Am. J. Trop. Med. Hyg., 102(1), 2020, pp. 31–35
doi:10.4269/ajtmh.19-0542

Prevalence of Depressive Symptoms and Associated Factors among Internal Migrants with Tuberculosis: A Cross-Sectional Study in China

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Abstract. There are hundreds of millions of internal migrants in China, and tuberculosis (TB) is an important health threat to them. However, the mental health problems of internal migrants with TB in China have been ignored. The present study aimed to determine the prevalence of depressive symptoms and its associated risk factors among internal migrants with TB in China. A cross-sectional survey was conducted between June 2018 and March 2019 in Shenzhen, southern China. Data were collected from 1,057 internal migrants with TB using a structured questionnaire. Depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale. Multinomial logistic regression analysis was used to identify risk factors for depressive symptoms. Of the 1,057 participants included in this study, 53.8% had depressive symptoms. Of these, 38.9% had mild, whereas 14.9% had moderate-to-severe depressive symptoms. Multinomial logistic regression analysis suggested that higher likelihoods of depressive symptoms were associated with female gender, lower education, family dysfunction, poor doctor–patient communication, and TB-related stigma. This study shows that the prevalence of depressive symptoms among internal migrants with TB is high in China. Targeting interventions and treatment of depressive symptoms among internal migrants with TB are needed.

INTRODUCTION

Tuberculosis (TB) remains one of the greatest global health problems and is the leading cause of death worldwide from an infectious disease among adults.[1] According to the WHO, there were an estimated 10.0 million new TB cases with 1.3 million TB deaths, globally, in 2017.[2] China ranks 2nd of 22 countries with high TB disease-burden countries in the world. Previous studies confirmed that TB affects not only the physical health but also the mental well-being of patients.[3,4] Depression is a frequently occurring mental disorder among patients with TB. Studies conducted in different countries on the prevalence of depression among patients with TB showed a prevalence of 39.5% in India,[5] 43.4% in Ethiopia,[6] 46.3% in Pakistan,[7] and 61.1% in Cameroon.[8]

People living with TB often experience depression because of the chronic nature of the TB infection or its associated psycho-socioeconomic stressors.[9,10] Isoniazid, a core anti-TB medication, can have adverse psychiatric effects including depression.[11] Previous studies showed that depression usually presents with persistent sadness, decreased energy, low self-worth, disturbed sleep or appetite, and poor concentration.[6,12] The presence of depression can lead to substantial impairments in an individual's ability to cope with stress and daily life among patients with TB. Many studies also found that depression not only threaten mental well-being of an individual but also had negative impact on treatment adherence to TB medication regimens.[1,13] Poor adherence could lead to the failure of treatment, the development of drug resistance, and high rates of community transmission, ultimately increasing the morbidity and mortality due to TB.[13] Thus, it is necessary to determine the prevalence of depressive symptoms and related risk factors among patients with TB.

To our knowledge, there is only one study that explored the occurrence of depressive symptoms among patients with TB in China, which reported a 48.0% prevalence of depression in Hubei Province.[14] In addition, most of the existing TB intervention programs in China have focused on microbiological treatment,[15] ignoring mental health–related outcomes. Previous studies suggest that internal migrants are potential high-risk populations of TB and suffer a disproportionate burden of TB in China.[16] However, the information about depression among internal migrants with TB in China is limited. Therefore, the present study was planned to estimate the prevalence of depressive symptoms and related risk factors among internal migrants with TB in China.

METHODS

Ethical approval. Ethical approval was provided by the Human Research Ethics Committee, Ningbo College of Health Sciences, Ningbo, China. Informed consent was obtained from all study participants.

Setting and study population. A cross-sectional study was carried out between June 2018 and March 2019 in Shenzhen, southern China. Cluster random sampling was performed, and two districts were randomly selected from 10 districts in Shenzhen as study sites. Thereafter, patients with TB who attended the TB dispensaries at the study sites during the study period were recruited as participants. The participants were individuals meeting the following criteria: 1) diagnosed as active TB based on national TB program guidelines, 2) patients who were taking anti-TB medications and had taken them for over half a month, 3) migrant population, that is, those who had resided in Shenzhen for more than 6 months but whose hukou (household registration) were still held in their homelands but not in Shenzhen, and 4) patients who were willing to participate in the study. In total, 1,100 patients with TB were recruited and completed a structured, self-administered questionnaire anonymously. Of the 1,100 questionnaires collected, 43 (3.9%) were removed because of errors in logic or a large amount of missing data. Thus, the data for 1,057 patients with TB were included in the analysis.

