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The job burnout of tuberculosis healthcare workers and associated factors under integrated tuberculosis control model: a mixed-method study based on the two-factor theory

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Abstract

Background China has made remarkable achievements in tuberculosis (TB) prevention and control, but it still takes long way to achieve the End TB goal especially in underdeveloped Southwest China. TB healthcare workers (HCWs) are core forces in TB prevention and control but often face job burnout. This study aimed to explore the burden and associated factors of job burnout among TB HCWs in Southwest China.

Methods This cross-sectional study used both survey questionnaires and semi-structured interviews, to assess job burnout among TB HCWs based on Malasch Model and explore the associated factors based on Herzberg's two-factor theory (different hygiene and motivation factors). Quantitative data analysis adopts multiple linear regression to in SPSS 22.0, and qualitative data were analyzed through a framework approach.

Results A total of 1140 TB HCWs were included in questionnaire surveys. The overall job burnout rates of TB HCWs in Centers for Disease Control and Prevention (CDC), designated hospitals and Primary Health Care (PHC) sectors were 55%, 70.1% and 67.5%, respectively. TB HCWs in CDC who scored lower in interpersonal factors had a higher risk of depersonalization (DP) [B(95%CI): -0.89 (-1.71 to -0.80)]. TB HCWs in designated hospitals who scored lower in doctor-patient relationship factors [B (95%CI): 6.63 (-12.06 to -1.20)] were more likely to have emotional exhaustion (EE). TB HCWs who were less satisfied with training, supervision and assessment in PHC sectors [B(95%CI): 0.65 (0.03 to 1.26)] had less personal accomplishment (PA). Interviews with nine TB HCWs showed that poor environment could lead to high infection and heavy workload could lead to work pressure among TB HCWs in Chongqing. It is also found that performance assessment and management of TB HCWs, communication and cooperation and so on are related to job burnout.

Conclusions TB HCWs had different levels of job burnout in CDC, designated hospitals, and PHC sectors of Chongqing, which were affected by different hygiene and motivation factors. Governments, organizations and individuals should take cooperative measures such as strengthening communication to deal with job burnout among TB HCWs.

Keywords Tuberculosis, Healthcare workers, The two-factor theory, Chongqing

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Introduction

Tuberculosis (TB) is a communicable disease that is a major cause of ill health and one of the leading causes of death worldwide. According to the WHO Global TB report 2023, an estimated 10.6 million people fell ill with TB in 2022, an increase of 4.5% from 2020, and 1.6 million people died from TB (including 187,000 among HIV positive people) [1]. TB has the characteristics of long course, difficult screening, challenging management, and easy recurrence, so TB HCWs engaged in control work for long time face a greater risk of infection. TB HCWs are at high risk of occupational exposure and latent TB infection. Therefore, TB HCWs face high stress and potentially experience severe job burnout, which not only has a negative impact on their health and work efficiency, but also affects the treatment for TB patients and then affects the overall process of TB prevention and control. However, very few studies reported job burnout among TB HCWs. SeoHae-Suk reported 67.3% of nurses and 57.7% of physicians had job burnout at public tuberculosis hospitals in South Korea [2]. China accounted for 7.4% of TB patients worldwide and was ranked as the third country with high TB burden in the world [1] and faced challenges of ending TB, especially in underdeveloped West China [3, 4].

Job burnout firstly proposed by American psychologist Freudenberger in 1974 refers to physical and mental fatigue and exhaustion of individuals under work pressure, which is an extreme reaction of emotion, attitude and behavior when individuals cannot cope with work pressure after a long-term stress experience [5]. Maslach et al. firstly proposed a three-dimensional model including Emotional Exhaustion (EE), Depersonalization (DP) and Personal Accomplishment (PA) to study job burnout [6, 7]. EE refers to insufficient energy and exhaustion caused by excessive consumption of emotions, resulting in the inability to concentrate on work and expectation of leaving the job, which is the most obvious indicator of job burnout. DP means the indifference to others and the decline in attitude towards service recipients. Reduced PA refers to negative evaluations of oneself, including lower expectations of work achievements and reduced effort. Maslach's three-dimensional model is currently the most widely used model in job burnout [6]. Previous research mentioned that job burnout was one of the most common symptoms among healthcare workers (HCWs) [8, 9], and the average of job burnout rate reached 67.0% among HCWs globally [10]. In 2003, Li et al. surveyed 218 medical personnel in three hospitals and found that the incidence of burnout in the three dimensions of EE, DP, and reduced PA was 42.1%, 22.7%, and 48.6% respectively [11].

However, the job burnout among infectious disease HCWs is more severe. In America, the Infectious Diseases Society of America used the Maslach Burnout Scale among 1840 infectious disease doctors and found that 43.5% of doctors had EE, and 40.3% of doctors had DP [12]. In China, Li et al. researched among 200 infectious disease prevention personnel and found that the incidence of job burnout was above moderate (75.85%) [13]; Qiao found that 76.9% of 501 AIDS HCWs met the job burnout criteria [8]; Qiu et al. found that 44.7% of 403 personnel in Centers for Disease Control and Prevention (CDC) had job burnout [14]. In Africa, Kruse conducted research among AIDS HCWs and reported the burnout rate of 51% in Zambia [15]; Hamzeh found HCWs had the burnout rate of 57.7% in Jordan during the COVID-19 pandemic [16].

