

## **Concerns about the knowledge, attitude and practice of tuberculosis in Anqing, China: comparison between new tuberculosis patients and non-tuberculosis patients.**

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### **Abstract**

**Inadequate knowledge of tuberculosis can affect people's attitude and practice, leading to health-seeking delay, treatment default and discrimination against tuberculosis patients. The objective of this study was to assess the knowledge, attitude and practice of tuberculosis among new tuberculosis patients and non-tuberculosis patients, and explore the differences of influencing factors between the two groups. Between June 2013 and December 2014, a survey about the knowledge, attitude and practice of tuberculosis was carried out in Anqing, China. Data were collected using a structured questionnaire (interviewer-administered questionnaire for illiterate participants and self-administered questionnaire for literate participants) and tuberculosis management system. Non-conditional logistic regression was used to determine the influencing factors of tuberculosis knowledge. The median of tuberculosis knowledge score was 12 [interquartile range: 5-17] for new tuberculosis patients and 9 (interquartile range: 4-15) for non-tuberculosis patients. In terms of correct answers of tuberculosis knowledge, there were significant differences of tuberculosis detection methods, some items of tuberculosis transmission and main tuberculosis infectious source between new tuberculosis patients and non-tuberculosis patients. Out of the eight items of attitude and practice, only two items had significant differences between new tuberculosis patients and non-tuberculosis patients. The influencing factors of new tuberculosis patients' knowledge were also different from non-tuberculosis patients'. The more efforts should be made to improve their knowledge and change their attitude and practice towards tuberculosis.**

**Keywords:** Tuberculosis, Knowledge, Attitude and practice, New tuberculosis patients, Non- tuberculosis patients.

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### **Introduction**

Tuberculosis (TB) is preventable and early diagnosis and treatment is required to reduce transmission. So it is critical for patients to attend health facilities where TB are diagnosed and treated as early as possible when TB symptoms emerge. However, only about half of patients with TB symptoms sought healthcare timely, most attribute to the lack of knowledge of TB [1]. Lacking of knowledge of TB would encourage people to consider various alternatives for their health care-seeking [2], which was significantly associated with patient delay and treatment default among newly diagnosed pulmonary TB patients [3-5]. And delay in diagnosis and treatment of TB patients could increase disease transmission within the community [6], lead to more serious complications and higher mortality [7]. In addition, a lack of reasonable knowledge of TB also led to discrimination and stigma [8], whereas discrimination against TB patients by

relatives and friends was likely to hinder positive health seeking behavior and thus impede control of TB [9].

Additionally, TB patients with indifferent attitude had significantly longer treatment delay than others [10], while patients diagnosed and treated after 60 days from the onset of symptoms were 2.64 times more likely to have multidrug resistant tuberculosis (MDR-TB) than those treated more promptly [11]. In a recent study, TB patients with the perception that TB was related to human immunodeficiency virus (HIV) were more likely to delay in TB case detection [12]. Therefore, it is necessary to improve TB patients' knowledge, and change their attitude and practice in order to prevent the emergence of TB, especially MDR-TB.

Although the knowledge, attitude and practice of TB were studied frequently, the majority of studies did not take or only took new TB patients as study subjects. New TB patients' knowledge, attitude and practice are crucial to their subsequent treatment, and can provide evidence when evaluating the

knowledge, attitude and practice of ordinary people. Therefore, we evaluated the knowledge, attitude and practice of new TB patients and non-TB patients, and explored the differences of the influencing factors between the two groups.

China has the world's second largest tuberculosis epidemic. Anqing city, located in the southwest of Anhui province, has high proportion population of farming and TB prevalence. Studies on the knowledge, attitude and practice of TB are absent. Therefore, we conducted this study amongst new TB patients and non-tuberculosis patients in Anqing, China.

## Material and Methods

### Study Setting

Anqing area, situated at Southwest Anhui Province, has high TB prevalence. In 2013, the number of rural population was 3.16 million (59.04%) and the per capita gross domestic product (GDP) was 26657.89 RMB. Anqing area is selected not only due to its high proportion population of farming and high TB prevalence but also because it is a typical rural area in the central of China, and can represent the Central China in some extent.