Measurement. The questionnaire consisted of five sections: demographic characteristics, family function, doctor–patient

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communication, TB-related stigma, and depressive symptoms. The demographic data included age, gender (males/females), educational level (primary school and below/middle school/high school or above), marital status (single/married/separated or divorced) and history of prior anti-TB treatment (no/yes).

Family function was measured using the Family APGAR (adaptability, partnership, growth, affection, and resolve) Index developed by Smilkstein in 1978.[17] It was designed to evaluate the satisfaction with social support received from their family members based on five components: adaptability, partnership, growth, affection, and resolve. Each item is scored using a 3-point Likert scale ranging from "scarcely" (= 0) to "often" (= 3). The item scores are summed to provide a total score (range: 0–10), and a higher score indicates better family function. The Family APGAR Index has been widely used in China with good reliability and validity.[18] In the present study, the Family APGAR Index demonstrated high internal consistency (Cronbach's $\alpha = 0.86$).

Doctor–patient communication was measured by the following four items: 1) satisfaction with the doctors' service attitude, 2) extent to which the doctor introduces the illness, 3) extent to which the doctor explains the details of taking anti-TB agents, and 4) extent to which the doctor explains adverse drug reactions to anti-TB agents. Participants were asked to rate their level of satisfaction from 1 to 3 for the four questions listed earlier. The total score ranged from 4 to 12, and a higher score means better doctor–patient communication. In the present study, the four items measuring the doctor–patient communication demonstrated high internal consistency (Cronbach's $\alpha = 0.84$).

Tuberculosis-related stigma was measured using the TB-related stigma Scale, which was developed by our research group and has shown good validity and consistency. Detailed information on the development and evaluation of TB-related stigma Scale can be found in our previous publication.[19,20] The scale consists of nine items, and each item is scored on a 4-point Likert scale, ranging from "strongly disagree" (= 0) to "strongly agree" (= 3). The item scores are summed to provide a total score (range: 0–27), and a higher score indicate a higher level of stigma. The overall Cronbach's α was 0.88 for the scale.

The presence and severity of depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D) which is a commonly used self-report measure of depressive symptoms in research and clinical settings.[21] The scale consists of 20 items and measures depressive symptoms across four domains: depressive affect, positive affect, somatic symptoms/activity inhibition, and interpersonal difficulties. Responses for the items are provided using a 4-point Likert scale ranging from 0 (not at all) to 3 (almost daily). The item scores are summed to provide a total score (range: 0–60), and higher scores indicate higher levels of depressive symptoms. The CES-D score, based on the severity of depressive symptoms, was categorized as follows: 0–15 indicates "no depressive symptoms," 16–25 indicates "mild depressive symptoms," and 26–60 indicates "moderate-to-severe depressive symptoms." The CES-D has been widely used in China,[22] and in this present study, the scale demonstrated high internal consistency (Cronbach's $\alpha = 0.86$).

Statistical analysis. Descriptive analyses were conducted. Categorical variables were described with frequencies and percentages. For continuous variables, means and SD were calculated. The chi-squared test was used in the analysis of the associations between participants' demographic characteristics and depressive symptoms. One-way analysis of variance (ANOVA) was conducted to compare the family function, doctor–patient communication, and stigma scores between groups with different depressive symptoms (no, mild and moderate-to-severe). Multinomial logistic regression analysis was carried out to estimate the potential risk factors of depressive symptoms, and odds ratios and 95% CIs were calculated. All comparisons were two-tailed. The significance threshold was a P-value < 0.05. All statistical procedures were conducted using the Statistical Analysis System (SAS) 9.4 for Windows (SAS Institute Inc., Cary, NC).