The increase of public health emergencies [17], hospital management factors [18], interpersonal relationship factors [10, 19], job satisfaction [19], job type and working years [5, 10], training situation [20], job support [17, 20, 21], task responsibility [21], and work pressure [10] were identified as the influencing factors of burnout. The study of South Africa [22] explored the influencing factors in three dimensions of burnout: work burden and interpersonal relationships associated with EE, organizational management, interpersonal relationships and HIV stigma associated with DP, and work position associated with reduced PA. One study [23] has explored the consequences of burnout, such as the decrease in the quality of service and the increase in the intention of leaving. Researchers also suggested measures to address job burnout, including strengthening the protective equipment facilities [24], establishing peer support groups, developing workplace HIV prevention policies [23], and raising HCWs' protection awareness [25].

Previous studies hinted inadequate qualified HCWs is one of the difficulties in China TB control [11, 26]. Fewer studies reported job burnout among TB HCWs. Only Li and Zhang reported TB HCWs in Yunnan and Beijing had the job burnout rates of 70.63% and 62.7%, respectively [11, 27]. Our previous research disclosed TB HCWs in Chongqing faced challenges including heavy job burden and associated factors needed further research [28]. Thus, this study aimed to assess job burnout and investigate associated factors among TB HCWs in West China which assist strategy development related to improve human resource related to TB care. Since TB is a global health problem, the exploration on job burnout and associated factors among TB HCWs in West China could contribute to the global experience of TB prevention and control, particularly regions with high TB burden.

Methods

Study setting

Chongqing as a municipal city in West China was among the top eight throughout the country with the TB incidence rate (61.7/100,000) higher than the average (45.5/100,000) in 2021, and some districts and counties have been more than four times higher than the average level of China [29]. This study purposively selected Chongqing as study place in West China. A stratified random sampling method was used to select the study sites in Chongqing. The level of tuberculosis incidence in Chongqing was divided into high- (>100/100,000), medium–high (66.68–100/100,000), medium–low (55.01–66.67/100,000), and low (<55/100,000) [29]. Four districts/counties were randomly selected from each incidence level area, and a total of 16 districts and counties were included as research sites. According to the integrated TB control model in China [30], CDC is responsible for planning and coordination, designated hospitals are responsible for clinical diagnosis and treatment, and PHC sectors are responsible for patient management. Quantitative research was conducted at the TB department of Centers for Disease Control and Prevention (CDC), designated hospitals, and Primary Health Care (PHC) sectors including community health centers, township health centers, and village clinics. Qualitative research conducted at the selected research sites to select participants for interview.

Study design

This cross-sectional study used mixed research methods to collect data from September 2021 to June 2022. We used the convergence approach for the analysis of data, to integrate qualitative and quantitative results. Questionnaire surveys and semi-structured in-depth interviews were conducted to explore the factors influencing job burnout among TB HCWs in Chongqing (Additional file 1 and 2).

Framework of factors associated with job burnout of TB HCWs

According to Herzberg's two-factor theory, factors that affect employees' work motivation can be divided into motivation factors and hygiene factors. Motivation factors known as internal factors are related to work content, nature and employees' subjective feelings. Hygiene factors known as external factors are related to working conditions and environment, salary, and factors that do not create incentives but merely eliminate dissatisfaction [28]. Previous research used the two-factor theory to explore the job burnout among physicians, nurses, and doctors to analyze data and measures [19, 24, 25, 29].This study considers TB HCWs' characteristics such as heavy workload, the lack of work enthusiasm and the instability of professional team, and included four motivation factors including workload factors, personal development and achievement factors, work support factors, meaning and responsibility factors. Similarly, considering TB HCWs' characteristics of low income, the lack of facilities and insufficient diagnosis, hygiene factors include environmental and conditional factors, payment factors, training, supervision and assessment factors, organizational management factors, doctor-patient relationship factors and interpersonal factors (Fig. 1).

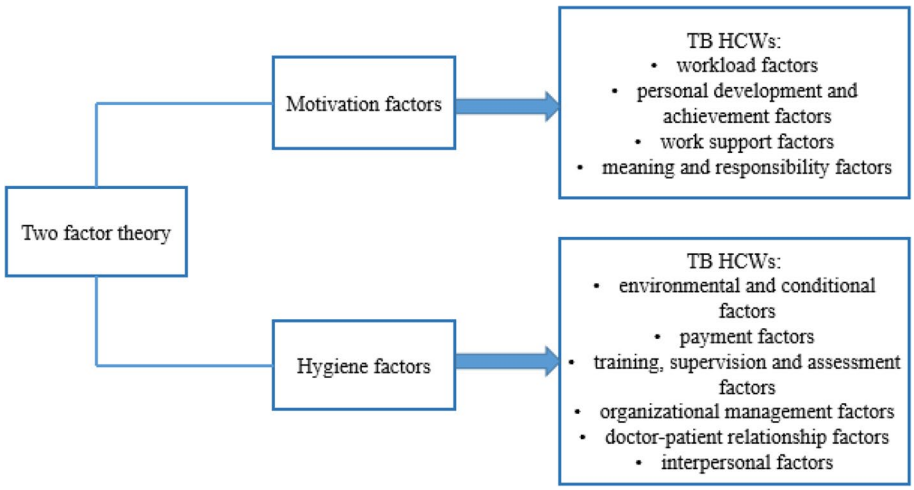

Fig. 1 Framework of factors associated with job burnout of TB HCWs. The figure presents the hygiene and motivation factors of TB HCWs according to the two-factor theory