### Population and sampling

This study was conducted between June 2013 and December 2014 in Anqing area. All the new TB patients among eight counties and three municipal districts in Anqing were asked to fill in the questionnaire when they were registered in the TB management system of local Centers for Disease Control and Prevention (CDCs), and 1118 new TB patients filled in the questionnaires.

Non-TB patients were selected randomly from the communities of the counties and districts, and 384 participants filled in the questionnaires. All the participants were residents who had lived in their present residence for more than six months before the survey. Interviewer-administered questionnaires were used to collect data of illiterate participants, and self-administered questionnaire were used to collect data of literate participants. As the new TB patients and non-TB patients varied widely in ages and sexes, so we matched them with sex and age. Finally, 250 new TB patients and 250 non-TB patients were recruited in this study.

The investigators in local TB dispensaries and CDCs had been trained before the survey. All participants were informed about the objectives of the study and provided verbal informed consent before the survey. People who refused to participate or worked in the city temporarily (seasonal workers) were dropped.

### Questionnaire and data collection

The questionnaire was designed by Anqing CDC according to the standardized questionnaire on major issues of national infectious diseases [8]. It was pre-tested among 100 people and was modified as necessary. The first section of the

questionnaire was information on socio-demographic characteristics (age, sex, residence, education level, living space, family members and family income in the past year, smoking and drinking habits), health insurance, TB patients around, history of bacillus Calmette-Guérin (BCG) vaccination, publicity and education about TB.

The second section of the questionnaire was patients' knowledge on TB. It contained 22 questions and was divided into several sections: TB pathogen (1 question), symptoms (4 questions), detection methods (3 questions), transmission (10 questions), treatment (3 questions) and one associated question. Answers were established as yes, no and unknown. Each question was awarded 1 mark for the correct answer, while each incorrect or unknown answer was given 0 mark. The overall knowledge score was obtained by summing these responses, which was expected to range between 0 and 22. The composite score was dichotomized using median obtained from the data. Therefore, those with a total score equal to or below the median were classified as having poor knowledge, whereas those above the median were considered having good knowledge.

The third section was attitude and practice of TB, and contained 8 items (Table 4 in details). Participants could choose the most satisfactory answer for these questions. In addition, we also inquired about questions on whether knew TB information, and the access of TB information.

### Operational definition of terms

(1) New tuberculosis patient refers to a patient who has never treated for tuberculosis or who has taken anti-tuberculosis drugs for less than one month or who has taken anti-tuberculosis drugs regularly for more than one month but has not completed the standard treatment regimen. (2) Non-tuberculosis patient refers to a community member who has not been diagnosed as TB patients during the study period. (3) Smoking includes people who are smoking presently and smoked previously. (4) In term of education level, "elementary" is referred to elementary school; "secondary" is referred to junior high school, senior high school and secondary specialized school; "higher" is referred to junior college and above. (5) Income is referred to per capita annual income (RMB). (6) Living space is referred to per capita living space (m<sup>2</sup>). (7) "TB patients around" is referred to TB patients who are in the household, neighborhood, work place or school of participants.

### Data analysis

EpiData software Version 3.1 was used for data entry and SPSS Version 18.0 was used for data analysis. The descriptive statistics (including median, interquartile range, frequencies and percentages) were used to show the distribution of the socio-demographic characteristics, knowledge, attitude and practice of TB, access of TB information. The differences between new TB patients and non-TB patients were compared by Chi-square test. Non-conditional logistic regression analysis

was applied to analyse the associations of socio-demographic characteristics with TB knowledge level. Multivariate logistic regression modelling attempted to use all factor associated with the outcome in univariate models ( $P < 0.10$ ).  $P < 0.05$  was considered to indicate a statistically significant difference.

**Ethics statement**

The study was carried out in compliance with the Declaration of Helsinki of the World Medical Association. According to a protocol approved by Medical Ethics Committee of Wannan Medical College, all participants were informed about the objectives of this study and provided verbal informed consent before the survey.

