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Medical care-seeking willingness for tuberculosis and associated factors among elderly population in Shenzhen: a cross-sectional study

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Medical care-seeking willingness for tuberculosis and associated factors among elderly population in Shenzhen: a cross-sectional study

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Abstract

Objectives This study was aiming at assessing the willingness of elderly people to seek medical care for tuberculosis (TB) and its influencing factors.

Design A cross-sectional study.

Setting A multistage random survey was conducted in Bao'an District of Shenzhen in China.

Participants 1200 elderly people aged 65 years or above were recruited to the study and completed a structured questionnaire between September and October 2019.

Main outcome measures Descriptive and binary logistic stepwise regression was conducted to analyze the characteristics of elderlies, their willingness and associated factors to seek medical care for TB.

Results Among 1140 respondents, 989 (86.75%) were willing to seek medical care if they discover TB suspicious symptoms. Binary logistic stepwise regression analysis indicated that elderly people who were at higher education levels (junior or senior middle school: odds ratio [OR] 1.93, 95% confidence interval [CI] 1.19-3.13; P=0.008; college degree or above: OR 3.64, 95% CI 0.84-15.80; P=0.085), scored more than 3 points on TB knowledge (OR 3.61, 95% CI 2.21-5.87; P<0.001), scored more than 2 points on TB (OR 1.93, 95% CI 1.23-3.04; P=0.004), and scored more than 2 points on TB practice (OR 2.97, 95% CI 1.88-4.67; P<0.001) were more willing to seek medical care for TB.

Conclusions Willingness to seek medical care for TB of elderly population needs to be further improved.

Strengths and limitations of this study

- This is the first study to investigate the willingness to seek medical care for tuberculosis (TB) among the elderly in China.
- The logistic regression model provides a quantified result of the influencing factors of medical care-seeking willingness for TB among elderlies, which could provide reference for TB control policies.
- The potential influencing factors of medical care-seeking willingness for TB are possibly more than the ones we investigated in the study. In addition, the cross-sectional study design is limited to identify causality of the observed relationships.

Introduction

Tuberculosis (TB) is a major cause of ill health, one of the top 10 causes of death worldwide and the leading cause of death from a single infectious agent. Globally, an estimated 10 million people fell ill with TB and 1.4 million died in 2019.[1] The risk of TB increases with age and the pace of population ageing is getting faster in modern China. It is estimated by the World Health Organization (WHO) that there will be 402 million people aged 60 years old or above in China by 2040.[2] The Fifth National TB Epidemiological Survey revealed that 48.8% of TB patients were over 60 years, while the prevalence of active TB in the elderly population over 65 years was determined at 1270/100,000.[3] According to the Chinese Center for Disease Control and Prevention, a total of 775,764 cases of TB were reported in the National Notifiable Disease Reporting System (NNDRS) in 2019.[4] The reporting rate of TB cases increased with age, with 197,730 (25.5%) cases among people aged 65 years or older.[4] That elderly people were one of the bottlenecks in TB control in China, and more TB preventive measures are needed to reach the most vulnerable populations at high priority.

Currently, the "Trinity" TB prevention and treatment model by China is comprised of the Center for Disease Control and Prevention, designated TB diagnostic and treatment hospitals, and primary healthcare institutions.[5] This model plays an important role in TB control and has made some progress. However, the rate of delay in TB diagnosis and treatment has remained high among the elderly, [6-8] which is a major contributor to worse outcomes and TB spreading. The medical care-seeking willingness of elderly people with suspicious symptoms could predict the actual behavior to seek care in TB prevention and treatment institutions. And positive behavior on TB could not only improve the detection rate for TB, but also reduce the proportion of delayed diagnosis and treatment.[9] In addition to the issues outlined above, this was the first study to examine the willingness to seek medical care for TB and its

determinants among elderly people aged 65 years. The findings may provide references for TB prevention and control among the elderly.

Methods

Study population and sampling

This study was conducted between September to October 2019 in Bao'an district of Shenzhen. A multistage random sampling method was performed in the study. First, 2 of 8 community health centers with chest X-ray film screening capabilities in Bao'an District were selected randomly. Second, 600 people aged 65 years or above who received health examinations were randomly selected from every community health service center. Initially, 1200 elderly people were targeted at be recruited in the survey, of whom 11 (0.92%) refused to participate in the study. Additionally, 49 questionnaires were discarded because of a lot of missing data and logical error. Finally, 1140 eligible questionnaires remained for analysis.

Patient and public involvement

No patient involved.

Instrument and measurement

A cross-sectional study was used to collect data from the elderly population through face-to-face interviews with a structured questionnaire. The questionnaire included four sections: (1) demographic characteristics, such as gender, age, education level, marital status, and family annual income per capita, (2) health-related characteristics, including self-perceived health status, smoking and alcohol consumption habits, (3) knowledge, attitudes, and practice for TB prevention and control, and (4) medical care-seeking willingness for TB and specific reasons

for being unwilling to do so. Incorrect, inappropriate, or uncertain (did not know) responses were given a 0 score, while 1 point was given for choosing the correct or appropriate answer; a correct or appropriate response was based on current literature and best practice.

Data collection and quality control

The questionnaire was designed based on literature review, group discussions, and mock interviews. A pilot study was conducted at one of the community health service centers in Bao'an District of Shenzhen to improve the quality of the questionnaire. The data were collected by trained investigators through field questionnaire survey. A logic check of all data was undertaken to determine if there were any contradictions.

Statistical analysis

All statistical procedures were performed using the SPSS V.22.0 software. The descriptive statistics were presented as the number of observations with percentage (%). χ^2 tests were conducted to compare the willingness of the elderly to seek medical care for TB between groups. A binary logistic stepwise regression model was used to analyze the factors associated with the medical care-seeking willingness for TB of the elderly (level for selection and elimination: P=0.05 and P=0.10, respectively). In the binary model, independent variables included all characteristics of the population. Odds ratio (OR) and 95% confidence interval (CI) for each variable were calculated. All tests were two-sided with a significance level of 0.05.

Results

The characteristics of participants are reported in Table 1. Among 1140 participants (response rate, 95.88%), 520 (45.61%) were males and 588 (51.58%) were aged 65~70 years. More than

half (54.43%) of them were at primary school or below. The majority (78.57%) of participants held non-Shenzhen household registrations, and 972 (89.34%) were married. There were 409 (37.91%) respondents with family annual income per capita lower than 50,000 ¥. The 47.45% of elderly people reported to have a good self-perceived health status. 125 (10.97%) and 108 (9.47%) were current cigarette smokers or alcohol drinkers. The majority (73.68% and 73.60%) of respondents knew the infectivity and suspicious symptoms of TB. 981 (86.05%) elderlies were willing to learn about TB knowledge. Only 343 (30.09%) participants stopped other people's spitting behavior.

A total of 989 (86.75%) elderly people over 65 years chose to seek medical care when they exhibited TB suspicious symptoms, whereas 151 (13.25%) were unwilling to seek treatment. Additionally, when we investigated the reasons for unwillingness, 80 (33.9%) considered "long treatment cycle and heavy financial burden" as the main reason (Table 2).

Table 3 demonstrates results comparing the differences in willingness to seek medical care for TB among various groups. There were significant differences in the willingness of the elderly to seek medical care for TB across age groups, education levels, and scores for TB core knowledge, beliefs and related behaviors (P<0.05).

Table 4 shows results from the binary logistic regression analysis to determine factors associated with the medical care-seeking willingness for TB among the elderly. In comparison with those who were only primary school or below educated, those with higher education levels were more willing to seek care for TB (junior or senior middle school: OR 1.93, 95% CI 1.19-3.13; P=0.008; college degree or above: OR 3.64, 95% CI 0.84-15.80; P=0.085). The higher their scores on TB-related core knowledge, beliefs and behaviors, the greater their willingness to seek medical care for TB (TB knowledge scores≥3: OR 3.61, 95% CI 2.21-5.87; P<0.001; TB attitudes scores≥2: OR 1.93, 95% CI 1.23-3.04; P=0.004; TB practice scores≥2: OR 2.97, 95% CI 1.88-4.67, P<0.001).

Discussion

This was the first study to investigate the willingness of the elderly to seek care for TB in China. We found that 86.75% of participants were willing to seek care for TB, while 13.25% were unwilling to do so. Individuals with suspicious symptoms of TB who do not seek medical care for TB will miss the opportunity for early detection of TB, which leads to delayed treatment and poor prognosis. In addition, unwillingness to seek medical care may increase the potential risk of transmission and will have a negative impact on their families and the society.

The findings showed that the main reasons for being unwilling to seek care for TB were "long treatment cycle and heavy economic burden". This indicated that individual's economic situation impacts their willingness to seek treatment, which needed to raise the attention to promote the publicity of free TB examination and treatment policy from those TB policy makers. This point was further supported by the multivariate analysis result that TB-related core knowledge affected the willingness of the elderly to seek treatment.