Study participants and data collection

Quantitative study

Participants who enrolled in our study met the inclusion and exclusion criteria. The inclusion criteria were the in-service TB HCWs from CDC, designated hospitals, and PHC sectors in the selected research sites of Chongqing, who are professional HCWs related to TB control, excluding cleaners and accountants, etc. The exclusion criteria were personnel who refused to sign the informed consent form and whose institution leaders refused to participate in the study. The sample size was estimated using the Kish and Leslie formula: $n = \left({}^{z_{\alpha}^{2}p(1-p)}/_{d^{2}}\right)$, where n is the minimum desired sample size. z_{α}^{2} is the standard normal deviate, usually set as 1.96, corresponding to a 5% level of significance. P is the minimum job burnout rate, set at 44.7% based on estimates from the available literature on the job burnout rate of HCWs in China [31], and d is the degree of accuracy (precision) set at 10% (0.1). The minimum sample size is calculated as n≈903. Structured questionnaires were administered to collect data from participants. This was a closed ended questionnaire in 4 parts: (1) demographic information (e.g. gender, age and marriage status) in unordered multiple classification options; (2) hygiene factors (e.g. environment, training and assessment) in ordered multiple classification options; (3) motivation factors (e.g. responsibility, support and achievement) in ordered multiple classification options; and (4) job burnout. The job burnout was measured using the Chinese version of the Maslach Burnout Inventory-Human Services Survey (CMBI-HSS), which was translated by Chinese scholar Li Chaoping and reviewed and finalized by Christina Maslach herself in 2003 [32]. The CMBI-HSS scale is publicly used in China and is currently widely used in research on various groups of people, including medical personnel. Each item can be measured on a 7-point Likert scale ranging from "never" (=0) to "daily" (=6) [32], which may take about 15 min to complete. The results of this inventory consist of three separate scores, one for each factor. High scores on EE (0–54 points), DP (0–30 points) and low scores on PA (0–48 points) correspond to high levels of burnout. The overall level of job burnout is determined using the Li's standard [30, 31]: If the EE and DP scores are higher than the upper tertiles, the PA score is lower than the lower tertiles, the dimension is considered positive. If all three dimensions are negative, it is no burnout; if only one dimension is positive, it is mild burnout; if two dimensions are positive, it is moderate burnout; if all three dimensions are positive, it is severe burnout. The presence of mild burnout or above is considered as job burnout. Questionnaires were designed by our research team based on existing literature and then consulted with related experts.

The reliability and validity analysis of the scoring system was conducted to test the validity and consistency of the questionnaire, and the Kaiser–Meyer–Olkin (KMO) and Cronbach's alpha values were used to evaluate the internal consistency and construct validity of the scoring system [33]. It was found that the overall questionnaire (Cronbach $\alpha = 0.768$, KMO = 0.763) and the job burnout scale (Cronbach $\alpha = 0.887$, KMO = 0.888) had good construct validity and internal consistency (Cronbach's alpha greater than 0.7, and KMO range from 0.8–0.9). All questionnaires were administered by trained investigators from our research group in a meeting or clinic room in each institution. Those who were willing to participate in the study were asked to read and sign the informed consent form to ensure confidentiality. Each completed questionnaire was checked and examined for quality control by trained investigators.

Qualitative study

Qualitative and quantitative research were conducted at the same time. The interview guide was developed by discussion with the research team and experts and pilot test, including interviewees' basic information, work experience, difficulties and suggestions, etc. Purposive sampling method was used to select TB HCWs and leaders from CDC, designated hospitals and PHC sectors within each site as study participants. During recruitment, personnel and leaders were approached and provided detailed explanations of the study and its objectives by YL, WZ and QW. Those who expressed an interest in volunteering to participate in the in-depth interview were asked to read and sign an informed consent form to confirm their voluntary participation in the study. The sample size of the qualitative study was determined by the point of data saturation [18], which means when researchers find that data no longer provides new information or views, they could consider the information saturated and stop further data collection. Each interview was conducted face to face in a quiet office room with no one else by at least two trained interviewers (GW, JZ and YC) who were not known to the participants. One was the main interviewer and others assisted, to enhance the information's trustworthiness and credibility. At the end of each interview, the interviewers discussed the findings and key information obtained to confirm whether a supplementary interview was required. Semi-structured topic guides were used in all interviews. Each interview lasted approximately 40–60 min. All interviews were audio-recorded and transcribed for the analysis.

