BMJ Open Pulmonary tuberculosis among migrants in Shandong, China: factors associated with treatment delay

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ABSTRACT Objective: A timely initiation of treatment is crucial to

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is to describe treatment delay among migrant patients with TB and to identify factors associated with treatment delay, so as to provide evidence for strategy development and improvement of TB control among migrants in China. **Design:** A cross-sectional study was conducted in

better control tuberculosis (TB). The aim of this study

Shandong province of China. A total of 314 confirmed smear positive migrant patients with pulmonary TB were included. Univariate logistic regression was used to analyse the association of variables with treatment delay among migrant patients with TB. A multilogistic regression model was developed to further assess the effect of variables on treatment delay.

Results: Of 314 migrant patients with TB, 65.6% experienced treatment delay (>1 day). Household income level, diagnosis symptom severity. understanding of whether TB is curable or not and knowledge about the free TB treatment policy are factors significantly associated with treatment delay. **Conclusions:** Economic status and knowledge about TB are key barriers to accessing TB treatment. An integrated policy of carrying out TB-related health education and publicising the free TB treatment policy among migrants is needed. Health insurance schemes for migrants should be modified to make them transferrable and pro-poor.

INTRODUCTION

China has one of the highest burdens of tuberculosis (TB) worldwide and it ranks second among the 22 high-burden countries in the world.¹ Since 1991, China has implemented the Directly Observed Treatment-Short Course (DOTS) strategy and has provided universal coverage for patients with TB.² As a result, the cure rate of active TB cases has reached over 90%.³ However, the implementation of DOTS for the migrant population remains one of the main challenges in China for controlling $TB.^{45}$

As of 2012, the migrant population in China has reached 236 million, and is

Strengths and limitations of this study

- This study is one of the first to try to analyse treatment delay among migrant patients with pulmonary tuberculosis (TB) in China.
- A cross-sectional study to examine the treatment delay and its risk factors was conducted in Shandong province of China with recruitment of 314 confirmed smear positive migrant patients with TB.
- Economic status and knowledge about TB are key barriers to accessing timely TB treatment among migrants.
- The measurement of treatment delay was selfreported, and reporting bias was unavoidable.

expected to increase continuously in upcoming decades.⁶ As reported in other studies, TB case management among migrants is more difficult than among local residents due to their 'migratory' nature, poor financial conditions, low education level and minimal awareness of TB.⁴ ⁵ ⁷ The challenge of administering to the migrant population presents an important barrier for the National TB Control Program in China. Early detection of cases and timely treatment of TB are essential for effective TB control.^{8–11} Delays occurring in any part of the health-seeking process would increase the probability of TB transmission and eventually result in higher disease burden.¹² Studies of delays have been conducted in many countries, most of which explain the delays in terms of patient delay, diagnosis delay and treatment delay.^{13 14} In China, a number of studies have reported the median length of patient delay among migrant patients with TB to last f

10 days in Shandong province¹² to 20 days in Changning District of Shanghai¹⁵ to 43 days in Shijiazhuang city.¹⁶ Previous studies have also reported median diagnosis delays among migrant patients with TB of 5 days in Putuo District of Shanghai¹⁷ to 8 days in Shandong province¹² to 13 days in Changning District of Shanghai.¹⁵ Factors including age, economic

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status, TB symptoms, health insurance, educational level, working time, and the specific health facilities first visited by the TB patients were found to be associated with the patient and diagnosis delays.¹² ^{15–19} However, to the authors' knowledge, few studies have documented the length of treatment delay, and few have identified risk factors for treatment delay. Therefore, treatment delay among migrants is a high priority among topics for study in China TB control.

The objective of this study is to describe treatment delay among migrant patients with TB in Shandong, China, and to identify factors associated with treatment delay, so as to provide evidence for strategy development and improvement of TB control among migrants in China.

MATERIALS AND METHODS Study design

This study was conducted in Shandong province, which consists of 140 counties (districts) with a total population of nearly 100 million. By the end of 2008, Shandong had about 6.91 million migrants. The DOTS strategy for TB was introduced in the 1990s and is now available in 100% of counties (districts) in Shandong province. In China, TB cases are usually diagnosed and treated in local TB dispensaries (LTD). However, service providers at other levels, especially the lowest level providers (such as township health centres and clinics) cannot diagnose and treat the TB cases, only to identify suspected TB cases (including new and relapsed patients) are required to be registered in the LTD and reported to upper level health authorities.