Many participants also were worried about being discriminated for visiting TB prevention and treatment institutions, which was also an important factor hindering their willingness to seek treatment. Previous studies have shown that TB patients suffered from widespread discriminatory and differential treatment due to the long-term stereotypes about TB.[10-11] The fear of being discriminated can affect the elderly's medical care-seeking willingness, health-seeking behaviors, and compliance during the treatment process. In order to increase the willingness of elderly population to seek medical care and enable them to receive timely treatment, it is crucial to further popularize knowledge about TB, eliminate denigration and stigmatization of TB through a variety of effective educational methods.

The results of the multivariate analysis showed that higher scores on knowledge, attitudes, and behaviors related to TB prevention and control were associated with greater willingness to seek medical care for TB. However, the overall awareness rate for TB core knowledge was not high, with 60.48% of elderly persons scored more than 3 points. While the majority of participants could correctly recognize that TB is a serious infectious disease and knew the suspicious symptoms of TB, they were unaware of the principles of TB consultation, national policy, and disease outcomes. These results were consistent with a study conducted by Wu,[12] which indicated that it is necessary to strengthen the publicity and education of TB-related knowledge among the elderly.

This study showed that elderlies with higher education levels were more willing to seek medical care for TB. The majority of participants were at primary school level or below. Currently, health education related to TB is mostly conducted through traditional means (e.g., distributing pamphlets in communities) or new media (e.g., WeChat). This is not very effective for the elderly due to low levels of access and understanding among those with low education levels. It is thus important to ensure that elderly people can easily access educational materials and the content should be easily to understand.

There are several strengths in this study. First, this was the first study to investigate the willingness of the elderly to seek medical care for TB in China. Second, our research found some important factors were associated with the medical care-seeking willingness, which could provide reference for TB control policies among elderly people. However, some limitations should be noted that the potential influencing factors of medical care-seeking willingness are possibly more than the ones we investigated in the study. Second, this was a cross-sectional study, which limited to identify causality of the observed relationships. Third, this study enrolled only elderly people in Shenzhen, limiting the generalisability of finding to other geographical regions.

Conclusion

In summary, this study found that education levels and TB-related knowledge, attitudes, and practice were significant predictors of medical care-seeking willingness for TB among elderlies. It is necessary to promote the publicity of TB-related knowledge and policies among the elderly. Measures must also be taken to clarify social misconceptions about TB and eliminate discrimination against TB patients.

Declarations

Acknowledgements

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Contributors

YXW, JF, and YG conceived and designed the study. JF, XS, YZ, XM, HKD, and WQX participated in the acquisition of data. YXW and XS analyzed the data. YG gave advice on methodology. YXW and JF wrote the draft of the paper. All authors contributed to writing, reviewing or revising the paper and read and approved the final manuscript. YG is the guarantors of this work and has full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis.

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Competing interests

We declare that we have no conflict of interests.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Ethics Committee of the Tongji Medical College Institutional Review Board, Huazhong University of Science and Technology, Wuhan, China (no. [2021] IEC (S081)).

Data sharing statement

Data may be made available by contacting the corresponding author.

Word count

2131 words

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Table 1 Characteristics of the study population

Variables	N	%
Total	1140	100
Age, y		
65~70	588	51.58
71~75	325	28.51
>75	227	19.91
Gender		
Male	520	45.61
Female	620	54.39
Residence		
Local residents	239	21.43
Others	876	78.57
Education		
Primary school or below	608	54.43
Junior or senior middle school	438	39.21
Bachelor degree or above	71	6.36
Marital status		
Unmarried/widow/divorced	116	10.66
Married	972	89.34
Family annual income per capita (¥)		
<50,000	409	37.91
50,000~100,000	353	32.72
100,000~200,000	221	20.48
>200,000	96	8.90
Self-perceived health status		
Good	512	47.45
Fair	493	45.69
Bad	74	6.86
Smoking status		
Current smoker	125	10.97
Former smoker	96	8.43
Never smoker	918	80.60
Alcohol intake		
Current drinker	108	9.47
Former drinker	84	7.37
Never drinker	948	83.16
Core knowledge of TB		
TB is a serious infectious disease.	840	73.68
TB should be suspected if cough or expectoration more than 2 weeks.	839	73.60
TB should be examined and treated in designated institutions.	409	35.88
TB examination and treatment can be free in the designated institution.	624	54.73
TB is a curable disease.	294	25.79
Attitude towards TB		
TB is a terrible disease.	684	60.00
Willing to learn about TB knowledge.	981	86.05
Willing to attend community activities for TB control.	379	33.24
Willing to offer TB knowledge to others.	358	31.40
TB-related practice		
Going to a doctor if catching cough or expectoration for more than 2 weeks.	956	83.86

Seeking medical attention immediately if suspect that yourself suffering TB.	974	85.44
Stop other people's spitting behavior.	343	30.09

Table 2 Distribution according to the reasons of unwillingness to seek medical care for TB among elderly population

Items	N	%
Lack of trust in the medical level of TB prevention and treatment institutions	44	18.60
Poor attitude of medical staff	8	3.40
Long treatment time and heavy economic burden	80	33.90
Fear of discrimination	44	18.60
Others	60	25.40

Table 3 Factors associated with medical care-seeking willingness for tuberculosis among elderly population

Variables	Number in unwillingness (%)	Number in willingness (%)	χ^2	*P* value
Age, y			7.01	0.03
65~70	79 (53.0)	509 (51.4)		
71~75	31 (20.8)	294 (29.7)		
>75	39 (26.2)	188 (19.0)		
Gender			3.00	0.08
Male	59 (39.1)	461 (46.6)		
Female	92 (60.9)	528 (53.4)		
Residence			0.01	0.91
Local residents	31 (21.1)	208 (21.5)		
Others	116 (78.9)	760 (78.5)		
Education			15.80	<0.001
Primary school or below	103 (69.1)	505 (52.2)		
Junior or Senior middle school	42 (28.2)	396 (40.9)		
College degree or above	4 (2.7)	67 (6.9)		
Marital status			0.25	0.61
Unmarried/widow/divorced	18 (11.8)	98 (10.5)		
Married	134 (88.2)	838 (89.5)		
Family annual income per capita (¥)			9.11	0.06
<50,000	67 (47.5)	342 (36.5)		
50,000~100,000	36 (25.5)	317 (33.8)		
100,000~200,000	29 (20.6)	192 (20.5)		
>200,000	9 (6.4)	87 (9.3)		
Self-perceived health status			2.35	0.31
Good	58 (41.4)	454 (48.3)		
Fair	71 (50.7)	422 (44.9)		
Bad	11 (7.9)	63 (6.7)		
Smoking status			2.69	0.26
Current Smoker	13 (8.8)	112 (11.3)		
Former smoker	17 (11.6)	79 (8.0)		
Never smoker	117 (79.6)	801 (80.7)		
Alcohol intake			3.06	0.22
Current Drinker	10 (6.7)	98 (9.9)		
Former drinker	15 (10.0)	69 (7.0)		
Never drinker	124 (83.3)	824 (83.1)		
TB knowledge scores				
≥3	41 (28.1)	617 (65.5)	74.04	<0.001
<3	105 (71.9)	325 (34.5)		
TB attitudes scores				
≥2	134 (89.9)	761 (78.2)	11.00	0.001
<2	15 (10.1)	212 (21.8)		
TB practice scores				
≥2	78 (56.1)	724 (84.5)	61.36	<0.001
<2	61 (43.9)	133 (15.5)		

Table 4 Binary logistic regression analysis for the association with medical care-seeking willingness for tuberculosis among elderly population

Variables(reference)	*B*	*SE*	Wald χ^2	*P* value	OR (95%CI)
Education level (Primary school or below)					
Junior or Senior middle school	0.657	0.246	7.144	0.008	1.93 (1.19-3.13)
College degree or above	1.291	0.750	2.965	0.085	3.64 (0.84-15.80)
TB knowledge scores (<3)					
≥3	1.282	0.249	26.571	<0.001	3.61 (2.21-5.87)
TB attitudes scores (<2)					
≥2	0.659	0.231	8.112	0.004	1.93 (1.23-3.04)
TB practice scores (<2)					
≥2	1.087	0.232	21.934	<0.001	2.97 (1.88-4.67)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	*6*

Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6, 7
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	7
		(*b*) Report category boundaries when continuous variables were categorized	7

		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	8, 9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8, 9
Generalisability	21	Discuss the generalisability (external validity) of the study results	9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Medical care-seeking willingness for tuberculosis and associated factors among elderly population in Shenzhen: a cross-sectional study

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Abstract

Objectives This study was aiming at assessing the willingness of elderly people to seek medical care for tuberculosis (TB) and its influencing factors.

Design A cross-sectional study.

Setting A multistage random survey was conducted in Bao'an District of Shenzhen in China.

Participants 1,200 elderly people aged 65 years or above were recruited to the study and completed a structured questionnaire between September and October 2019.

Main outcome measures Descriptive and binary logistic stepwise regression analyses were conducted to analyze the characteristics of elderlies, their willingness and associated factors to seek medical care for TB.