Data analysis

Quantitative analysis

Quantitative data were compiled in Epi Data 3.1, and analyzed using Statistical Package for Social Science (SPSS 22.0) (IBM Corporation, Armonk, NY, USA). Missing data were excluded from the analysis. Descriptive analysis was used to present participants' basic information and their overall levels of job burnout. Kruskal–Wallis H test was used to explore the overall difference of job burnout in different institutions. Spearman rank correlation test was used to analyze and screen variables. Multiple linear regression was used to explore factors associated with job burnout. Demographic characteristics of HCWs were taken as confounding factors and adjusted when we analyze internal and external factors associated with job burnout.

Qualitative analysis

Each interview was transcribed and reviewed for accuracy. All in-depth interviews were analyzed using a framework approach, including familiarizing the data, identifying and coding themes, and summarizing and analyzing the data [21]. Researchers transcribed data into electronic documents, including audio recordings and on-site notes (XF, QH, TZ and SL). To ensure anonymity, all names of participants were removed from the citations. The analysis framework was developed under the guidance of experts and according to the two-factor theory, motivation factors and hygiene factors were discussed by the research group, and each topic was analyzed independently by two members (YL and GW) in the research team who did not participate in the on-site interview. It is submitted to all members in the research team to review and complete a final version, and then it is translated into English version with the guidance of experts.

Results

Demographic characteristics of participants

A total of 1194 personnel were invited to participate in the survey and 54 declined, with 95.47% response rate. The sociodemographic characteristics are shown in Table 1. Most TB HCWs were married (78.9%, $n=889$), received medical education (88.9%, $n=1013$), and felt good about their health (61.7%, $n=703$). Around half were women (59.6%, $n=679$), had more than 2 children (40.5%, $n=461$), had junior professional titles (44.6%, $n=509$), studied clinical medicine (41.2%, $n=407$), and attended junior college (40.4%, $n=460$). 46.1% ($n=526$) were formal personnel, 78.3% ($n=893$) worked in PHC sectors, 29.5% ($n=336$) were from medium low epidemic areas, and 37.8% ($n=431$) worked for less than 3 years.

Totally 9 participants were included in qualitative study, including 1 leader from the Chongqing Institute of Tuberculosis Control, 1 leader from the tuberculosis department of a designated hospital, 2 doctors from designated hospitals, 2 TB HCWs from CHCs, and 3 TB HCWs from THCs. Most participants were men (6/9) and attended junior college (6/9).

The job burnout levels of TB HCWs in Chongqing

Based on previous literature on the job burnout determination criteria [32], the overall job burnout rate of TB HCWs in CDC was 55% (28.0% mild, 16.0% moderate and 11.0% severe job burnout rates), that of TB HCWs in designated hospitals was 70.1% (30.6% mild, 34.0% moderate and 5.4% severe job burnout rates), and that of TB HCWs in PHC sectors was 67.5% (32.6% mild, 26.1% moderate and 8.8% severe job burnout rates) (Fig. 2).

The score of 3 dimension of job burnout in different TB prevention and control institutions

We used rank sum test (Kruskal–Wallis H test) to calculate the score of each dimension in job burnout as dependent variables, and the TB prevention institutions as independent variables. As seen in Table 2, in CDC, the average score of emotional exhaustion (EE) was 13.49 ± 9.59, the score of depersonalization (DP) was 3.54 ± 4.09, and the score of personal accomplishment (PA) was 28.65 ± 10.25.In the designated hospitals, the average score of emotional depletion (EE) was 17.69 ± 11.22, the score of depersonalization (DP) was 5.67 ± 6.10, and the score of personal accomplishment (PA) was 31.20 ± 10.10; In PHC sectors, the average score of emotional depletion (EE) was 14.32 ± 11.32, the score of depersonalization (DP) was 4.73 ± 5.60, and the score of personal accomplishment (PA) was 27.57 ± 12.69. The scores of EE, DP and PA in different TB prevention and control institutions were significantly different: EE ($H=14.67$, $P<0.01$) 、DP ($H=7.09$, $P=0.03$) 、PA ($H=11.19$, $P<0.01$), it is necessary to analyze the influencing factors of job burnout in various dimensions of TB prevention and control institutions.

Qualitative results of factors associated with job burnout of TB HCWs in Chongqing

Table 3 presents qualitative results of hygiene and motivation factors associated with job burnout of TB HCWs in Chongqing.

Hygiene factors

(1) TB HCWs reported poor working environment and conditions and high risks of infection, which affected

Table 1 Demographic characteristics of participants ($n = 1140$)