A total of 12 counties/districts (including Huaiyin District, Lixia District, Dongying District, Guangrao County, Penglai County, Laizhou County, Zouping

Table 1Econstudy sites	nomic status and distribution	of cases of
Sites	GDP per capita (RMB)*	Number of participants
Huaiyin	34 511	25
Lixia	75 148	25
Dongying	48 163	25
Guangrao	41 125	26
Penglai	54 584	34
Laizhou	26 936	26
Zouping	47 566	25
Chengyang	97 426	22
Jimo	39 011	27
Luozhuang	34 706	26
Lanshan	31 111	26
Gaomi	22 093	27

*The data of the GDP per capita sourced from *Shandong Statistical Yearbook 2007.* GDP, gross domestic product. County, Chengyang District, Jimo County, Luozhuang District, Lanshan District, Gaomi County) were selected as study sites after considering the larger number of migrants in these counties (districts) and the feasibility of the study implementation. The participants were required to meet the following selection criteria: (1) they were smear-positive migrant patients with pulmonary TB registered in one of the LTDs in the 12 sampling sites between 1 August 2007 and 31 July 2008; (2) they had undergone treatment time of over 1 month and (3) they had completed normal treatment, the end of which was within 6 months of initiation.

There were a total of 418 migrant TB patients registered in the 12 sampling sites during the period, 372 of whom met the above criteria. Of the 372 eligible cases, 20 individuals were unreachable because they had left the area, 16 individuals were unresponsive to contact, 11 individuals refused to participate in the study, and 11 individuals did not participate for other reasons. There were 314 patients successfully recruited into the study. Table 1 presents the economic status and distribution of the patients in different sites.

Data collection

A cross-sectional study was conducted between 2 August 2008 and 17 October 2008. The participants were contacted and recruited by staff of the LTD and were interviewed face-to-face at the LTD of the study site using questionnaires that included sociodemographic characteristics, household income, health insurance status, geographic health service accessibility, knowledge about TB and its related policies, and patient health-seeking experiences from diagnosis to the initiation of treatment. The interviews were undertaken by trained postgraduates from the School of Public Health of Shandong University and physicians from the Shandong Center for TB Prevention and Control.

Definitions

In this study, 'migrants' were non-local residents who had already lived or intended to stay in our study areas for at least 3 months.²⁰ The 'diagnosis symptoms severity' was divided into three categories: mild, moderate and severe. The 'mild symptoms' included the initial symptoms of cough, sputum and night sweats; the 'moderate symptoms' referred to the initial symptoms of chest pain, weight loss and fever; and the 'severe symptoms' included high fever and haemoptysis.¹² Treatment of time was the period from the diagnosis of TB to the initiation of treatment. Using the median (1 day) as the cutoff point, a period of longer than 1 day was defined as a treatment delay.

Data analysis

The data were double entered using EPI Data 6.04 and both copies were verified. We used SPSS V.13.0 for Windows to analyse the data. Gender, age, educational level, marital status, residence and health insurance

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status were presented as percentages. Univariate logistic regression was used to analyse the association of each variable with treatment delay across different subgroups of migrant patients with TB. The identified risk factors (p<0.05) were included into a multivariate logistic regression model to further assess the impact of variables on treatment delay. The magnitude of the association was measured by the OR with 95% CI. A p value of <0.05 was considered statistically significant.

RESULTS

Of the 314 respondents, 63.4% were male. The age of the participants ranged from 15 to 70 years, with a mean of 31.8 years, and 53.8% were from 15 to 29 years, 31.5% were from 30 to 44 years, 14.7% were 45 years and above. As for educational level, 18.8% had primary education or below, 40.1% had junior high education and 41.1% had high school education and above. With regard to marital status, 44.6% of the respondents were single (never-married), while 51.9% were married and 3.5% were divorced or widowed. In total, 88.2% of the respondents were from rural areas and 11.8% were from urban areas. A total of 64.6% of the patients did not have health insurance plans (table 2).

