicine providers. Health education should be used to address TB stigma attitudes by taking into consideration the different cultural beliefs and health knowledge of the target population [8].

In terms of TB practice, this study found that sociodemographic factors (older age, lower education, being a migrant, or belonging to an ethnic minority group), TB program funding status (residing in an area supported by the Global Fund), and better TB knowledge in terms of knowledge score and TB contact experience (having a family member with TB and knowing other people in the community with TB) were all associated with ever having been screened for TB. Screening among contacts of TB patients [26,27] may need scaling up, and screening in other risk groups, such as migrants and ethnic minority populations, may also be considered.

Furthermore, the intended TB health-seeking behavior of consulting a health facility was, as found in some other studies [16,17], associated with better TB knowledge (in terms of TB knowledge score and/or having a family member with TB). Compared to migrants and ethnic minorities, Thais had a higher odds

of intended healthcare facility consultation. It is possible that migrants and ethnic minorities have less access to public health facilities and are more likely to consult traditional and complementary medicine providers. An interesting finding was that higher perceived community TB stigma was associated with less intended health facility consultation if experiencing TB symptoms. Healthcare workers were considered to be the most credible and the most preferred source of TB information, which is similar to what was reported in a previous study [24], and can be utilized in future TB awareness campaigns.

Suggestions for policymakers on how to increase knowledge and awareness of TB may include the following: an expanded use of ACSM (Advocacy, Communication, and Social Mobilization to Fight TB) activities to reach all populations; increased utilization of health workers and health volunteers may for the provision of TB information services to match their clients' needs; promotion of workplace knowledge and TB awareness programs; provision of bilingual Information, Education and Communication (IEC) materials for migrant populations; and implementation of community events on TB awareness and stigma reduction among Thai and/or migrant and ethnic minority populations.

Study limitations

This study had several limitations. The study was cross-sectional, so causal conclusions could not be drawn. Another limitation of the study was that information collected in the study was based on self-reporting. There were some problems of identifying migrants in this study, and therefore other areas had to be oversampled [19]. In addition, the TB knowledge index in this study only had a moderate internal consistency, which may be due to the heterogeneous response format to the questions.

Conclusions

The results showed an overall medium level of TB knowledge, which was lower among the migrant and ethnic minority population and higher among family members of a TB patient. A significant proportion had unfavorable attitudes toward TB patients. The frequency of ever having ever been screened for TB was higher in risk groups (family members of a TB patient, migrants, and ethnic minorities). Several sociodemographic factors identified for TB knowledge, TB attitudes, and TB practices in different population groups can be utilized for TB public health education programs.

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