**Table 1.** Socio-demographic characteristics of new tuberculosis (TB) patients and non-TB patients.

Characteristics	Total (n, %)	New TB patients (n, %)	Non-TB patients (n, %)	$\chi^2$	P	
Sex	Male	282 (56.40)	141 (56.40)	141 (56.40)	0	1
	Female	218 (43.60)	109 (43.60)	109 (43.60)		
Age group	<25	70 (14.00)	35 (14.00)	35 (14.00)	0.05	0.997
	25~45	188 (37.60)	95 (38.00)	93 (37.20)		
	45~65	195 (39.00)	97 (38.80)	98 (39.20)		
	$\geq 65$	47 (9.40)	23 (9.20)	24 (9.60)		
Residence	Town	85 (19.32)	33 (14.80)	52 (23.96)	5.93	0.015
	Rural area	355 (80.68)	190 (85.20)	165 (76.04)		
	Missing	60				
Education	Illiterate	68 (13.77)	41 (16.60)	27 (10.98)	24.9	<0.001
	Elementary	129 (26.11)	76 (30.77)	53 (21.46)		
	Secondary	236 (47.77)	116 (46.96)	120 (48.58)		
	High	61 (12.35)	14 (5.67)	47 (19.03)		
	Missing	6				
Health insurance	Yes	479 (96.96)	237 (96.34)	242 (97.58)	0.64	0.422
	No	15 (3.04)	9 (3.66)	6 (2.42)		
	Missing	6				
Smoking	Yes	179 (36.02)	102 (42.13)	77 (30.92)	5.62	0.018
	No	318 (63.98)	146 (58.87)	172 (69.08)		
	Missing	3				
Drinking	Yes	138 (28.11)	71 (29.22)	67 (27.02)	0.29	0.587
	No	353 (71.89)	172 (70.78)	181 (72.98)		
	Missing	9				

**TB knowledge of new TB patients and non-TB patients**

Information on the knowledge of TB was summarized in Table 2. There were significant differences of TB knowledge

**Results**

**Socio-demographic characteristics of new TB patients and non-TB patients**

Most participants were males (56.40%), rural residents (80.68%) and had health insurance (96.96%). Only 13.77% participants were illiterate. There were significant differences of residence, education and smoking between new TB patients and non-TB patients (all  $P < 0.05$ ) (Table 1).

between new TB patients and non-TB patients in correct responses of the following questions: 1) TB symptom of hemoptysis ( $P = 0.008$ ); 2) TB detection methods of sputum smear ( $P = 0.023$ ) and X-rays ( $P = 0.001$ ); 3) TB was transmitted through coughing/sneezing ( $P = 0.009$ ); 4) overcrowding can

lead to TB transmission ( $P=0.041$ ); 5) sputum smear positive TB patients were the main TB infectious source ( $P<0.001$ ); 6) TB was not transmitted by shaking hand ( $P=0.039$ ); 7) animals can infect TB ( $P=0.006$ ); 8) sputum smear negative TB

patients were not the main TB infectious source ( $P=0.039$ ). The correct response rates among these questions were higher in new TB patients except for the last three.

**Table 2.** Correct answer rate among new TB patients and non-TB patients towards all knowledge questions.

Items	Total (n, %)	New TB patients (n, %)	Non-TB patients (n, %)	$\chi^2$	P
Had knowledge of the pathogen of TB	224 (44.80)	115 (46.00)	109 (43.60)	0.291	0.590
Had knowledge of TB symptoms					
Cough and expectoration for 2 or more weeks	257 (51.40)	135 (54.00)	122 (48.80)	1.353	0.245
Hemoptysis	201 (40.20)	115 (46.00)	86 (34.40)	6.997	0.008
Blood-tinged sputum	141 (28.20)	77 (30.80)	64 (25.60)	1.669	0.196
Phlegm	293 (58.60)	137 (54.80)	156 (62.40)	2.976	0.085
Had knowledge of TB detection methods					
Sputum smear	207 (41.40)	116 (46.40)	91 (36.40)	5.152	0.023
Urine Analysis	283 (56.60)	140 (56.00)	143 (57.20)	0.073	0.787
X-rays	189 (37.80)	112 (44.80)	77 (30.80)	10.420	0.001
Had knowledge of TB transmission					
TB is an infectious disease	392 (78.40)	203 (81.20)	189 (75.60)	2.315	0.128
Transmitted by coughing/sneezing	277 (55.40)	153 (61.20)	124 (49.60)	6.807	0.009
Transmitted by having dinner together	284 (56.80)	140 (56.00)	144 (57.60)	0.130	0.718
Transmitted by shaking hand	223 (44.60)	100 (40.00)	123 (49.20)	4.282	0.039
Transmitted by touching utensils of TB patients	252 (50.40)	116 (46.40)	136 (54.40)	3.200	0.074
Transmitted by water and food polluted by TB patients	120 (24.00)	68 (27.20)	52 (20.80)	2.807	0.094
Overcrowding can lead to TB transmission	182 (36.40)	102 (40.80)	80 (32.00)	4.181	0.041
Animals can infect TB	233 (46.60)	101 (40.40)	132 (52.80)	7.724	0.006
Had knowledge of the main TB infectious source					
Sputum smear negative TB patients	277 (55.40)	127 (50.80)	150 (60.00)	4.282	0.039
Sputum smear positive TB patients	159 (31.80)	106 (42.40)	53 (21.20)	25.904	<0.001
Had knowledge of TB treatment					
TB is a curable disease	354 (70.80)	178 (71.20)	176 (70.40)	0.039	0.844
Aware of free detection/treatment policy	362 (72.40)	183 (73.20)	179 (71.60)	0.160	0.689
Aware of institutions to implement the free detection/treatment policy	293 (58.60)	156 (62.40)	137 (54.80)	2.976	0.085
TB is associated with HIV	67 (13.40)	34 (13.60)	33 (13.20)	0.017	0.896