Demographic characteristics	Number (N)	Percentage (%)
Gender ($n = 1140$)		
Male	461	40.4
Female	679	59.6
Age ($n = 1140$)		
< 30	193	25.3
30–39	477	27.2
40–49	326	29.5
≥ 50	206	18.1
Marriage status ($n = 1140$)		
Unmarried	195	17.1
Married	899	78.9
Divorce/Widow	46	4.0
Number of children ($n = 1140$)		
None	251	22.0
One	428	37.5
Two and above	461	40.5
Education level ($n = 1140$)		
High school/vocational school and below	254	22.3
Junior college	460	40.4
Undergraduate	404	35.4
Master's degree (including MPH) and above	22	1.9
Professional title ($n = 1140$)		
None	374	32.8
Junior	509	44.6
Intermediate	207	18.2
Senior	50	4.4
Medical education ($n = 1140$)		
Yes	1013	88.9
No	127	11.1
Major ($n = 1013$)		
Clinical medicine	470	41.2
Public health	84	7.4
Chinese medicine	88	7.7
Health service management	13	1.1
Nursing	271	23.8
Pharmacy	43	3.8
Others	44	3.9
Self-reported health status ($n = 1140$)		
Not good	82	7.2
Fair	355	31.1
Good	703	61.7
Workplace ($n = 1140$)		
CDC	100	8.8
Designated hospitals	147	12.9
PHC sectors	893	78.3
Epidemic situations at workplace ($n = 1140$)		
Low	268	23.5
Medium low	336	29.5
Medium high	266	23.3

Table 1 (continued)

Demographic characteristics	Number (N)	Percentage (%)
High	270	23.7
Years of working (*n* = 1139)		
≤ 3 years	431	37.8
3–10 years	255	22.4
11–20 years	237	20.8
> 20 years	216	18.9
Staffing status (*n* = 1140)		
Formal staff	526	46.1
Long-term contract	260	22.8
Short-term contract	354	31.1

CDC refers to Centers for Disease Control and Prevention; PHC refers to primary health care

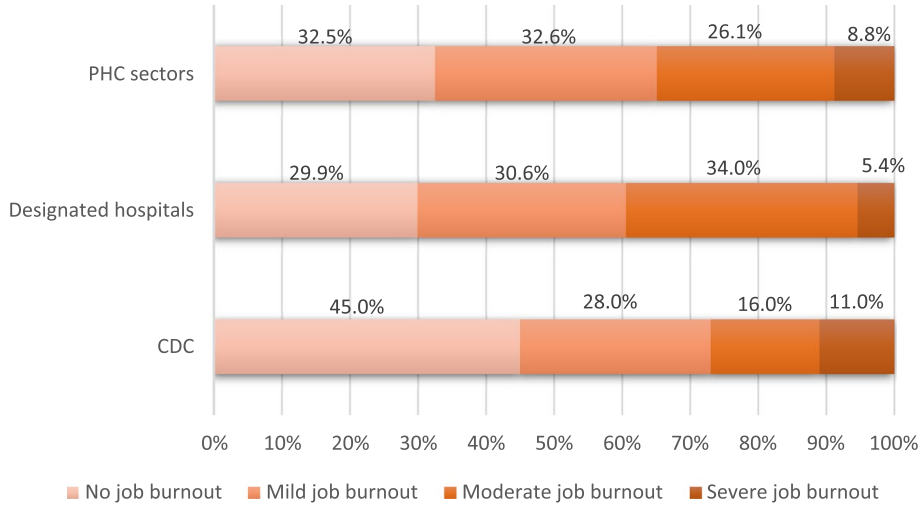

Fig. 2 The job burnout levels of TB HCWs in the integrated TB control model of Chongqing. The figure the overall job burnout rate of TB HCWs in CDC, designated hospitals and PHC sectors

Table 2 Comparison of job burnout scores of 3 dimensions in different TB prevention and control institutions

Items	EE ($(\overline{X}\pm S)\pm S$)	H	P	DP ($\overline{X}\pm S$)	H	P	PA ($\overline{X}\pm S$)	H	P
CDC (*n* = 100)	13.49 ± 9.59	14.67	< 0.01	3.54 ± 4.09	7.09	0.03	28.65 ± 10.25	11.19	< 0.01
Designated hospitals (*n* = 147)	17.69 ± 11.22			5.67 ± 6.10			31.20 ± 10.10		
PHC sectors (*n* = 893)	14.32 ± 11.32			4.73 ± 5.60			27.57 ± 12.69		

their work and rest. (2) TB HCWs thought their payment was low and were in lack of motivation mechanisms, which could be improved by adding benefits. (3) TB HCWs lacked initiatives on training, their assessment contents were often not matched with what they did, and they were worried about evaluation on their performance. (4) Leaders only focused on results and ignored poor coordination between departments. (5) TB HCWs reported poor communication with patients, which could be improved by managing patients effectively with the help of government departments.

Motivation factors

(1) TB HCWs complained about heavy workload, overtime shifts, and high pressure. (2) TB HCWs were not optimistic about the future development and reported

Table 3 Qualitative results of hygiene and motivation factors associated with job burnout of TB HCWs in Chongqing