The median of treatment delay was 1 day, with a mean of 2.5 days, ranging from 0 to 90 days. When we examined the treatment delay at the individual level, we found that 65.6% of the participants experienced treatment delay during the study period. The treatment delay was compared across different subgroups using

	Number of	Per
Characteristic	patients	cent
Gender		
Male	199	63.4
Female	115	36.6
Age (in years)		
15–29	169	53.8
30–44	99	31.5
≥45	46	14.7
Educational level		
Primary or below	59	18.8
Junior high	126	40.1
High school and above	129	41.1
Marital status		
Single	140	44.6
Married	163	51.9
Divorced/bereft of spouse	11	3.5
Residence		
Rural	277	88.2
Urban	37	11.8
Health insurance status		
Yes	111	35.4
No	203	64.6

univariate logistic regression analysis. We found that migrant patients with TB who were younger (p<0.05), who were single (p<0.05), whose household income levels were lower (p<0.01), who had a debt (p<0.01), who were from Dibao households (low-income households identified and subsidised by local bureau of civil affairs—p<0.05), who migrated without families (p<0.01), whose diagnosis of symptoms was mild (p<0.01), who thought TB was incurable (p<0.01) and who did not know about the free TB treatment policy P (p<0.01) were more likely to experience treatment delay (table 3).

The multivariate logistic regression model indicated Š that household income level, diagnosis of symptom severity, understanding of whether TB was curable or copyright not and knowledge about the free TB treatment policy were factors significantly associated with treatment delay (table 4). including

DISCUSSION

Providing timely treatment after diagnosis is a key intervention to prevent TB transmission in a community. Therefore, understanding the risk factors for treatment delay is of high significance. The median treatment delay in our study was 1 day, which was similar to the reported median (1 day) among permanent residents in research conducted in Ghana²¹ and Ethiopia,¹³ and the median (1 day) of delay found in another study among permanent residents in the same study area (Shandong province²²), but it was a slightly longer delay than the 0 day median reported among migrant patients with TB in Changning District of Shanghai.¹⁵

Similar to the findings of other studies, this study also indicated that economic status of migrant patients with TB was a key barrier to accessing TB treatment.^{23–25} The ≥ policy implemented by the Chinese government to provide free treatment for patients with TB has reached migrants and has, to a certain extent, reduced the financial burden of migrant patients with TB. However, there are also some items that are critical to treating TB among migrants that have not yet been included in the <u>0</u> free policy, such as transport costs occurring in the careseeking process and ancillary drugs for treatment. These high out-of-pocket health expenditures may hinder migrant patients with TB from seeking timely TB treatment after diagnosis. Therefore, in order to efficiently reach migrants and make these policies more pro-poor, & the free TB control programme should address the economic factors.

When compared with migrant patients who had migrated with their families, we found that patients living alone in the study sites were more vulnerable to treatment delay. Some previous studies found that lack of social support was a positively associated risk factor for TB-related health-seeking behaviour.^{26 27} As the most important source of social support for migrant patients with TB, family members played an important role,