### **TB knowledge level of new TB patients and non-TB patients**

The median of TB knowledge score was 12 [interquartile range (IQR): 5-17] for new TB patients and 9 (IQR: 4-15) for non-

TB patients. There were no significant differences of TB knowledge level between the two study groups (Table 3).

**Table 3.** TB knowledge level and access of TB information among new TB patients and non-TB patients.

Items	Total (n, %)	New patients (%)	TB (n, patients %)	Non-TB patients (%)	$\chi^2$ (n, %)	P
TB knowledge	Median score (IQR)	12 (5-17)	9 (4-15)			
	Good	239 (47.80)	118 (47.20)	121 (48.40)	0.072	0.788
	Poor	261 (52.20)	132 (52.80)	129 (51.60)		
Knew information about TB	275 (55.00)	133 (53.20)	142 (56.80)	0.655	0.419	
Access of TB information	Medical personnel	177 (64.36)	85 (63.91)	92 (64.79)	0.023	0.879
	Propagandist manual	156 (56.73)	70 (52.63)	86 (60.56)	1.76	0.185
	Television and website	120 (43.64)	63 (47.37)	57 (40.14)	1.459	0.227
	Newspapers and magazines	90 (32.73)	47 (35.34)	43 (30.28)	0.798	0.372
	Lectures related to TB	69 (25.09)	26 (19.55)	43 (30.28)	4.209	0.04

**Access of TB information among new TB patients and non-TB patients**

There were 275 participants declared that they knew TB information, among them 133 were new TB patients. In terms of access to TB information, there were significant differences of lectures related to TB (P=0.040) between the two study groups (Table 3).

For new TB patients and non-TB patients, the most frequent accesses of TB information were medical personnel (63.91% and 64.79% respectively), propagandist manual (52.63% and 60.56% respectively), and television and website (47.37% and 40.14% respectively) (Table 3).

**Attitude and practice of TB among new TB patients and non-TB patients**

Summary information about the attitude and practice of TB was summarized in Table 4. There were significant differences of attitude and practice about TB between new TB patients and non-TB patients in the responses of the following items: 1) if you had respiratory symptoms like cough and expectoration, hemoptysis, what would you do? (P<0.001); 2) if you were found to have TB, who you wanted to seek for help from? (P=0.003).