Themes	Results	Quotations
Hygiene factors	The environment and conditions of PHC sectors and designated hospitals were poor, which affected the work and rest of TB HCWs	"We do not have a separate office, which may have increase infection risks among colleagues." (TB HCW in PHC sectors) "Even patients felt that our conditions were poor." (TB HCW in designated hospital)
	The payment of TB HCWs in PHC sectors and designated hospitals was low and the performance distribution is unreasonable	"Our basic salary was 3,000 yuan per month for years. (TB HCW in PHC sectors) "We get the same amount of money doing less or more." (TB HCW in designated hospital)
	TB HCWs in designated hospitals PHC sectors were not passionate about training and were worried about supervision and criticism from leaders. Leader in CDC reported that the assessment did not match with the actual situation	"There were not many participants in training." (Leader in the designated hospital) "We are under pressure because leaders will yell if we don't do well." (TB HCW in PHC sectors) "We have to complain that the assessment does not consider the actual situation enough." (Leader in CDC)
	There was a lack of cooperation between departments in PHC sectors and designated hospitals. Leaders in PHC sectors valued results more than processes. Being open to doctors' leaving intentions could prevent doctors from showing negative emotions	"Now the screening is all in our department, and other departments are not involved…leaders only look at the result and does not look at the process." (TB HCW in PHC sectors) "Our clinicians and program doctors are in lack of cooperation on drug prescription." (TB HCW in designated hospital) "Doctors chose to leave because they have better development opportunities. I support them so they do not have negative emotions." (Leader in designated hospital)
	TB HCWs had communication problems with patients and suggested that leaders and government departments should participate in communication with patients	"I find it difficult to communicate with some patients." (TB HCW in designated hospital) "There is a young man who is very uncooperative, but he cooperates with the leader of our public health department." (TB HCW in PHC sectors) "It's better for the government to intervene to support patients' medical insurance or other subsidies." (TB HCW in PHC sectors)
Motivation factors	TB HCWs had heavy workload, long working hours and high pressure, and doctors in designated hospitals were not motivated	"When the epidemic occurs in the school…it will at least last for two weeks until eleven or twelve at night." (TB HCW in PHC sectors) "I feel not very motivated, having tiredness and long-term pressure to be on duty." (Leader in designated hospital)
	TB HCWs in PHC sectors and designated hospitals were not optimistic about the current situation and development. TB HCWs in PHC sectors and CDC lacked material rewards and did not value spiritual rewards	"I am not positive about the development of my workplace." (TB HCW in PHC sectors) "If I could choose, I will choose clinics in the general hospital." (TB HCW in designated hospital) "Their pursuit is not high, and they do not value spiritual rewards." (Leader in CDC)
	Families, the public, and government departments did not pay enough attention to and do not support TB HCWs' work	"Doctors are too young. Patients have limited trust in township health centers and do not trust us enough." (Leader in CDC) "My family were worried that I would be infected with TB." (TB HCW in PHC sectors) "Someone in the government department has TB, but leaders did not approve us to leave work." (TB HCW in PHC sectors)
	Leaders lacked confidence in achieving the goal of eliminating TB and suggested learning from COVID-19 prevention practices. TB HCWs in PHC sectors reported treated patients' joy could bring them satisfaction Leaders in CDC reported the lack of knowledgeable TB HCWs	"I think it would be difficult to achieve the goal of eliminating TB by 2035." (Leader in CDC) "If it could be dealt with according to the COVID-19, it is much more likely to be ended." (Leader at designated hospital) "Hearing TB patients to say that they have stopped the drug and have been cured made us mutually happy." (TB HCW in PHC sectors) "At present, there is a lack of people who have a comprehensive understanding of TB." (Leader in CDC)

TB refers to tuberculosis, CDC refers to Centers for Disease Control and Prevention, PHC refers to primary health care, EE refers to Emotional Exhaustion, DP refers to Depersonalization, PA refers to Personal Accomplishment

the lack of rewards. (3) TB HCWs reported the lack of support from families, the public, and government departments. (4) Leaders reported that there is a lack of confidence in achieving the goal of ending TB, which could be improved by reinforcing the integrated TB control model, educating residents, and referring to the experience against the COVID-19. (5) TB HCWs reported their intentions of leaving for other work, which could be avoided by building their sense of achievement and satisfaction at work.

Quantitative study on factors associated with job burnout of TB HCWs in Chongqing

Table 4 depicts the univariate analysis of hygiene and motivation factors associated with job burnout of TB HCWs in CDC, designated hospitals, and PHC sectors. Table 5 shows the multivariate analysis of hygiene and motivation factors associated with job burnout of TB HCWs in CDC, designated hospitals, and PHC sectors.

Factors associated with job burnout of TB HCWs in CDC

Regarding hygiene factors, univariate analysis indicated that Training, supervision and assessment factors ($P<0.01$), organizational management factors ($P<0.01$), doctor-patient relationship factors ($P<0.01$), interpersonal factors ($P<0.01$) were associated with TB HCWs' EE. Training, supervision and assessment factors ($P=0.01$), doctor-patient relationship factors ($P=0.01$), interpersonal factors ($P<0.01$) were associated with TB HCWs' DP. Supervision and assessment factors ($P=0.01$), organizational management factors ($P<0.01$), interpersonal factors ($P<0.01$) were associated with TB HCWs' PA. Among motivation factors, workload factors ($P=0.03$), work support factors ($P<0.01$) were associated with TB HCWs' EE; work support factors ($P<0.01$) were associated with TB HCWs' DP; personal development and achievement factors ($P=0.04$) and work support factors ($P<0.01$) were associated with TB HCWs' PA.