Results Among 1,123 respondents, 943 (84.0%) were willing to seek medical care if they discover TB suspicious symptoms. Binary logistic stepwise regression analysis indicated that elderly people whose family annual income per capita was 50,000–100,000 ¥ [odds ratio (OR) = 2.56, 95% confidence interval (CI): 1.44–4.54], who had positive attitudes (≥ 3 scores: OR = 3.10, 95% CI: 1.90–5.05) or practices (≥ 4 scores: OR = 3.13, 95% CI: 1.82–5.39) towards TB were more willing to seek medical care for TB.

Conclusions Willingness to seek medical care for TB of the elderly population can be further improved according to the determinants.

Strengths and limitations of this study

- This is the first study to investigate the willingness to seek medical care for tuberculosis (TB) among the elderly in China.
- The logistic regression model provides a quantified result of the influencing factors of medical care-seeking willingness for TB among elderlies, which could provide reference for TB control policies.
- The potential influencing factors of medical care-seeking willingness for TB are possibly more than the ones we investigated in the study.
- The cross-sectional study design is limited to identify causality of the observed relationships.

Introduction

Tuberculosis (TB) is a major cause of ill health, one of the top 10 causes of death worldwide, and the leading cause of death from a single infectious agent. Globally, an estimated 10 million people fell ill with TB and 1.4 million died in 2019.[1] The risk of TB increases with age and the pace of population ageing is getting faster in modern China. It is estimated by the World Health Organization (WHO) that there will be 402 million people aged 60 years old or above in China by 2040.[2] The Fifth National TB Epidemiological Survey revealed that 48.8% of TB patients were over 60 years, while the prevalence of active TB in the elderly population over 65 years was determined at 1,270/100,000.[3] According to the Chinese Centre for Disease Control and Prevention, a total of 775,764 cases of TB were reported in the National Notifiable Disease Reporting System (NNDRS) in 2019.[4] The reporting rate of TB cases increased with age, with 197,730 (25.5%) cases among people aged 65 years or older.[4] That elderly people were one of the bottlenecks in TB control in China, and more TB preventive measures are needed to reach the most vulnerable populations at high priority.

Currently, the "Trinity" TB prevention and treatment model by China is comprised of the Centre for Disease Control and Prevention, designated TB diagnostic and treatment hospitals, and primary healthcare institutions.[5] This model plays an important role in TB control and has made some progress. However, the rate of delay in TB diagnosis and treatment has remained high among the elderly, [6-8] which is a major contributor to worse outcomes and TB transmission. The medical care-seeking willingness of elderly people with suspicious symptoms could predict the actual behaviour to seek care in TB prevention and treatment institutions. In addition, positive behaviour on TB could not only improve the detection rate for TB, but also reduce the proportion of delayed diagnosis and treatment.[9] Therefore, this study was aimed to examine the willingness to seek medical care for TB and its determinants

among elderly people aged 65 years. The findings may provide references for TB prevention and control among the elderly.

Methods

Study setting

Shenzhen, a highly developed region in China, had an estimated population of more than 13.4 million in 2019.[10] The percentage of the migrant population is 63.2% in Shenzhen, whereas this rate was 80.5% in Bao'an district.[10] The immigrants were mostly poor, had a low level of education, and lived in a circumstance conducive to TB transmission.[11,12] Although the incidence of TB has declined in Shenzhen, the prevalence of TB remained high in Bao'an district due to a high TB case load caused by a heavy concentration of migrants.

The Chinese government has followed and launched the directly observed treatment + short course chemotherapy (DOTS) strategy to control the epidemic of TB since 1990.[13] Shenzhen was one of the first cities in China to implement the DOTS strategy in 1993 and its coverage at the individual level has been reached 100% in 2000. [14] As the first established special economic zone in China, the economy and society progress of Shenzhen developed rapidly. There were robust health care infrastructure, providers, service culture, and conditions for timely diagnosis and treatment.[9,12] The Centre for Chronic Disease Control, the local TB designated institution, has provided TB diagnosis, treatment, and management. Patients had free access to anti-TB fix-dose combination products and must undergo standard anti-TB treatment.[15] Since patients started to take anti-TB drugs, they were required to visit the Centre for Chronic Disease Control every month for health checks until the treatment ends.[11] Besides the free TB drugs, the government has provided subsidies of transportation and nutrition for low-income TB patients.[16] However, all patients had to pay for monthly

prescriptions of subsidiary drugs such as liver protection drugs and auxiliary examinations like X-ray tests.[11,17]

Study population and sampling

This study was conducted between September and October 2019 in Bao'an district of Shenzhen. Taking a confidence interval (CI) of 95%, an estimated proportion of 92.2%,[18] and an absolute error of 5%, the sample size was rounded off to 113 according to the formula, $n = [Z^2p(1-p)]/d^2$. To compensate for nonresponses, the sample size was increased by 10% to 124.

A multistage random sampling method was performed in the study. First, 2 of 8 community health service centres with chest X-ray film screening capabilities in Bao'an District were selected randomly. Second, 600 people aged 65 years or above who received health examinations were randomly selected from every community health service centre. Elderly people in the study communities who met the following criteria were included in the survey: (1) aged 65 years and older; (2) residence in the area for at least half a year; (3) no communication disorders or mental illnesses; and (4) willingness to complete the survey. Individuals were excluded if they did not meet one of the above requirements.

Patient and public involvement

No patient involved

Study design and instrument

A cross-sectional study was used to collect data from the elderly population through face-to-face interviews with a structured questionnaire. Based on the actual conditions of elderly people in Shenzhen and the context of China healthcare, we designed the

questionnaire according to the previous literatures.[18-21] The questionnaire included four sections: (1) demographic characteristics, such as gender, age, residence, duration of residence in Shenzhen, education level, marital status, medical insurance, and family annual income per capita, (2) health-related characteristics, including self-perceived health status, smoking and alcohol consumption habits, and previous history of TB, (3) knowledge, attitudes, and practice (KAP) for TB prevention and control,[22] and (4) medical care-seeking willingness for TB and specific reasons for being unwilling to seek medical care for TB (Appendix). In the section of TB KAP, incorrect, inappropriate, or uncertain (did not know) responses were given a 0 score, while 1 point was given for choosing the correct or appropriate answer; a correct or appropriate response was based on current literature and best practice. Respondents who answered 60% of the KAP questions correctly or appropriately were considered aware of TB or to have positive attitudes or practices regarding TB.

Data collection and quality control

The questionnaire was designed based on literature review, group discussions, and mock interviews. A pilot study was conducted at one of the community health service centres in Bao'an District of Shenzhen to improve the quality of the questionnaire. The questionnaire reported a good validity among elderly people. The data were collected by trained investigators through field questionnaire survey. A logic check of all data was undertaken to determine if there were any contradictions. The logical errors were identified as some mismatched socio-demographic characteristics for individuals. For example, an individual aged 70 years old reported the duration of residence in Shenzhen was more than 70 years.

Statistical analysis

All statistical procedures were performed using the SPSS V.22.0 software. The descriptive

statistics were presented as the number of observations with percentage (%). χ^2 tests were conducted to compare the willingness of the elderly to seek medical care for TB between groups. A binary stepwise logistic regression model was used to analyze the factors associated with the medical care-seeking willingness for TB of the elderly (level for selection and elimination: P=0.05 and P=0.10, respectively), including neutral or unwillingness attitude as the reference category. In the binary model, independent variables included: age (65~70, 71~75, > 75), gender (male, female), residence (local residents, others), education (primary school or below, junior or senior middle school, college degree or above), marital status (married, unmarried/widow/divorced), medical insurance (yes, no), family annual income per capita (< 50,000 ¥, 50,000~100,000 ¥, 100,000~200,000 ¥, > 200,000 ¥), self-perceived health status (good, fair, bad), smoking status (current smoker, former smoker, never smoker), alcohol intake (current drinker, former drinker, never drinker), TB knowledge scores (< 3, ≥ 3), TB attitudes scores (< 3, ≥ 3), and TB practice scores (< 4, ≥ 4). Odds ratio (OR) and 95% CI for each variable were calculated. All tests were two-sided with a significance level of 0.05.

Results

Initially, 1,200 elderly people were recruited in the survey, of whom 11 (0.92%) refused to participate in the study. Based on the inclusion and exclusion criteria, 1,172 participants were included in the analyses. Because the previous history of TB might influence the medical care-seeking willingness for TB, we further excluded 35 participants who had previously been treated for TB. Then, we deleted 8 questionnaires due to missing data on medical care-seeking willingness for TB. Additionally, 6 questionnaires with logical errors were discarded. Finally, 1,123 eligible questionnaires remained for analysis.

The characteristics of participants are reported in Table 1. Among 1,123 participants (response rate, 94.45%), 505 (45.3%) were males and 584 (52.5%) were aged 65~70 years. More than half (55.4%) of them were at primary school or below. The majority (78.8%) of participants held non-Shenzhen household registrations, and 947 (89.0%) were married. Most (73.3%) elderly people had medical insurance. There were 398 (37.8%) respondents with family annual income per capita lower than 50,000 ¥. Less than half (48.1%) of elderly people reported having a good self-perceived health status. Only 119 (10.7%) or 106 (9.5%) were current cigarette smokers or alcohol drinkers, respectively. The knowledge awareness rate for TB among elderly people was 69.1%. The percentages of elderly people who had positive attitudes or practices were 48.0% and 42.2% respectively.