RESULTS

Table 1 shows the participants' characteristics and the prevalence of depressive symptoms (mild and moderate-to-severe depressive symptoms). The participants' mean age was 46.21 (SD = 16.46) years, and 63.3% of participants were males. Most of the participants were married (77.3%), and 60.8% of participants were educated to at least a middle school level. The mean standard score of CES-D was 16.94 (SD = 8.20). The overall prevalence of depressive symptoms among 590 participants of the total 1,097 participants was 53.8%, with the prevalence of mild depressive symptoms reported as 38.9% and that of moderate-to-severe depressive symptoms as 14.9%. The associations between participants' demographic characteristics and depressive symptoms among patients with TB were assessed using a chi-squared test (Table 1). All demographic characteristics except prior anti-TB treatment were associated with depressive symptoms ($P < 0.05$). Findings of ANOVA indicated that there were significant differences in family function, doctor–patient communication, and stigma among participants within the different depressive symptom categories (Table 2).

Table 3 shows the result of the multinomial logistic regression analyses. Participants with primary school or less education showed a higher likelihood of experiencing depressive symptoms ($P < 0.001$). Female participants showed a higher likelihood of experiencing moderate-to-severe depressive symptoms ($P < 0.001$). Family function and doctor–patient communication were negatively associated with experiencing depressive symptoms, compared with no depressive symptoms. Stigma was positively associated with experiencing depressive symptoms, compared with no depressive symptoms. Age, marital status, and prior anti-TB treatment showed no significant association with depressive symptoms ($P > 0.05$).

DISCUSSION

This study showed that the prevalence of depressive symptoms among internal migrants with TB in China was 53.8%. A study conducted in Hubei Province in central China in 2013 has shown a 48.0% prevalence of depressive symptoms in rural patients with TB based on the CES-D.[14] Compared with studies in other countries, the prevalence of depressive symptoms in our study was higher than the study carried out in Ethiopia (43.4%),[6] Pakistan (46.3%),[7] and Angola (49.4%).[23] Thus, our findings suggest that the prevalence of depressive symptoms among internal migrants with TB is high in China. Higher prevalence of depression among

TABLE 1
Participants' characteristics and associations with depressive symptoms of the internal migrants with TB

		Depressive symptoms		
	Total (n = 1,057)	Mild (n = 467)	Moderate to severe (n = 177)	
Variables	N (%)	N (%)	N (%)	P-value
Age (years)				0.002
29	259 (23.61)	85 (32.82)	30 (11.58)	
30–44	171 (15.59)	76 (44.44)	28 (16.37)	
45–59	416 (37.92)	166 (39.90)	54 (12.98)	
60+	251 (22.88)	100 (39.84)	51 (20.32)	
Gender				< 0.01
Male	694 (63.26)	274 (39.48)	75 (10.81)	
Female	403 (36.74)	153 (37.97)	88 (21.84)	
Education				< 0.01
Primary school and below	430 (39.30)	176 (40.93)	93 (21.63)	
Middle school	462 (42.11)	189 (40.91)	52 (11.26)	
High school or above	205 (18.69)	62 (30.24)	18 (8.78)	
Marital status				< 0.01
Single	202 (18.41)	85 (32.18)	27 (13.37)	
Married	848 (77.30)	342 (40.33)	121 (14.27)	
Separated/divorced	47 (4.28)	20 (42.55)	15 (31.91)	
Prior anti-TB treatment				0.297
No	964 (87.88)	374 (38.80)	138 (14.32)	
Yes	133 (12.12)	53 (39.85)	25 (18.80)	

TB = tuberculosis.

them could be attributed to several factors. Most domestic internal migrants migrate from poor rural to urban areas to seek better livelihoods; they often live and work in crowded environments, have lower health literacy, and are less likely to seek health care when they are sick. In addition, low levels of social support, such as difficulty integrating into urban culture and lack of family companionship, may also increase their likelihood of experiencing depression. Despite depression may lead to a range of adverse health outcomes, including poor medication adherence, increased mortality, morbidity, and drug resistance, depression is treatable and early detection and intervention can prevent the long-term accumulation of depressive symptoms and their negative consequences.[24] Therefore, it is crucial to explore effective intervention strategies to alleviate depressive symptoms among patients with TB.

Previous studies that investigated the demographic factors contributing to depressive symptoms among TB patients have shown inconsistent results.[5,6,8,25] These differences in results may be attributable to differences in cultural contexts, data collection methods, population inclusion criteria, and measurement tools for depressive symptoms.[10] Our study indicated that gender and education levels among internal migrants with TB are associated with depressive symptoms, although other demographic characteristics such as age and marital status are not related. In line with previous research,[8,26] patients with TB who were female with a lower educational level were more likely to experience depressive symptoms. Thus, health care workers should pay attention to the psychological state of female and low-educated TB patients and help them alleviate depressive symptoms.