**Table 4.** New TB patients and non-TB patients' attitude and practice about TB.

Items	Total (n, %)	New TB patients (n, %)	Non-TB patients (n, %)	$\chi^2$	P
How terrible a disease is TB?				1.795	0.408
Very terrible	30 (6.00)	13 (5.20)	17 (6.80)		
Terrible	234 (46.80)	124 (49.60)	110 (44.00)		
Not terrible	236 (47.20)	113 (45.20)	123 (49.20)		
If you had respiratory symptoms like cough and expectoration, hemoptysis, what would you do?				17.414	<0.001
It is a small problem, and let it slide.	23 (4.60)	9 (3.60)	14 (5.60)		
Seek medical help immediately	355 (71.00)	161 (64.40)	194 (77.60)		
Seek medical help as the case may be	107 (21.40)	68 (27.20)	39 (15.60)		
Others	15 (3.00)	12 (4.80)	3 (1.20)		
What would be your reaction if your family members or relatives had TB?				5.751	0.331
More concerned	275 (55.00)	133 (53.20)	142 (56.80)		
Continue to associate with them	156 (31.20)	85 (34.00)	71 (28.20)		
Treat them coldly step by step	17 (3.40)	5 (2.00)	12 (4.80)		
Refused to associate with them	7 (1.40)	3 (1.20)	4 (1.60)		

Do not know how to deal with	31 (6.20)	15 (6.00)	16 (6.40)		
Other	14 (2.80)	9 (3.60)	5 (2.00)		
What would be your reaction if your friends or colleagues had TB?				8.356	0.138
More concerned	211 (42.20)	105 (42.00)	106 (42.40)		
Continue to associate with them	213 (42.60)	112 (44.80)	101 (40.40)		
Treat them coldly step by step	25 (5.00)	7 (2.80)	18 (7.20)		
Refused to associate with them	5 (1.00)	1 (0.40)	4 (1.60)		
Do not know how to deal with	32 (6.40)	16 (6.40)	16 (6.40)		
Other	14 (2.80)	9 (3.60)	5 (2.00)		
What would be your reaction if you closely contacted with TB patients?				5.262	0.154
Do not talk with them	40 (8.00)	26 (10.40)	14 (5.60)		
Avoid contact with them as far as possible	231 (46.20)	107 (42.80)	124 (49.60)		
Treat them as usual	206 (41.20)	104 (41.60)	102 (40.80)		
Other	23 (4.60)	13 (5.20)	10 (4.00)		
If you were found to have TB, you want to seek for help from				16.126	0.003
Family members	18 (3.60)	2 (0.80)	16 (6.40)		
Friends, colleagues	8 (1.60)	5 (2.00)	3 (1.20)		
Neighbours	7 (1.40)	3 (1.20)	4 (1.60)		
Doctors	458 (91.60)	233 (93.20)	225 (90.00)		
Others	9 (1.80)	7 (2.80)	2 (0.80)		
What would be your reaction if you were found to have TB?				0.829	0.843
Fear, despair	27 (5.40)	12 (4.80)	15 (6.00)		
Fear that others may discriminate against you	192 (38.40)	93 (37.20)	99 (39.60)		
Just as usual	263 (52.60)	136 (54.40)	127 (50.80)		
Other	18 (3.60)	9 (3.60)	9 (3.60)		
If you were found to have TB, what you hoped others to do?				2.315	0.314
People who know it can keep secret	255 (51.00)	119 (47.60)	136 (54.40)		
It doesn't matter	219 (43.80)	117 (46.80)	102 (40.80)		
Others	26 (5.20)	14 (5.60)	12 (4.80)		

### ***Influencing factors of TB knowledge level among new TB patients and non-TB patients***

In multivariable analysis, for new TB patients, being male (OR 1.80, 95% CI 1.04-3.21), having education level of secondary (OR 2.12, 95% CI 1.19-3.77), having health insurance (OR 10.33, 95% CI 1.15-92.56), having publicity and education

about TB (OR 2.21, 95% CI 1.18-4.13) were more likely to have good knowledge level of TB (Table 5).

For non-TB patients, being in the per capita living space of 30-60 m<sup>2</sup> (OR 2.68, 95% CI 1.46-4.92) and above 60 m<sup>2</sup> (OR 3.91, 95% CI 1.35-11.33) were more likely to have good knowledge level of TB. While those had TB patients around (OR 0.43, 95% CI 0.22-0.87), did not know whether there were

Concerns about the knowledge, attitude and practice of tuberculosis in Anqing, China

TB patients around (OR 0.22, 95% CI 0.10-0.46) and had publicity and education about TB (OR 0.49, 95% CI 0.27-0.87) were less likely to have good knowledge level of TB (Table 5).