A total of 943 (84.0%) elderly people over 65 years chose to seek medical care when they exhibited TB suspicious symptoms, whereas 155 (13.8%) were unwilling to seek treatment. Additionally, when we investigated the reasons for unwillingness to seek medical care for TB, 82 (52.9%) reported "long treatment cycle and heavy financial burden" was the main reason (Table 2).

Table 3 demonstrates results comparing the differences in willingness to seek medical care for TB among various groups. There were significant differences in the willingness of the elderly to seek medical care for TB across scores for TB KAP ($P < 0.05$). There were no significant differences in the willingness of the elderly to seek medical care for TB across genders, ages, residences, education levels, marital statuses, medical insurance statuses, family annual incomes per capita, self-perceived health statuses, tobacco use, alcohol consumption ($P > 0.05$).

Table 4 shows results from the binary logistic regression analysis to determine factors associated with the medical care-seeking willingness for TB among the elderly. Family annual income per capita (50,000~100,000 ¥: OR = 2.56, 95% CI: 1.44–4.54), attitudes (≥ 3:

OR = 3.10, 95% CI: 1.90–5.05) and practices scores (≥ 4: OR = 3.13, 95% CI: 1.82–5.39) towards TB were significant predictors of elderly people's medical care-seeking willingness for TB.

Discussion

This was the first study to investigate the willingness of the elderly to seek medical care for TB in China. We found that 84.0% of participants were willing to seek medical care for TB, while 13.8% were unwilling to seek medical care for TB. Individuals with suspicious symptoms of TB who do not seek medical care for TB will miss the opportunity for early detection of TB, which leads to the delayed treatment and poor prognosis.[23-25] In addition, unwillingness to seek medical care may increase the potential risk of transmission and will have a negative impact on their families and the society.[26]

Our findings showed that the main reasons for being unwilling to seek medical care for TB were "long treatment cycle and heavy economic burden". This indicated that an individual's economic situation impacts their willingness to seek treatment. In China, the policy that TB diagnosis and anti-TB drugs were free was not well understood and was even in doubt for its authenticity.[27,28] In addition, the free items provided by the government accounted for less than 40% of the total cost of TB diagnosis and treatment, meaning that TB patients still need to pay more than half of the total cost.[29] This may explain the effects of economic situation on medical care-seeking willingness for TB. Similarly, the economic burden has been found to be a key factor hindering the health-seeking behaviours among TB patients, as well as a primary concern for TB control in India,[23] Indonesia,[30] Malawi,[31] the Middle East, and North Africa.[32] To reduce the economic burden on TB patients, it is important for the government to expand health insurance coverage and lower the costs of TB treatment. The economic factor was further supported by the multivariate analysis result that

family annual income per capita affected the willingness of the elderly to seek treatment. However, the significant association between family annual income per capita and the medical care-seeking willingness was only shown in the elderly population who had 50,000~100,000 ¥ of family annual income per capita. The percentage of the elderly whose family annual income per capita were more than 100.000 ¥ was relatively low in our study. Income was a sensitive topic and elderly people may underreport it. Thus, the effects of high family annual income per capita on the medical care-seeking willingness may have been underestimated in this study.

Many participants have worried about being discriminated for visiting TB prevention and treatment institutions, which was also an important factor hindering their willingness to seek treatment. This was consistent with the previous findings in South African,[33] Ethiopia,[34] India, Bangladesh, Malawi, and Columbia.[35] Previous studies have shown that TB patients suffered from widespread discriminatory and differential treatment due to the long-term stereotypes about TB.[33,36] The fear of being discriminated can affect the elderly's medical care-seeking willingness, health-seeking behaviours, and compliance during the treatment process.[9,33,37] In addition, evidence has shown that TB stigma was associated with patient delay and diagnostic delay.[9] Available evidence suggested that measures aimed at empowering TB patients to resist stigmatizing perceptions, as well as making efforts to change norms about TB, can be effective to reduce the stigma attitude towards TB.[38] In order to increase the willingness of the elderly population to seek medical care and enable them to receive timely treatment, it is crucial to further popularize knowledge about TB and eliminate denigration and stigmatization of TB through a variety of effective educational methods.

The results of the multivariate analysis showed that higher scores on attitudes and behaviours related to TB prevention and control were associated with greater willingness to seek medical care for TB. However, the prevalence of positive attitudes and practice towards

TB was at a low level. Therefore, measures should be taken to improve TB-related attitudes and behaviours among the elderly, which may be helpful to increase the medical care-seeking willingness for TB. Intriguingly, we found that TB knowledge scores were not a significant determinant of the medical care-seeking willingness in the multivariable analysis, which was not in line with previous studies.[9,25,26,32,39] Association between TB knowledge and medical care-seeking willingness needs further research.

There were several strengths in this study. First, this was the first study to investigate the willingness of the elderly to seek medical care for TB in China. Second, our research found some important factors were associated with the medical care-seeking willingness, which could provide reference for TB control policies among elderly people. However, some limitations should be noted that the potential influencing factors of medical care-seeking willingness were possibly more than the ones we investigated in the study. Second, this was a cross-sectional study, which was limited to identify causality of the observed relationships. Third, this study enrolled only elderly people in Shenzhen, limiting the generalisability of findings to other geographical regions.

Conclusion

In summary, this study found that family annual income per capita and TB-related attitudes, and practice were significant predictors of medical care-seeking willingness for TB among the elderly population. It is necessary to promote the publicity of TB-related knowledge and policies among the elderly. Measures must be taken to reduce the economic burden, clarify social misconceptions about TB and eliminate discrimination against TB patients.

Declarations

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Contributors

YXW, JF, and YG conceived and designed the study. JF, XS, YZ, XM, HKD, and WQX participated in the acquisition of data. YXW and XS analyzed the data. ZHL, ZXL, XJW, and YG gave advice on methodology. YXW and JF wrote the draft of the paper. All authors contributed to writing, reviewing, or revising the paper and read and approved the final manuscript. YG is the guarantor of this work and has full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis.

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Competing interests

We declare that we have no conflict of interests.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Ethics Committee of the Tongji Medical College Institutional Review Board, Huazhong University of Science and Technology, Wuhan, China. Informed consent was obtained from all survey participants.

Data sharing statement

Data may be made available by contacting the corresponding author.

Word count

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Table 1 Characteristics of the study population*

Variables	N	%
Total	1123	100.0
Age, y		
65~70	584	52.5
71~75	312	28.0
>75	217	19.5
Gender		
Male	505	45.3
Female	611	54.7
Residence		
Local residents	232	21.2
Others	862	78.8
Education level		
Primary school or below	605	55.4
Junior or senior middle school	423	38.7
College degree or above	64	5.9
Marital status		
Married	947	89.0
Unmarried/widow/divorced	117	11.0
Medical insurance		
Yes	779	73.3

No	284	26.7
Family annual income per capita (¥)		
<50,000	398	37.8
50,000~100,000	342	32.4
100,000~200,000	221	21.0
> 200,000	93	8.8
Self-perceived health status		
Good	505	48.1
Fair	476	45.3
Bad	69	6.6
Smoking status		
Current smoker	119	10.7
Former smoker	92	8.3
Never smoker	902	81.0
Alcohol intake		
Current Drinker	106	9.5
Former drinker	82	7.3
Never drinker	931	83.2
TB knowledge scores		
< 3	333	30.9
≥ 3	746	69.1
TB attitudes scores		

< 3	546	52.0
≥ 3	505	48.0
TB practice scores		
< 4	555	57.8
≥ 4	406	42.2

*Missing number of participants: age: 10; gender: 7; residence: 29; education level: 31; marital status: 59; medical insurance: 60; family annual income per capita: 69; self-perceived health status: 73; smoking status: 10; alcohol consumption habits: 4; TB knowledge scores: 44; TB attitudes scores: 72; TB practice scores: 162.

Abbreviation: TB, tuberculosis.

Table 2 Distribution according to the reasons of unwillingness to seek medical care for TB among elderly population (N=155)

Items	N	%
Lack of trust in the medical level of TB prevention and treatment institutions	40	25.8
Poor attitude of medical staff	8	5.2
Long treatment time and heavy economic burden	82	52.9
Fear of discrimination	46	29.7
Others	55	35.5

Abbreviation: TB, tuberculosis.