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	T-dela	ay	No T-	delay			
Variables	n	Per cent	n	Per cent	OR	95% CI	p Value
Gender							0.38
Male	127	63.8	72	36.2	10	_	0.00
Female	79	68.7	36	31.3	1.0	0 76 to 2 03	
Age (in years)	10	00.7	00	01.0		0.10 10 2.00	0.01
15–29	124	73.4	45	26.6	1.0	_	0.01
30-44	56	56.6	43	43.4	0.47	0.28 to 0.80	
>45	26	56.5	20	43.5	0.47	0.24 to 0.93	
Educational level		00.0			••••	0.2110 0.00	0.26
Primary and below	35	59.3	24	40.7	1.0	_	
Junior high	89	70.6	37	29.4	1.65	0.87 to 3.15	
High school and above	82	63.6	47	36.4	1.20	0.64 to 2.25	
Marital Status							0.04
Sinale	102	72.9	38	27.1	1.0	_	
Married	96	58.9	67	41.1	0.53	0.33 to 0.87	
Divorced/bereft of spouse	8	72.7	3	27.3	0.99	0.25 to 3.94	
Residence							0.64
Rural	183	66.1	94	33.9	1.0	_	
Urban	23	62.2	14	37.8	0.84	0.42 to 1.72	
Household income level*			• •	0110	0.01	0.12.00.112	0.00
Lowest group	60	75.0	20	25.0	1.0		0.00
Lower group	54	76.1	17	23.9	1.06	0.50 to 2.23	
Higher group	58	63.0	34	37.0	0.57	0.29 to 1.10	
Highest group	34	47.9	37	52.1	0.31	0 15 to 0 61	
Debt status	01		0,	02.1	0.01	0.10 10 0.01	0.00
No	135	60.3	89	39.7	10		0.00
<¥10.000 (BMB)	44	77.2	13	22.8	2.23	1 14 to 4 38	
>¥10 000 (RMB)	27	81.8	6	18.2	2 97	1 18 to 7 48	
Dibao householdt	21	01.0	Ŭ	10.2	2.07	1.10 10 7.10	0.03
Yes	16	94 1	1	59	10		0.00
No	190	64.0	107	36.0	0.11	0.02 to 0.85	
Working hours per day	100	04.0	107	00.0	0.11	0.02 10 0.00	0.65
	134	64 7	73	35.3	10		0.00
 >8	72	67.3	35	32.7	1.0	0.68 to 1.84	
Working days per week	12	07.0	00	02.7	1.12	0.00 10 1.01	0.22
	93	69.4	41	30.6	10		0.22
 5	113	62.8	67	37.2	0.74	0.46 to 1.20	
Migrating with families or not	110	02.0	07	07.2	0.74	0.10101.20	0.00
No	126	78.3	35	21.7	10		0.00
Ves	80	52.3	73	47.7	0.30	0 19 to 0 50	
Health insurance status	00	52.0	70	77.7	0.00	0.10 10 0.00	0.97
Yes	73	65.8	38	34.2	10		0.07
No	133	65.5	70	34.5	0.99	0.61 to 1.61	
Distance to LTD (km)	100	00.0	70	04.0	0.00	0.01 10 1.01	0.56
	51	68.0	24	32.0	10		0.00
5	48	67.6	23	32.0	0.98	0.49 to 1.97	
10-	73	67.0	36	33.0	0.00	0.51 to 1.79	
20-	34	57.6	25	42.4	0.64	0.32 to 1.30	
Diagnosis symptom severity	04	57.0	20	72.7	0.04	0.02 10 1.00	0.00
Mild	21	42 9	28	57 1	10		0.00
Moderate	122	67.0	60	33.0	2 71	1 42 to 5 17	
Severe	63	75.0	20	24.1	1 20	1.97 to 8.96	
Understanding of whether TR is curable or not	00	10.0	20	27.1	4.20	1.07 10 0.30	0.01
Yes	182	63.2	106	36.8	10		0.01
No	24	92.3	2	77	6.99	1 62 to 30 16	
Knowledge about the free TR treatment policy	24	32.0	2	1.1	0.99	1.02 10 50.10	0.00
Ves	130	50 0	02	40.1	1.0		0.00
No	67	81 7	15	18.2	2.00	1 61 to 5 55	
NU	07	01.7	15	10.0	2.99	1.01 10 5.55	

*Household income level: (1) lowest group (≤¥10 000 RMB per year); (2) lower group (¥10 001–¥20 000 RMB per year); (3) higher group (¥20 001–¥30 000 RMB per year); (4) highest group (>¥30 000 RMB per year). †*Dibao* household: low-income households identified and subsidised by local bureau of civil affairs. LTD, local TB dispensaries; TB, tuberculosis.

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which could not be replaced by any other sources, in encouraging them to seek timely treatment after TB diagnosis.

We found that migrant patients with TB with mild and moderate diagnosis symptoms were more likely to experience treatment delay than those with severe diagnosis symptoms. In China, 80% of migrants are rural-to-urban workers.²⁸ Among this population, the average educational level is relatively low,²⁸ which may result in these patients' poor understanding of TB symptoms, importance of timely treatment and the free TB treatment policy, consequently delaying treatment seeking time after diagnosis.

Table 4	Multivariate logistic regression model of the risk
factors fo	r treatment delay among migrant patients with TB
in Shande	ong, China