**Table 5.** The analysis of TB knowledge level influencing factors among new TB patients and non-TB patients.

Characteristics	New TB patients (n, %)	Level of TB knowledge		Univariate analysis	Multivariable analysis	Non-TB patients (n, %)	Level of TB knowledge		Univariate analysis	Multivariable analysis
		Good	Poor	OR (95% CI)	OR (95% CI)		Good	Poor	OR (95% CI)	OR (95% CI)
Sex	Male	141 (56.40)	74 (62.71)	67 (50.76)	1.63 (0.98,2.71)	1.80 (1.04,3.21)	141(56.40)	72(59.50)	69 (53.49)	1.28 (0.77,2.11)
	Female	109 (43.60)	44 (37.29)	65 (49.24)	1	1	109(43.60)	49 (40.50)	60 (46.51)	1
Age group	<25	35 (14.00)	21 (17.80)	14 (10.61)	1	1	35 (14.00)	10 (8.26)	25 (19.38)	1
	25~45	95 (38.00)	42 (35.59)	53 (40.15)	0.53 (0.24,1.16)	1	93 (37.20)	50 (41.32)	43 (33.33)	2.91 (1.26,6.73)
	45~65	97 (38.80)	44 (37.29)	53 (40.15)	0.55 (0.25,1.21)	1	98 (39.20)	54 (44.63)	44 (34.11)	3.07 (1.33,7.07)
	≥65	23 (9.20)	11 (9.32)	12 (9.09)	0.61 (0.21,1.77)	1	24 (9.60)	7 (5.79)	17 (13.18)	1.03 (0.34,3.24)
Residence	Town	33 (14.80)	16 (15.53)	17 (14.17)	1.11 (0.53,2.34)	1	52 (23.96)	27 (26.47)	25 (21.74)	1.30 (0.69,2.42)
	Rural area	190 (85.20)	87 (84.47)	103 (85.83)	1	1	165 (76.04)	75 (73.53)	90 (78.26)	1
	Missing	27					33			
Education level	Illiterate	41 (16.60)	15 (12.82)	26 (20.00)	1	1	27 (10.93)	12 (10.08)	15 (11.72)	1
	Elementary	76 (30.77)	32 (27.35)	44 (33.85)	1.26 (0.58,2.76)	1	53 (21.46)	25 (21.01)	28 (21.88)	1.12 (0.44,2.83)
	Secondary	116 (46.96)	66 (56.41)	50 (38.46)	2.29 (1.10,4.77)	2.12 (1.19,3.77)	120(48.58)	63 (52.94)	57 (44.53)	1.38 (0.60,3.20)
	High	14 (5.67)	4 (3.42)	10 (7.69)	0.69 (0.19,2.60)	1	47 (19.03)	19 (15.97)	28 (21.88)	0.85 (0.33,2.21)
	Missing	3					3			
Health insurance	Yes	237 (96.34)	114 (99.13)	123 (93.89)	7.42 (0.91,60.21)	10.33 (1.15,92.56)	242(97.58)	118 (97.52)	124 (97.64)	0.95 (0.19,4.81)
	No	9 (3.66)	1 (0.87)	8 (6.11)	1	1	6 (2.42)	3 (2.48)	3 (2.36)	1
	Missing	4					2			
Smoking	Yes	102 (41.13)	52 (44.07)	50 (38.46)	1.26 (0.76, 2.09)	1	77 (30.93)	47 (38.84)	30 (23.44)	2.08 (1.20,3.59)
	No	146 (58.87)	66 (55.93)	80 (61.54)	1	1	172 (69.08)	74 (61.16)	98 (76.56)	1
	Missing	2					1			
Drinking	Yes	71 (29.22)	30 (26.55)	41 (31.54)	0.79 (0.45, 1.37)	1	67 (27.02)	37 (30.83)	30 (23.44)	1.46 (0.83,2.56)
	No	172 (70.78)	83 (73.45)	89 (68.46)	1	1	181 (72.98)	83 (69.17)	98 (76.56)	1
	Missing	7					2			
Income	<5000	52 (29.89)	29 (29.29)	23 (30.67)	1	1	36 (16.82)	13 (12.04)	23 (21.70)	1