Table 3 Factors associated with medical care-seeking willingness for tuberculosis among elderly population*

Variables	Willing	Neutral	Unwilling	χ^2	*P*
Total	943 (84.0)	25 (2.2)	155 (13.8)		
Age, y					
65~70	490 (52.4)	12 (48.0)	82 (53.9)	1.74	0.78
71~75	262 (28.0)	6 (24.0)	44 (28.9)		
>75	184 (19.7)	7 (28.0)	26 (17.1)		
Gender					
Male	430 (45.9)	12 (48.0)	63 (40.6)	1.58	0.45
Female	506 (54.1)	13 (52.0)	92 (59.4)		
Residence					
Local residents	185 (20.2)	9 (36.0)	38 (24.8)	5.04	0.08
Others	731 (79.8)	16 (64.0)	115 (75.2)		
Education level					
Primary school or below	503 (54.9)	13 (54.2)	89 (58.9)	3.23	0.52
Junior or senior middle school	363 (39.6)	10 (41.7)	50 (33.1)		
College degree or above	51 (5.6)	1 (4.2)	12 (7.9)		
Marital status					
Married	795 (89.1)	22 (91.7)	130 (87.8)	0.39	0.82
Unmarried/widow/divorced	97 (10.9)	2 (8.3)	18 (12.2)		

Medical insurance					
Yes	657 (73.7)	19 (79.2)	103 (69.6)	1.55	0.46
No	234 (26.3)	5 (20.8)	45 (30.4)		
Family annual income per capita (¥)					
< 50,000	337 (38.0)	9 (39.1)	52 (36.1)	9.39	0.15
50,000~100,000	300 (33.8)	5 (21.7)	37 (25.7)		
100,000~200,000	173 (19.5)	7 (30.4)	41 (28.5)		
> 200,000	77 (8.7)	2 (8.7)	14 (9.7)		
Self-perceived health status					
Good	420 (47.8)	11 (50.0)	74 (49.7)	1.16	0.89
Fair	403 (45.8)	10 (45.5)	63 (42.3)		
Bad	56 (6.4)	1 (4.5)	12 (8.1)		
Smoking status					
Current smoker	105 (11.3)	3 (12.0)	11 (7.1)	4.73	0.32
Former smoker	78 (8.4)	0 (0.0)	14 (9.0)		
Never smoker	750 (80.4)	22 (88.0)	130 (83.9)		
Alcohol intake					
Current Drinker	91 (9.7)	4 (16.0)	11 (7.1)	2.39	0.67
Former drinker	68 (7.2)	2 (8.0)	12 (7.7)		
Never drinker	780 (83.1)	19 (76.0)	132 (85.2)		
TB knowledge scores					
< 3	249 (27.5)	12 (50.0)	72 (48.3)	30.25	<0.01

≥ 3	657 (72.5)	12 (50.0)	77 (51.7)		
TB attitudes scores					
< 3	417 (47.3)	15 (65.2)	114 (77.6)	47.74	<0.01
≥ 3	464 (52.7)	8 (34.8)	33 (22.4)		
TB practice scores					
< 4	433 (53.6)	18 (85.7)	104 (78.8)	36.41	<0.01
≥ 4	375 (46.4)	3 (14.3)	28 (21.2)		

*Missing number of participants: age: 10; gender: 7; residence: 29; education level: 31; marital status: 59; medical insurance: 60; family annual income per capita: 69; self-perceived health status: 73; smoking status: 10; alcohol consumption habits: 4; TB knowledge scores: 44; TB attitudes scores: 72; TB practice scores: 162.

Abbreviation: TB, tuberculosis.

Table 4 Binary logistic regression analysis for the association with medical care-seeking willingness for tuberculosis among elderly population*

Variables	*B*	SE	*Wald* χ^2	*P*	OR (95% CI)
Family annual income per capita (¥) (ref: < 50,000)					
50,000~100,000	0.94	0.29	10.37	<0.01	2.56 (1.44–4.54)
100,000~200,000	-0.10	0.26	0.15	0.69	0.90 (0.54–1.51)
> 200,000	0.29	0.39	0.57	0.45	1.34 (0.63–2.86)
TB attitudes scores (ref: < 3)					
≥ 3	1.13	0.25	20.51	<0.01	3.10 (1.90–5.05)
TB practice scores (ref: < 4)					
≥ 4	1.14	0.28	16.93	<0.01	3.13 (1.82–5.39)

*Adjustment for age (65~70, 71~75, > 75), gender (male, female), residence (local residents, others), education (primary school or below, junior or senior middle school, college degree or above), marital status (married, unmarried/widow/divorced), medical insurance (yes, no), self-perceived health status (good, fair, bad), smoking status (current smoker, former smoker, never smoker), alcohol intake (current drinker, former drinker, never drinker), TB knowledge scores (< 3, ≥ 3), and other variables in the model.

Abbreviation: OR, odds ratio; SE, standard error; TB, tuberculosis.

A survey of the elderly's awareness and health-related practices of tuberculosis

Socio-demographic information section:

1. Age: __ years old.

2. Gender:

☐ Male

☐ Female

3. Are you a local resident?

☐ Yes

☐ No

4. Your duration of residence in Shenzhen is __ years __ months.

5. Education level:

☐ Illiteracy

☐ Primary school

☐ Junior high school

☐ High school / Secondary school

☐ Junior college

☐ Undergraduate or higher

6. Marital status:

☐ Unmarried

☐ Married

☐ Divorced

☐ Widowed

7. Medical insurance:

☐ Basic medical insurance for urban and rural residents (including New rural cooperative medical insurance)

☐ Medical insuraance for urban employee

☐ Commercial insurance

☐ Free medical services

☐ No medical insurance

8. Family annual income per capita (RMB):

☐ Less than 50,000

☐ 50,000 to 100,000

☐ 100,000 to 200,000

☐ 200,000 to 500,000

☐ More than 500,000

Health-related characteristic section:

1. How do you feel your current health status?

☐ Very good

☐ Relatively good

☐ Fair

☐ Relatively bad

☐ Very bad

2. Are you a smoker?

☐ Yes

☐ Former smoker

☐ No

3. Do you drink alcohol?

☐ Yes

☐ Former drinker

☐ No

4. Have you previously been treated for TB?

☐ Yes

☐ No

Tuberculosis knowledge, attitudes, and practices section:

Knowledge

1. Infectivity of TB

☐ Yes

☐ No

☐ Do not know

2. Route of TB transmission

☐ Touching items

☐ Sharing utensils

☐ Coughing or sneezing

☐ All of the above

☐ Do not know

3. TB symptoms

☐ Headache or dizziness

☐ Coughing for longer than 2 weeks or coughing up blood

☐ Abdominal pain or diarrhoea

☐ Do not know

4. Prevention and control of TB

☐ Covering mouth and nose when coughing or sneezing

☐ Wearing a mask

☐ Good nutrition

☐ Washing hands after touching items in public

☐ All of the above

5. Curability of TB

☐ Yes

☐ No

☐ Do not know

Attitudes

1. Do you think that TB is a terrible disease?

☐ Yes

☐ No

☐ Do not sure

2. Would you like to learn about TB?

☐ Yes

☐ No

☐ Do not sure

3. Would you like to participate in TB education activities?

☐ Yes

☐ No

☐ Do not sure

4. Are you willing to complete treatment if you have TB?

☐ Yes

☐ No

☐ Do not sure

5. Would you be willing to be screened for TB if you had suggestive symptoms?

☐ Yes

☐ No

☐ Do not sure

Practices

1. Have you ever taken the initiative to learn about TB?

☐ Yes

☐ No

☐ Do not sure

2. Would you urge your friends with suspicious TB symptoms visit the doctor?

☐ Yes

☐ No

☐ Do not sure

3. Would you visit a health facility if you had a cough for more than 2 weeks?

☐ Yes

☐ No

☐ Do not sure

4. Would you visit a health facility if you suspected that you had TB?

☐ Yes

☐ No

☐ Do not sure

5. Would you stop spitting in public?

☐ Yes

☐ No

☐ Do not sure

6. Would you cover your mouth and nose when coughing or sneezing?

☐ Yes

☐ No

☐ Do not sure

Medical care-seeking willingness for TB section:

1. Were you willing to seek medical care if you suspected that you had TB?

☐ Yes (skip to 3)

☐ Neutral (skip to 3)

☐ No

2. Why were you unwilling to seek medical care if you suspected that you had TB?

(Multiple choice)

☐ Lack of trust in the medical level of TB prevention and treatment institutions

☐ Poor attitude of medical staff

☐ Long treatment time and heavy economic burden

☐ Fear of discrimination

☐ Others: __

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 5
Methods			
Study design	4	Present key elements of study design early in the paper	6, 7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5, 6, 7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6, 7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7, 8
Bias	9	Describe any efforts to address potential sources of bias	*8*
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7, 8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8, 9
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	9, 10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9, 10
		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10, 11, 12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Willingness to seek medical care for tuberculosis and associated factors among the elderly population in Shenzhen: A cross-sectional study

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Willingness to seek medical care for tuberculosis and associated factors among the elderly population in Shenzhen: A cross-sectional study

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Abstract

Objectives This study was aimed to assess the willingness of elderly people to seek medical care for tuberculosis (TB) and the associated influencing factors.

Design A cross-sectional study.

Setting A multistage random survey was conducted in Bao'an District of Shenzhen in China.

Participants A total of 1,200 elderly people aged 65 or above were recruited for the study and completed a structured questionnaire between September and October 2019.

Main outcome measures Descriptive and binary logistic stepwise regression analyses were conducted to analyse the characteristics of elderly individuals, their willingness to seek medical care for TB and associated factors.