Age (in years) ≥45 1.0 15–29 1.56 0.55 to 4.42 0.40 30–44 1.03 0.43 to 2.48 0.95 Marital status Single 1.0 Married 1.37 0.56 to 3.34 0.49 Divorced/bereft of 0.97 0.14 to 6.70 0.97 spouse Household income level* Highest group 1.0 Lowest group 3.79 1.55 to 9.29 0.00 Lowest group 2.37 0.96 to 5.81 0.06 Higher group 1.42 0.66 to 3.07 0.37 Debt status No 1.0 ≤¥10 000 (RMB) 1.91 0.84 to 4.32 0.12 >¥10 000 (RMB) 2.23 0.76 to 6.52 0.14 Dibao household† Yes 1.0 No 0.14 0.02 to 1.24 0.08 Migrating with families or not
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$\begin{array}{c cccc} Married & 1.37 & 0.56 \mbox{ to } 3.34 & 0.49 \\ Divorced/bereft of & 0.97 & 0.14 \mbox{ to } 6.70 & 0.97 \\ spouse \\ Household income level* \\ Highest group & 1.0 \\ Lowest group & 2.37 & 1.55 \mbox{ to } 9.29 & 0.00 \\ Lower group & 2.37 & 0.96 \mbox{ to } 5.81 & 0.06 \\ Higher group & 1.42 & 0.66 \mbox{ to } 3.07 & 0.37 \\ Debt status \\ No & 1.0 \\ \leq \end{tabular} 10000 \mbox{ (RMB)} & 1.91 & 0.84 \mbox{ to } 4.32 & 0.12 \\ > \end{tabular} 10000 \mbox{ (RMB)} & 2.23 & 0.76 \mbox{ to } 6.52 & 0.14 \\ Dibao \mbox{ household}^+ \\ Yes & 1.0 \\ No & 0.14 & 0.02 \mbox{ to } 1.24 & 0.08 \\ \end{tabular}$
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Dibao household† Yes 1.0 No 0.14 0.02 to 1.24 0.08 Migrating with families or not
Yes 1.0 No 0.14 0.02 to 1.24 0.08 Migrating with families or not
No 0.14 0.02 to 1.24 0.08 Migrating with families or not
Migrating with families or not
No 1.0
Yes 0.21 0.11 to 0.43 0.00
Diagnosis symptom severity
Mild 1.0
Moderate 7.00 2.91 to 16.84 0.00
Severe 13.35 4.87 to 36.63 0.00
Understanding of whether TB is curable or not
No 1.0
Yes 0.04 0.01 to 0.23 0.00
Knowledge about the free TB treatment policy
No 1.0
Yes 0.22 0.10 to 0.50 0.00
*Household income level: (1) lowest group (≤¥10 000 RMB per
year); (2) lower group (¥10 001–¥20 000 RMB per year); (3)
(>¥30 000 RMB per year).
†Dibao household: low-income households identified and
subsidised by local bureau of civil affairs.

A clear association was observed between treatment delay and patient understanding of the possibility of curing TB. Patients who thought TB was incurable were more likely to experience treatment delay than those who thought TB was curable. We also found that the patients who did not know about the free TB treatment policy were more likely to experience treatment delay. The *National TB Control Program Implementation Guide in China (2008)* proposed that improving the TB-related understanding level among patients with TB was crucial to controlling TB in China.²⁹ These findings should therefore give an impetus to carry out TB-related health education and also publicise the free TB treatment policy among migrants.

We were somewhat surprised to observe that health insurance status had no significant effect on the treatment delay among migrant patients with TB. One possible explanation for this finding is the weakness of health insurance policies towards the migrants. In China, the health insurance system is tightly tied to the hukou (household registration) system. Owing to localised management, health insurance is generally not transferrable to a new location. This means that insured migrants are generally unable to utilise local health services. Instead, insured migrants are usually required to return to their hometowns (hukou registered locations) if they want to make use of these benefits. Given the general poor financial conditions of the migrant population, it is unlikely that insured migrants would travel all the way back to their hometowns to utilise these health services.³⁰ Therefore, the true financial protection level among migrants through health insurance is relatively ata low, even if they had been covered by some kind of health insurance plans in their hometowns. This finding underlies the need for policymakers to make health insurance plans transferable for migrants.

This study has potential limitations. First, the measure of treatment delay was self-reported and recall bias was thus a serious threat to the estimate of the treatment delay. Similar with other studies, we minimised the estimation error by helping the migrant patients with TB in their recall efforts, and also collecting data from the LTD registration system. Second, the selection of migrant patients with TB might be biased. The target population of this study was patients who had registered in a LTD. This means that patients with undetected TB, patients who had not registered in a LTD and patients who had left the sample counties (districts) during the period of the survey, were not included. This thus affects to some extent the representativeness of our results.

CONCLUSIONS

In this study, 65.6% of participants experienced treatment delay (>1 day). The study indicates that treatment delay was associated with the economic status of migrant patients, which suggests that future policies should extend the range of reimbursement for TB-related

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health services for the poor among migrant patients with TB to make them more pro-poor. We found that TB patients' poor understanding of the disease was significantly associated with higher treatment delay. This suggests that policymakers should carry out extensive TB-related health education among migrant patients with TB. We also found that factors including diagnosis symptom severity and whether migrants lived with their associated with treatment families were delay. Understanding these risk factors may be helpful for policymakers to make more effective policies targeting the most at-risk patients.

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