	5000~	102 (58.62)	59 (59.60)	43 (57.33)	1.09 (0.56,2.14)		118 (55.14)	63 (58.33)	55 (51.89)	2.03 (0.94,4.38)	
	>15000	20 (11.49)	11 (11.11)	9 (12.00)	0.97 (0.34,2.74)		60 (28.04)	32 (29.63)	28 (26.42)	2.02 (0.87,4.72)	
	Missing	76					36				
Living space	<30	80 (37.21)	45 (41.67)	35 (32.71)	1		94 (41.41)	35 (31.25)	59 (51.30)	1	1
	30~60	118 (54.88)	52 (48.15)	66 (61.68)	0.61 (0.35,1.09)		112 (49.34)	63 (56.25)	49 (42.61)	2.17 (1.24,3.80)	2.68 (1.46,4.92)
	>60	17 (7.91)	11 (10.19)	6 (5.61)	1.43 (0.48,4.23)		21 (9.25)	14(12.50)	7 (6.09)	3.37 (1.24,9.15)	3.91 (1.35,11.33)
	Missing	35					23				
BCG	Yes	98 (44.34)	45 (41.67)	53 (46.90)	0.81 (0.48,1.38)		153 (65.11)	75 (66.37)	78(63.93)	1.11 (0.65,1.91)	
	No	123(55.66)	63 (58.33)	60 (53.10)	1		82 (34.89)	38 (33.63)	44(36.07)	1	
	Missing	29					15				
TB patients around	Yes	48(19.92)	22 (18.97)	26 (20.80)	0.83 (0.42,1.66)		54 (21.86)	23 (19.17)	31 (24.41)	0.46 (0.24,0.88)	0.43 (0.22,0.87)
	No	99(41.08)	50 (43.10)	49 (39.20)	1		133 (58.85)	82 (68.33)	51 (40.16)	1	1
	Unknown	94 (39.00)	44 (37.93)	50 (40.00)	0.86 (0.49,1.52)		60 (24.29)	15 (12.50)	45 (35.43)	0.21 (0.11,0.41)	0.22 (0.10,0.46)
	Missing	9					3				
Publicity and education	Yes	67 (30.59)	42 (40.00)	25 (21.93)	2.37 (1.31,4.29)	2.21 (1.18,4.13)	110 (47.21)	45 (40.18)	65 (53.72)	0.58 (0.34,0.97)	0.49 (0.27,0.87)
	No	152 (69.41)	63 (60.00)	89 (78.07)	1	1	123 (52.79)	67 (59.82)	56 (46.28)	1	1
	Missing	31					17				

## Discussion

One of the main accesses of information on TB in our study was medical personnel, which was consistent with the studies conducted in Nigeria [3], Ethiopia [13] and Pakistan [14]. Other sources of information mentioned by the study participants were mass media like television and website, newspapers and magazines, which were more or less similar to the researches in Pakistan [14], Vietnam [15] and Bangladesh [16]. Another important aspect noted in this study was that propagandist manual was the second important source for both new TB patients and non-TB patients, which was greatly different from other researches [14-16]. The above findings indicated that medical personnel, propagandist manual and mass media were acting as the successful means of disseminating information about TB in our study area.

This study showed that new TB patients had better TB knowledge than non-TB patients in the current study area, as the median score of TB knowledge was higher in new TB patients. Compared to new TB patients, the non-TB patients showed extremely poor knowledge about whether haemoptysis was the TB symptom or not, whether sputum smear and X-rays were TB detection methods or not, whether TB was transmitted by coughing/sneezing or not, etc. Therefore, more attention

should be paid to non-TB patients about the above TB knowledge. However, non-TB patients had good knowledge about whether TB was transmitted by shaking hand or not, whether animals could infect TB or not. So it is necessary to improve new TB patients' knowledge about these.

In terms of TB pathogen, 46% new TB patients and 43.60% non-TB patients mentioned that bacteria/germ as a cause of TB, which were different from the studies in Vanuatu [17] and Ethiopia [13], where most study subjects perceived cold air, shortage of food, alcohol, smoking and chat chewing as the cause of TB. The respondents also had basic knowledge about the common TB symptoms and its modes of transmission. For new TB patients, 54% realized that coughing for 2 or more weeks was the symptom of TB, which was superior to the TB patients (32.7%) in Ethiopia [18]; 61.2% knew that TB could transmit through coughing/sneezing, which was higher than the study in Dhaka city (56%) [16]. For non-TB patients, 48.8% knew that coughing for 2 or more weeks was the symptom of TB, which was higher than 9.9% in south western Ethiopia [13] but lower than 72.4% in eastern Ethiopia [19]; 49.60% realized that TB could transmit through coughing/sneezing, which was similar to the study in Nigeria (47.14%) [20]. The basic knowledge about the symptoms and transmission modes of TB had an important implication for the TB control program

in the current study area, because it could help reduce patient and health system delays in the diagnosis and treatment of TB [21], as well as the transmission of TB [22].