Results Among the final 1,123 respondents, 943 (84.0%) were willing to seek medical care if they discovered suspicious TB symptoms. Binary logistic stepwise regression analysis indicated that respondents whose family annual income per capita was 50,000–100,000 ¥ [odds ratio (OR) = 2.56, 95% confidence interval (CI): 1.44–4.54, $P < 0.01$] and who had positive attitudes (≥ 3 scores: OR = 3.10, 95% CI: 1.90–5.05, $P < 0.01$) or practices (≥ 4 scores: OR = 3.13, 95% CI: 1.82–5.39, $P < 0.01$) towards TB were more willing to seek medical care for TB.

Conclusions Willingness to seek medical care for TB in the elderly population can be improved according to the determinants.

Strengths and limitations of this study

- This is the first study to investigate willingness to seek medical care for tuberculosis (TB) among elderly individuals in China.
- The logistic regression model provides quantified results of the influencing factors of willingness to seek medical care for TB among elderly individuals, which could provide a reference for TB control policies.
- There may be more potential influencing factors of willingness to seek medical care for TB than those we investigated in the study.
- The cross-sectional study design is limited in terms of identifying the causality of the observed relationships.

Introduction

Tuberculosis (TB) is a major cause of ill health, one of the top 10 causes of death worldwide, and the leading cause of death from a single infectious agent. In 2019, an estimated 10 million people worldwide fell ill with TB, and 1.4 million died.[1] The risk of TB increases with age, and the pace of population ageing is increasing in modern China. World Health Organization (WHO) has estimated that there will be 402 million people aged 60 or above in China by 2040.[2] The Fifth National TB Epidemiological Survey revealed that 48.8% of TB patients were over 60 years old, while the prevalence of active TB in the elderly population over 65 years old was determined to be 1,270/100,000.[3] According to the Chinese Centre for Disease Control and Prevention, a total of 775,764 cases of TB were reported in the National Notifiable Disease Reporting System (NNDRS) in 2019.[4] The reporting rate of TB cases increased with age, with 197,730 (25.5%) cases among people aged 65 or older.[4] Elderly people are one of the bottlenecks in TB control in China, and more TB preventive measures are urgently needed to reach the most vulnerable populations.

Currently, the "trinity" model of TB prevention and treatment in China comprises the Centre for Disease Control and Prevention, designated TB diagnostic and treatment hospitals, and primary healthcare institutions.[5] This model plays an important role in TB control and has made some progress. However, the rate of delay in TB diagnosis and treatment has remained high among the elderly, [6-8] which is a major contributor to poor outcomes and TB transmission. The willingness to seek medical care of elderly people with possible symptoms could predict the actual behaviour of seeking care in TB prevention and treatment institutions. In addition, positive behaviour related to TB could not only improve the detection rate for the disease but also reduce the proportion of delayed diagnosis and treatment.[9] Therefore, this study aimed to examine willingness to seek medical care for TB and its determinants among

elderly people aged 65 or older. The findings may provide references for TB prevention and control among the elderly.

Methods

Study setting

Shenzhen, a highly developed region in China, had an estimated population of more than 13.4 million in 2019.[10] The percentage of the migrant population was 63.2% in Shenzhen compared to 80.5% in Bao'an District.[10] The immigrants were mostly poor, had a low level of education, and lived in circumstances conducive to TB transmission.[11,12] Although the incidence of TB has declined in Shenzhen, the prevalence of TB has remained high in Bao'an District due to a high TB case load caused by a heavy concentration of migrants.

The Chinese government launched the directly observed treatment + short course chemotherapy (DOTS) strategy to control the TB epidemic in 1990 and has followed this protocol since then.[13] Shenzhen was one of the first cities in China to implement the DOTS strategy in 1993, and its coverage at the individual level reached 100% in 2000. [14] Economy and social progress developed rapidly in Shenzhen, which was the first established special economic zone in China. The region has a robust health care infrastructure, providers, service culture, and conditions for timely diagnosis and treatment.[9,12] The Centre for Chronic Disease Control, the local institution designated for TB management, provides TB diagnosis, treatment, and management. Patients have free access to anti-TB fix-dose combination products and must undergo standard anti-TB treatment.[15] After patients start to take anti-TB drugs, they are required to visit the Centre for Chronic Disease Control every month for health checks until the treatment ends.[11] In addition to free TB drugs, the government provides subsidies for transportation and nutrition for low-income TB patients.[16] However, all

patients must pay for monthly prescriptions for subsidiary drugs such as liver protection drugs, and auxiliary examinations, such as X-ray tests.[11,17]

Study population and sampling

This study was conducted between September and October 2019 in Bao'an District of Shenzhen. With a confidence interval (CI) of 95%, an estimated proportion of 92.2%,[18] and an absolute error of 5%, the sample size was rounded to 113 according to the formula, $n = [Z^2p(1-p)]/d^2$. To compensate for nonresponses, the sample size was increased by 10% to 124.

A multistage random sampling method was performed in the study. First, 2 of 8 community health service centres with chest X-ray film screening capabilities in Bao'an District were selected randomly. Second, 600 people aged 65 or above who received health examinations were randomly selected from every community health service centre. Elderly people in the study communities were included in the survey if they: (1) were aged 65 or older, (2) had resided in the area for at least half a year, (3) had no communication disorders or mental illnesses, and (4) were willing to complete the survey. Respondents were excluded if they did not meet any of the above requirements.

Patient and public involvement

No patients were involved in this study.

Study design and instrument

A cross-sectional study was used to collect data from the elderly population through face-to-face interviews with a structured questionnaire. Based on the actual conditions of elderly people in Shenzhen and the context of health care in China, we designed a

questionnaire according to previous literature.[18-21] The questionnaire contained four sections: (1) demographic characteristics, such as gender, age, residence, duration of residence in Shenzhen, education level, marital status, medical insurance, and family annual income per capita; (2) health-related characteristics, including self-perceived health status, smoking and alcohol consumption habits, and previous history of TB; (3) knowledge, attitudes, and practices (KAP) for TB prevention and control;[22] and (4) willingness to seek medical care for TB and specific reasons for being unwilling to seek medical care for TB (Appendix). In the TB KAP section, incorrect, inappropriate, or uncertain (do not know) responses received a 0 score, while 1 point was assigned if the respondent chose the correct or appropriate answer; correctness or appropriateness was based on current literature and best practices. The respondents who answered 60% of the KAP questions correctly or appropriately were considered aware of TB or to have positive attitudes or practices regarding TB.

Data collection and quality control

The questionnaire was designed based on literature review, group discussions, and mock interviews. A pilot study of 40 elderly people was conducted at one of the community health service centres in the Bao'an District of Shenzhen to improve the quality of the questionnaire. A total of 38 of those respondents were able to clearly understand all the questions of the questionnaire, and further modifications were made according to their feedback. The questionnaire had good validity among elderly people. The data were collected by trained investigators through a field questionnaire survey. A logic check of all data was undertaken to determine whether there were any contradictions. Logical errors were identified as certain mismatched sociodemographic characteristics; for example, an individual aged 70 years old reported a duration of residence in Shenzhen of more than 70 years.

Statistical analysis

All statistical procedures were performed using SPSS V.22.0 software. The descriptive statistics are presented as the number of observations in percentages (%). χ^2 tests were conducted to compare the willingness of the elderly to seek medical care for TB between groups. A binary stepwise logistic regression model was used to analyse the factors associated with willingness to seek medical care for TB among the elderly (levels for selection and elimination $P = 0.05$ and $P = 0.10$, respectively), including a neutral attitude or unwillingness as the reference category. In the binary model, independent variables were age (65~70, 71~75, > 75), gender (male, female), residence (local residents, others), education (primary school or below, junior or senior middle school, college degree or above), marital status (married, unmarried/widowed/divorced), medical insurance (yes, no), family annual income per capita (< 50,000 ¥, 50,000~100,000 ¥, 100,000~200,000 ¥, > 200,000 ¥), self-perceived health status (good, fair, bad), smoking status (current smoker, former smoker, never smoked), alcohol intake (current drinker, former drinker, never drank), TB knowledge scores (< 3, ≥ 3), TB attitudes (< 3, ≥ 3), and TB practices (< 4, ≥ 4). The odds ratio (OR) and 95% CI for each variable were calculated. All tests were two-sided with a significance level of 0.05.

Results

Initially, 1,200 elderly people were recruited for the survey, of whom 11 (0.92%) refused to participate. Based on the inclusion and exclusion criteria, 1,172 participants were ultimately included in the analyses. Because a previous history of TB might have influenced willingness to seek medical care for TB, we further excluded 35 participants who had previously been treated for TB. Then, we deleted 8 questionnaires due to missing data on willingness to seek medical care for TB. Additionally, we discarded 6 questionnaires with logical errors. Finally, 1,123 eligible questionnaires remained for analysis.

The characteristics of the participants are reported in Table 1. Among 1,123 participants (response rate, 94.45%), 505 (45.3%) were males and 584 (52.5%) were aged 65~70 years. More than half (55.4%) had an educational level of primary school or below. The majority (78.8%) held non-Shenzhen household registrations, and 947 (89.0%) were married. Most (73.3%) of the participants had medical insurance. Of the respondents, 398 (37.8%) had a family annual income per capita lower than 50,000 ¥. Less than half (48.1%) reported having a good self-perceived health status. Only 119 (10.7%) and 106 (9.5%) were current cigarette smokers and alcohol drinkers, respectively. The knowledge awareness rate for TB among them was 69.1%. The percentages of respondents who had positive attitudes or practices were 48.0% and 42.2%, respectively.