Regression analysis showed that TB HCWs in CDC who scored lower in interpersonal factors had a higher risk of DP [B(95%CI): -0.89 (-1.71 to -0.80)]. TB HCWs who were less satisfied with training, supervision and assessment in CDC had less PA [B(95%CI): 2.13 (0.91 to 3.35)].

Factors associated with job burnout of TB HCWs in designated hospitals

Among hygiene factors, univariate analysis indicated that Environmental and conditional factors ($P<0.01$), payment factors ($P=0.04$), training, supervision and assessment factors ($P=0.03$), organizational management factors ($P<0.01$), doctor-patient relationship factors ($P<0.01$), interpersonal factors ($P<0.01$) were associated with TB HCWs' EE. Training, supervision and assessment factors ($P=0.01$), organizational management factors ($P<0.01$), doctor-patient relationship factors ($P<0.01$), interpersonal factors ($P=0.02$) were associated with TB HCWs' DP. Regarding motivation factors Workload factors ($P<0.01$) and work support factors ($P<0.01$) were associated with TB HCWs' EE. Work support factors ($P<0.01$) were associated with TB HCWs' DP.

Multivariate linear regression analysis showed that TB HCWs in designated hospitals who scored lower in doctor-patient relationship factors [B(95%CI): -6.63 (-12.06

Table 4 Univariate analysis of hygiene and motivation factors associated with job burnout of TB HCWs in Chongqing ($n=1140$)

Items	CDC			Designated hospitals			PHC sectors		
	EE	DP	PA	EE	DP	PA	EE	DP	PA
Hygiene factors									
Environmental and conditional factors				√√			√√	√√	√
Payment factors				√			√√	√√	
Training, supervision and assessment factors	√√	√	√√	√	√		√√	√√	√√
Organizational management factors	√√		√√	√√	√√		√√	√√	√√
Doctor-patient relationship factors	√√	√		√√	√√		√√	√	√√
Interpersonal factors	√√	√√	√√	√√	√		√√	√√	√√
Motivation factors									
Workload factors	√			√√					
Personal development and achievement factors			√						√√
Work support factors	√√	√√	√√	√√	√√		√√	√√	√√
Meaning and responsibility factors							√√	√√	

CDC refers to Centers for Disease Control and Prevention, PHC refers to primary health care, EE refers to Emotional Exhaustion, DP refers to Depersonalization, PA refers to Personal Accomplishment

√: $P<0.05$, √√: refers to $P<0.01$

Table 5 Multivariate analysis of hygiene and motivation factors associated with job burnout of TB HCWs in Chongqing

Items	CDC B(95% CI)		Designated hospitals B (95% CI)		PHC sectors B(95% CI)		
	DP	PA	EE	DP	EE	DP	PA
Hygiene factors							
Environmental and conditional factors					-0.46 (-0.73 to -0.19)[a]		
Payment factors							
Training, supervision and assessment factors		2.13 (0.91 to 3.35)[a]				-0.55 (-0.87 to -0.22)[a]	0.65 (0.03 to 1.26)[a]
Organizational management factors						-0.12 (-0.21 to -0.03)[a]	
Doctor-patient relationship factors			-6.63 (-12.06 to -1.20)[a]	-1.77 (-3.31 to -0.23)[a]	-1.23 (-2.16 to -0.29)[a]		
Interpersonal factors	-0.89 (-1.71 to -0.80)[a]						0.97 (0.15 to 1.78)[a]
Motivation factors							
Workload factors			-3.65 (-5.74 to -1.55)[a]				
Personal development and achievement factors							
Work support factors					-0.93 (-1.46 to -0.39)[a]		
Meaning and responsibility factors					-0.73 (-1.35 to -0.10)[a]		

CDC refers to Centers for Disease Control and Prevention, PHC refers to primary health care, EE refers to Emotional Exhaustion, DP refers to Depersonalization, PA refers to Personal Accomplishment

[a] $P < 0.05$

to -1.20)] and had higher workload [B(95%CI): -3.65 (-5.74 to -1.55)] were more likely to have EE, respectively. TB HCWs in designated hospitals who scored lower in doctor-patient relationship factors had a higher risk of DP [B(95%CI): -1.77 (-3.31 to -0.23)].

Factors associated with job burnout of TB HCWs in PHC sectors

Univariate analysis indicated that environmental and conditional factors ($P < 0.01$), payment factors ($P < 0.01$), training, supervision and assessment factors ($P < 0.01$), organizational management factors ($P < 0.01$), doctor-patient relationship factors ($P < 0.01$), and interpersonal factors ($P < 0.01$) were associated with TB HCWs' EE. Environmental and conditional factors ($P < 0.01$), payment factors ($P < 0.01$), training, supervision and assessment factors ($P < 0.01$), organizational management factors ($P < 0.01$), doctor-patient relationship factors ($P = 0.03$), and interpersonal factors ($P < 0.01$) were associated with TB HCWs' DP. Environmental and conditional factors ($P = 0.03$), training, supervision and assessment factors ($P < 0.01$), organizational management factors ($P < 0.01$), doctor-patient relationship factors ($P < 0.01$), and interpersonal factors ($P < 0.01$) were associated with TB HCWs' PA. Given Motivation factors, work support factors ($P < 0.01$) and meaning and responsibility factors ($P < 0.01$) were associated with TB HCWs' EE; work support factors ($P < 0.01$) and meaning and responsibility factors ($P < 0.01$) were associated with TB HCWs' DP; personal development and achievement factors ($P < 0.01$) and work support factors ($P < 0.01$) were associated with TB HCWs' PA.