Another important aspect noted in this study was that most new TB patients (71.2%) and non-TB patients (70.4%) believed that TB was curable, which were higher than 58.2% among South African high-school learners [23] but lower than 97.2% among final year students in Iran [24] and 97.7% amongst front-line tuberculosis personnel in Peru [25]. Furthermore, 73.2% new TB patients and 71.6% non-TB patients had heard about the national TB policy of free detection/treatment, relatively higher compared to researches amongst the patients in Ethiopia (43.1%) [18] and the medical students Southwest China (34.1%) [26], while only 62.4% new TB patients and 54.8% non-TB patients were aware of the institutions to implement the free detection/treatment policy. Knowledge about this should be told both of them, so that when they or their friends, relatives, etc. had TB symptoms they knew where to go first, and thus reduced the patient and health system delays when diagnosing and treating TB [21]. It was interesting to note, however, that 13.6% new TB patients and 13.2% non-TB patients had knowledge that TB was related to HIV, which were extremely low, even compared to TB patients' relatives in Brazil (22.7%) [27]. Knowledge about HIV and TB should be taken seriously.

It was interesting to note in this study that the factors associated with TB knowledge were significantly different between new TB patients and non-TB patients. For new TB patients, being males, having secondary education level than being illiterate, having health insurance and having publicity and education about TB were more likely to have good level of overall knowledge about TB. The findings corroborated the researches in Ethiopia [13, 19], Vietnam [15], Nigeria [20] and US and Canada [28]. For non-TB patients, high overall TB knowledge was significantly associated with larger living space (>30 m<sup>2</sup>). Living space can reflect the socioeconomic status in some extent, and previous study reported that poor TB knowledge was significant among the poorest household and non-working respondents [20]. However, having TB patients around, having no awareness of whether there were TB patients around and having publicity and education about TB were less likely to have good level of overall knowledge about TB. It might be ascribed to people's attitude and practice that they did not care about TB, so they only remembered that they received publicity and education but had no knowledge about what they learned. More efforts should be made to improve non-TB patients' knowledge of TB.

More brave in this survey was the fact that majority of new TB patients (64.4%) and non-TB patients (77.6%) reported that they would seek medical help immediately when they realized they had symptoms related to TB, unlike other reports in Vanuatu [17] and Malawi [21]. However, about half participants (42.8%, 42%, and 47.6% for new TB patients; 49.6%, 45.6% and 54.4% for non-TB patients, respectively) would avoid contact with TB patients as far as possible, and when they were found to have TB they would be fear, despair

and hope that others can keep secret. Similar feelings had been reported in Pakistan [14] and Ethiopia [19]. It is necessary to change their unfavorable attitude and practice towards TB, which can potentially influence TB patients' decision in health seeking behavior and adherence to TB treatment [29].

Our study has several limitations. Firstly, this design and limited study area meant that the knowledge, attitude and practice of new TB patients and non-TB patients may not be representative of those at the national level. Secondly, the questionnaire we used did not contain the questions about MDR and extensively drug-resistant tuberculosis (XDR-TB), information on occupation, HIV status. Thirdly, use questionnaire may cause deficiency of some important information, especially self-administered questionnaire. Although we referred to TB management system, we could not add the whole missing information. Interviewer-administered questionnaire should be adopted no matter illiterate participants and literate participants.

## **Conclusions**

In summary, new TB patients had better TB knowledge than non-TB patients but they had similar attitude and practice towards TB. Measures must be taken to improve their TB knowledge and change their attitude and practice towards TB. Based on our findings, we suggest that propaganda conducted by medical personnel and staff of local CDCs and TB dispensaries, propagandist manuals can be allocated at the same time. People were encouraged to read newspapers and magazines, watch TV and surf the Internet as well.

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