A total of 943 (84.0%) respondents would choose to seek medical care if they exhibited possible TB symptoms, whereas 155 (13.8%) were unwilling to seek treatment. Additionally, when we investigated the reasons for unwillingness to seek medical care for TB, 82 (52.9%) reported "long treatment cycle and heavy financial burden" as the main reason (Table 2).

Table 3 demonstrates the results of a comparison of willingness to seek medical care for TB among various groups. There were significant differences in willingness to seek medical care for TB across scores for TB KAP ($P < 0.05$). There were no significant differences in willingness to seek medical care for TB across genders, ages, residences, education levels, marital statuses, medical insurance statuses, family annual income per capita levels, self-perceived health statuses, tobacco use, or alcohol consumption ($P > 0.05$).

Table 4 shows the results of the binary logistic regression analysis to determine factors associated with willingness to seek medical care for TB among the elderly. Family annual income per capita (50,000~100,000 ¥: OR = 2.56, 95% CI: 1.44–4.54), attitudes towards TB (≥ 3: OR = 3.10, 95% CI: 1.90–5.05) and practices towards TB (≥ 4: OR = 3.13, 95% CI:

1.82–5.39) were significant predictors of the respondents' willingness to seek medical care for TB.

Discussion

This was the first study to investigate the willingness of elderly individuals to seek medical care for TB in China. We found that 84.0% of the participants were willing to seek medical care for TB, while 13.8% were unwilling to seek medical care for TB. Individuals with possible TB symptoms who do not seek medical care will miss the opportunity for early detection of TB, leading to delayed treatment and poor prognoses.[23-25] In addition, unwillingness to seek medical care may increase the potential risk of transmission and will have a negative impact on their families and society.[26]

Our findings showed that the main reason for being unwilling to seek medical care for TB was "long treatment cycle and heavy economic burden". This indicated that individuals' economic situation impacts their willingness to seek treatment. In China, the policy that TB diagnosis and anti-TB drugs are free is not well understood, and some even doubt its authenticity.[27,28] In addition, the free items provided by the government accounted for less than 40% of the total cost of TB diagnosis and treatment, meaning that TB patients still must pay more than half of the total cost.[29] This may explain the effects of economic situation on willingness to seek medical care for TB. Similarly, the economic burden has been found to be a key factor hindering health-seeking behaviours among TB patients, as well as a primary concern for TB control in India,[23] Indonesia,[30] Malawi,[31] the Middle East, and North Africa.[32] To reduce the economic burden on TB patients, it is important for the government to expand health insurance coverage and lower the costs of TB treatment. The economic factor was further supported by the multivariate analysis result that family annual income per capita affected the willingness of the elderly to seek treatment. However, the significant association

between family annual income per capita and willingness to seek medical care appeared only in the respondents who had 50,000~100,000 ¥ of family annual income per capita. The percentage of respondents whose family annual income per capita was more than 100,000 ¥ was relatively low in our study. Income is a sensitive topic and elderly people may underreport it. Thus, the effects of high family annual income per capita on willingness to seek medical care may have been underestimated in this study.

Many participants worried about being discriminated against for visiting TB prevention and treatment institutions, which was another important factor hindering their willingness to seek treatment. This was consistent with previous findings in South Africa,[33] Ethiopia,[34] India, Bangladesh, Malawi, and Columbia.[35] Previous studies have shown that TB patients suffer from widespread discriminatory and differential treatment due to long-term stereotypes about TB.[33,36] The fear of being discriminated against can affect elderly people' willingness to seek medical care, health-seeking behaviours, and compliance during the treatment process.[9,33,37] In addition, evidence has shown that TB stigma was associated with patient delay and diagnostic delay.[9] Available evidence suggests that measures aimed at empowering TB patients to resist stigmatizing perceptions, as well as efforts to change norms related to TB, can be effective in reducing the stigma associated with TB.[38] To increase the willingness of the elderly population to seek medical care and enable them to receive timely treatment, it is crucial to further popularize knowledge about TB and eliminate the denigration and stigmatization of TB through a variety of effective educational methods.

The results of the multivariate analysis showed that higher scores on attitudes and behaviours related to TB prevention and control were associated with greater willingness to seek medical care for TB. However, the prevalence of positive attitudes and practices towards TB was low. Therefore, measures should be taken to improve TB-related attitudes and behaviours among the elderly, which may help to increase willingness to seek medical care

for TB. Intriguingly, we found that TB knowledge scores were not a significant determinant of willingness to seek medical care in the multivariate analysis, which was not in line with previous studies.[9,25,26,32,39] Therefore, the association between TB knowledge and willingness to seek medical care needs further research.

This study had several strengths. First, it was the first to investigate the willingness of the elderly to seek medical care for TB in China. Second, our research found that certain important factors were associated with willingness to seek medical care, which could provide a reference for TB control policies among elderly people. However, some limitations should be noted. First, there may be more potential influencing factors of willingness to seek medical care than those we investigated in the study. Second, we listed "others" as an open-ended response to reasons for unwillingness to seek medical care for TB but failed to acquire information about the specific other reasons, as the respondents did not provide detailed answers to this question. In future research, we could consider designing specific responses to investigate elderly people's additional reasons for being unwilling to seek medical care for TB. Third, the study was cross-sectional, and thus was limited in terms of identifying the causality of the observed relationships. Fourth, this study enrolled only elderly people in Shenzhen, limiting the generalizability of the findings to other geographical regions.

Conclusion

In summary, this study found that family annual income per capita and TB-related attitudes and practices were significant predictors of willingness to seek medical care for TB among the elderly population. It is necessary to publicize TB-related knowledge and policies among the elderly. Measures must be taken to reduce the economic burden, clarify social misconceptions about TB and eliminate discrimination against TB patients.

Declarations

Acknowledgements

We thank the elderly population who participated in this research.

Contributors

YXW, JF, and YG conceived and designed the study. JF, JJZ, XS, YZ, XM, HKD, YFG, QY, and WQX participated in the acquisition of data. YXW and XS analyzed the data. ZHL, ZXL, XJW, and YG gave advice on methodology. YXW and JF wrote the draft of the paper. All authors contributed to writing, reviewing, or revising the paper and read and approved the final manuscript. YG is the guarantor of this work and has full access to all the data in the study and takes responsibility for its integrity and the accuracy of the data analysis.

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Competing interests

We declare that we have no conflict of interests.

Patient consent for publication

Not required.

Ethics approval

The study was approved by the Ethics Committee of the Tongji Medical College Institutional Review Board, Huazhong University of Science and Technology, Wuhan, China. Informed consent was obtained from all survey participants.

Data sharing statement

Data may be made available by contacting the corresponding author.

Word count

2715 words

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Table 1 Characteristics of the study population*

Variables	N	%
Total	1123	100
Age, y		
65~70	584	52.5
71~75	312	28
>75	217	19.5
Gender		
Male	505	45.3
Female	611	54.7
Residence		
Local residents	232	21.2
Others	862	78.8
Education level		
Primary school or below	605	55.4
Junior or senior middle school	423	38.7
College degree or above	64	5.9
Marital status		
Married	947	89
Unmarried/widow/divorced	117	11
Medical insurance		
Yes	779	73.3
No	284	26.7
Family annual income per capita (¥)		
< 50,000	398	37.8
50,000~100,000	342	32.4
100,000~200,000	221	21
> 200,000	93	8.8
Self-perceived health status		
Good	505	48.1
Fair	476	45.3
Bad	69	6.6
Smoking status		
Current smoker	119	10.7
Former smoker	92	8.3
Never smoker	902	81
Alcohol intake		
Current Drinker	106	9.5
Former drinker	82	7.3
Never drinker	931	83.2
TB knowledge scores		
< 3	333	30.9
≥ 3	746	69.1

TB attitudes scores		
< 3	546	52
≥ 3	505	48
TB practice scores		
< 4	555	57.8
≥ 4	406	42.2

*Missing number of participants: age: 10; gender: 7; residence: 29; education level: 31; marital status: 59; medical insurance: 60; family annual income per capita: 69; self-perceived health status: 73; smoking status: 10; alcohol consumption habits: 4; TB knowledge scores: 44; TB attitudes scores: 72; TB practice scores: 162.

Abbreviation: TB, tuberculosis.

Table 2 Distribution according to the reasons of unwillingness to seek medical care for TB among elderly population (N=155)

Items	N	%
Lack of trust in the medical level of TB prevention and treatment institutions	40	25.8
Poor attitude of medical staff	8	5.2
Long treatment time and heavy economic burden	82	52.9
Fear of discrimination	46	29.7
Others	55	35.5

Abbreviation: TB, tuberculosis.