Our study showed that internal migrants with TB who had higher stigma scores were more likely to have depressive symptoms. Tuberculosis is commonly related with uncleanliness, and patients often suffer social and financial discrimination and experience a certain stigma.[27,28] Previous studies have shown that stigma damage patients' self-efficacy, self-esteem, and self-confidence, resulting in social withdrawal and concealment of patients, and ultimately increased their risk of psychological problems, such as depression symptoms.[29,30] Health care workers should, therefore, understand TB-related stigma and devise psychological interventions which are effective in reducing stigma during TB treatments.

Previous studies have shown that inadequate social support is associated with depression, which is consistent with our study.[6,31] Our study indicated that family dysfunction and bad doctor–patient communication have negative effects on depressive symptoms. For patients with TB, family members (including spouses, children, and parents) and health care workers are usually considered as the major sources of social support.[32] Patients with family dysfunction and poor doctor–patient communication will be more susceptible to being isolated and estranged which may predispose them to depression. In comparison with the Chinese general

TABLE 2
Family function, doctor–patient communication, and stigma among the internal migrants with tuberculosis with different depressive symptoms

	Family function	Doctor–patient communication	Stigma
Depressive symptoms	Mean ± SD	Mean ± SD	Mean ± SD
No	8.07 ± 1.84	11.50 ± 1.09	9.21 ± 4.09
Mild	6.83 ± 2.19	11.05 ± 1.33	10.24 ± 3.39
Moderate to severe	5.84 ± 2.11	11.00 ± 1.39	11.04 ± 3.19
P-value	< 0.001	< 0.001	< 0.001

TABLE 3
Multinomial logistic regression of factors associated with depressive symptoms among the internal migrants with TB

Variable	Depressive symptoms	
	Mild	Moderate to severe
Age	1.00 (0.98–1.01)	1.00 (0.98–1.01)
Gender (ref = males)	1.19 (0.88–1.61)	2.61 (1.69–4.01)***
Education (ref = high school or higher)		
Primary school and below	1.81 (1.13–2.90)***	3.21 (1.55–6.62)***
Middle school	1.39 (0.92–2.39)	1.41 (0.71–2.78)
Marital status (ref = single)		
Married	1.40 (0.88–2.22)	0.87 (0.44–1.69)
Separated/divorced/widowed	1.48 (0.60–3.72)	1.46 (0.47–4.51)
Prior anti-TB treatment (ref = no)	0.98 (0.63–1.54)	0.94 (0.50–1.75)
Family function	0.74 (0.69–0.80)***	0.61 (0.56–0.67)***
Doctor–patient communication	0.78 (0.69–0.87)***	0.82 (0.69–0.97)*
Stigma	1.06 (1.02–1.10)**	1.24 (1.16–1.32)***

TB = tuberculosis. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

population, the family function of patients with TB was significantly impaired. For example, the mean family APGAR score of participants in the current study (7.57 points) was lower than that reported by a previous study that assessed family function of rural residents in Hubei Province (8.08 points).[33] Given the importance of family support in Chinese culture, health workers should pay more attention to the group of individuals with dysfunctional families and take some educational programs and interventions for improving marital and intergenerational relationships among patients with TB. Furthermore, doctor–patient communication is also needed to be strengthened to fight against depressive symptoms.

The main limitation of the present study is its cross-sectional nature, which limits the possibility of establishing causal relationships among study variables. Conducting longitudinal studies to identify factors that associated with depression among patients with TB is required.

CONCLUSION

In conclusion, the prevalence of depressive symptoms among internal migrants with TB is high in China. Health workers need to raise awareness about the problem of depression among patients with TB. Proper interventions aimed at reducing depressive symptoms among internal migrants with TB may improve TB treatment outcomes. Given that the main factors associated with depressive symptoms among patients with TB in China include female, low education, stigma, family dysfunction, and poor doctor–patient communication, targeted interventions should focus on these factors.

Received July 22, 2019. Accepted for publication September 18, 2019.

Published online November 4, 2019.

Acknowledgments: We thank the Center for Disease Control and Prevention of Shenzhen for supporting. We also appreciate all study participants who have been involved and contributed to the procedure of data collection.

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