Table 3 Factors associated with medical care-seeking willingness for tuberculosis among elderly population* (N=1,123)

Variables	Willing	Neutral	Unwilling	χ^2	*P*
Total	943 (84.0)	25 (2.2)	155 (13.8)		
Age, y					
65~70	490 (52.4)	12 (48.0)	82 (53.9)	1.74	0.78
71~75	262 (28.0)	6 (24.0)	44 28.9)		
> 75	184 (19.7)	7 (28.0)	26 (17.1)		
Gender					
Male	430 (45.9)	12 (48.0)	63 (40.6)	1.58	0.45
Female	506 (54.1)	13 (52.0)	92 (59.4)		
Residence					
Local residents	185 (20.2)	9 (36.0)	38 (24.8)	5.04	0.08
Others	731 (79.8)	16 (64.0)	115 (75.2)		
Education level					
Primary school or below	503 (54.9)	13 (54.2)	89 (58.9)	3.23	0.52
Junior or senior middle school	363 (39.6)	10 (41.7)	50 (33.1)		
College degree or above	51 (5.6)	1 (4.2)	12 (7.9)		
Marital status					
Married	795 (89.1)	22 (91.7)	130 (87.8)	0.39	0.82
Unmarried/widow/divorced	97 (10.9)	2 (8.3)	18 (12.2)		
Medical insurance					
Yes	657 (73.7)	19 (79.2)	103 (69.6)	1.55	0.46
No	234 (26.3)	5 (20.8)	45 (30.4)		
Family annual income per capita (¥)					
< 50,000	337 (38.0)	9 (39.1)	52 (36.1)	9.39	0.15
50,000~100,000	300 (33.8)	5 (21.7)	37 (25.7)		
100,000~200,000	173 (19.5)	7 (30.4)	41 (28.5)		
> 200,000	77 (8.7)	2 (8.7)	14 (9.7)		
Self-perceived health status					
Good	420 (47.8)	11 (50.0)	74 (49.7)	1.16	0.89
Fair	403 (45.8)	10 (45.5)	63 (42.3)		
Bad	56 (6.4)	1 (4.5)	12 (8.1)		
Smoking status					
Current smoker	105 (11.3)	3 (12.0)	11 (7.1)	4.73	0.32
Former smoker	78 (8.4)	0 (0.0)	14 (9.0)		
Never smoker	750 (80.4)	22 (88.0)	130 (83.9)		
Alcohol intake					
Current Drinker	91 (9.7)	4 (16.0)	11 (7.1)	2.39	0.67
Former drinker	68 (7.2)	2 (8.0)	12 (7.7)		
Never drinker	780 (83.1)	19 (76.0)	132 (85.2)		

TB knowledge scores					
< 3	249 (27.5)	12 (50.0)	72 (48.3)	30.25	< 0.01
≥ 3	657 (72.5)	12 (50.0)	77 (51.7)		
TB attitudes scores					
< 3	417 (47.3)	15 (65.2)	114 (77.6)	47.74	< 0.01
≥ 3	464 (52.7)	8 (34.8)	33 (22.4)		
TB practice scores					
< 4	433 (53.6)	18 (85.7)	104 (78.8)	36.41	< 0.01
≥ 4	375 (46.4)	3 (14.3)	28 (21.2)		

*Missing number of participants: age: 10; gender: 7; residence: 29; education level: 31; marital status: 59; medical insurance: 60; family annual income per capita: 69; self-perceived health status: 73; smoking status: 10; alcohol consumption habits: 4; TB knowledge scores: 44; TB attitudes scores: 72; TB practice scores: 162.

Abbreviation: TB, tuberculosis.

Table 4 Binary logistic regression analysis for the association with medical care-seeking willingness for tuberculosis among elderly population* (N=903)

Variables	*B*	SE	*Wald* χ^2	*P*	OR (95% CI)
Family annual income per capita (¥) (ref: < 50,000)					
50,000~100,000	0.94	0.29	10.37	< 0.01	2.56 (1.44–4.54)
100,000~200,000	-0.1	0.26	0.15	0.69	0.90 (0.54–1.51)
> 200,000	0.29	0.39	0.57	0.45	1.34 (0.63–2.86)
TB attitudes scores (ref: < 3)					
≥ 3	1.13	0.25	20.51	< 0.01	3.10 (1.90–5.05)
TB practice scores (ref: < 4)					
≥ 4	1.14	0.28	16.93	< 0.01	3.13 (1.82–5.39)

*Adjustment for age (65~70, 71~75, > 75), gender (male, female), residence (local residents, others), education (primary school or below, junior or senior middle school, college degree or above), marital status (married, unmarried/widow/divorced), medical insurance (yes, no), self-perceived health status (good, fair, bad), smoking status (current smoker, former smoker, never smoker), alcohol intake (current drinker, former drinker, never drinker), TB knowledge scores (< 3, ≥ 3), and other variables in the model.

Abbreviation: OR, odds ratio; SE, standard error; TB, tuberculosis.

A survey of the elderly's awareness and health-related practices of tuberculosis

Socio-demographic information section:

1. Age: __ years old.

2. Gender:

☐ Male

☐ Female

3. Are you a local resident?

☐ Yes

☐ No

4. Your duration of residence in Shenzhen is __ years __ months.

5. Education level:

☐ Illiteracy

☐ Primary school

☐ Junior high school

☐ High school / Secondary school

☐ Junior college

☐ Undergraduate or higher

6. Marital status:

☐ Unmarried

☐ Married

☐ Divorced

☐ Widowed

7. Medical insurance:

☐ Basic medical insurance for urban and rural residents (including New rural cooperative medical insurance)

☐ Medical insurance for urban employee

☐ Commercial insurance

☐ Free medical services

☐ No medical insurance

8. Family annual income per capita (RMB):

☐ Less than 50,000

☐ 50,000 to 100,000

☐ 100,000 to 200,000

☐ 200,000 to 500,000

☐ More than 500,000

Health-related characteristic section:

1. How do you feel your current health status?

☐ Very good

☐ Relatively good

☐ Fair

☐ Relatively bad

☐ Very bad

2. Are you a smoker?

☐ Yes

☐ Former smoker

☐ No

3. Do you drink alcohol?

☐ Yes

☐ Former drinker

☐ No

4. Have you previously been treated for TB?

☐ Yes

☐ No

Tuberculosis knowledge, attitudes, and practices section:

Knowledge

1. Infectivity of TB

☐ Yes

☐ No

☐ Do not know

2. Route of TB transmission

☐ Touching items

☐ Sharing utensils

☐ Coughing or sneezing

☐ All of the above

☐ Do not know

3. TB symptoms

☐ Headache or dizziness

☐ Coughing for longer than 2 weeks or coughing up blood

☐ Abdominal pain or diarrhoea

☐ Do not know

4. Prevention and control of TB

☐ Covering mouth and nose when coughing or sneezing

☐ Wearing a mask

☐ Good nutrition

☐ Washing hands after touching items in public

☐ All of the above

5. Curability of TB

☐ Yes

☐ No

☐ Do not know

Attitudes

1. Do you think that TB is a terrible disease?

☐ Yes

☐ No

☐ Do not sure

2. Would you like to learn about TB?

☐ Yes

☐ No

☐ Do not sure

3. Would you like to participate in TB education activities?

☐ Yes

☐ No

☐ Do not sure

4. Are you willing to complete treatment if you have TB?

☐ Yes

☐ No

☐ Do not sure

5. Would you be willing to be screened for TB if you had suggestive symptoms?

☐ Yes

☐ No

☐ Do not sure

Practices

1. Have you ever taken the initiative to learn about TB?

☐ Yes

☐ No

☐ Do not sure

2. Would you urge your friends with suspicious TB symptoms visit the doctor?

☐ Yes

☐ No

☐ Do not sure

3. Would you visit a health facility if you had a cough for more than 2 weeks?

☐ Yes

☐ No

☐ Do not sure

4. Would you visit a health facility if you suspected that you had TB?

☐ Yes

☐ No

☐ Do not sure

5. Would you stop spitting in public?

☐ Yes

☐ No

☐ Do not sure

6. Would you cover your mouth and nose when coughing or sneezing?

☐ Yes

☐ No

☐ Do not sure

Medical care-seeking willingness for TB section:

1. Were you willing to seek medical care if you suspected that you had TB?

☐ Yes (end of survey)

☐ Neutral (end of survey)

☐ No

2. Why were you unwilling to seek medical care if you suspected that you had TB?

(Multiple choice)

☐ Lack of trust in the medical level of TB prevention and treatment institutions

☐ Poor attitude of medical staff

☐ Long treatment time and heavy economic burden

☐ Fear of discrimination

☐ Others: __

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1, 2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4, 5
Objectives	3	State specific objectives, including any prespecified hypotheses	4, 5
Methods			
Study design	4	Present key elements of study design early in the paper	6, 7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5, 6, 7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6, 7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7, 8
Bias	9	Describe any efforts to address potential sources of bias	*8*
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8
		(*b*) Describe any methods used to examine subgroups and interactions	8
		(*c*) Explain how missing data were addressed	N/A
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A
		(*e*) Describe any sensitivity analyses	N/A
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9
		(b) Indicate number of participants with missing data for each variable of interest	N/A
Outcome data	15*	Report numbers of outcome events or summary measures	9, 10
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9, 10
		(*b*) Report category boundaries when continuous variables were categorized	8
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10, 11, 12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	13

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.