The multivariate linear regression analysis demonstrated that TB HCWs in PHC sectors who scored lower in environmental and conditional factors [B(95%CI): -0.46 (-0.73 to -0.19)] and doctor-patient relationship factors [B(95%CI): -1.23 (-2.16 to -0.29)], who had less work support [B(95%CI): -0.93 (-1.46 to -0.39)] and meaning and responsibility [B(95%CI): –0.73,(-1.35 to -0.10)] were more likely to have EE, respectively. TB HCWs who were less satisfied with training, supervision and assessment in PHC sectors [B(95%CI): -0.55 (-0.87 to -0.22)] and who scored lower in organizational management factors [B(95%CI): -0.12 (-0.21 to -0.03)] had a higher risk of DP, respectively. TB HCWs who were less satisfied with training, supervision and assessment in PHC sectors [B(95%CI): 0.65 (0.03 to1.26)] and

who scored lower in interpersonal factors [B(95%CI): 0.97 (0.15 to 1.78)] had less PA, respectively.

Discussion

Job burnout among TB HCWs in different institutions

We found that the job burnout rate of TB HCWs in CDC was 55%, lower than that of CDC in Jiangsu Province (59.5%) [34]. The job burnout rate of TB HCWs in designated hospitals was 70.1%, higher than that of designated hospitals in Yunnan Province (67.9%) [11]. The job burnout rate of TB HCWs in PHC sectors was 67.5%, higher than that of Basic Public Health Service personnel in Chongqing (63.17%) [35]. Therefore, the job burnout rate of TB HCWs in Chongqing may be at a high level, especially in designated hospitals and PHC sectors.

This study used the two-factor theory to discuss two categories of factors that affected job burnout among TB HCWs in CDC, designated hospital and PHC sectors. The use of two-factor theory could identify job burnout problems among TB HCWs more clearly and accurately. We found that there were DP and PA affected by 2 hygiene factors in CDC. There were EE affected by 2 hygiene and 1 motivation factors, and DP affected by 1 hygiene factor in designated hospitals. There were EE affected by 2 hygiene and 2 motivation factors, DP and PA affected by 2 hygiene factors respectively in PHC sectors.

As the management unit of tuberculosis prevention and control, the interpersonal relationship is more sensitive and complex in CDC. A study found that it was more difficult for personnel with poor interpersonal relationships to obtain information and advice from the group [9]. This study found that HCWs with worse interpersonal relationships in CDC had more serious DP, which belonged to hygiene factors. The proportion of personnel with high educational level and senior professional titles in CDC of China has increased significantly [36], whose expectation towards PA are high [37]. HCWs who have participated in professional training are more likely to have higher PA due to their improved knowledge and skills [38]. Dissatisfaction with training may reflect that their knowledge and skills have not been improved, resulting in the decrease in PA which belonged to hygiene factors. However, no influencing factor in EE has found among TB prevention and treatment personnel in CDC, which might be the fact that personnel in CDC are mainly responsible for the management of tuberculosis, and have less pressure of contacting with patients and less risk of infection than those in designated hospitals and PHC sectors.

TB prevention and treatment personnel in the designated hospital need to directly deal with patients and conflicts, which may result in EE. Besides, DP was found to be more severe among personnel when the number of their patients increased, which led to the decrease of their relationships with patients [39]. Lin found that the DP was more severe among those with poorer doctor-patient relationships [40], which was consistent with this study. Compared with PHC sectors, designated hospitals face more doctor-patient relationship problems (outpatient, nursing, drug distribution, etc.) [30]. The ineffective communication with the less educated and elderly patients may lead to TB HCWs' DP and the decline of work efficiency, which belonged to hygiene factors. A systematic review showed that increased workload contributed to nurses' reluctance to continue working. Previous study suggested that heavy workload in infectious disease hospitals are primary stressors to cause EE [41], which is consistent with our study. Designated hospitals are responsible for many tasks such as diagnosis and treatment, so heavy workload could lead to increased pressure and reduced work motivation among TB HCWs, which belonged to motivation factors. No factor in PA was found among TB prevention and treatment personnel in designated hospital. It may be that TB prevention and treatment personnel in the designated hospital had professional qualification on diagnosis and treatment, so they have already had confidence and recognition on their work, which is consistent with the finding that HCWs who participated in specialized training had a higher level of PA [37].

The poor work environment has caused TB HCWs' fear of infection in PHC sectors, which belonged to hygiene factors. Studies in Zambia found that poor working conditions created medical personnel's concerns on infection and led to job burnout [15], which is consistent with our finding. Other study also found that when workers faced poor working environment, they tended to have leaving intentions and lose their focus on work [42]. This study found that there was no separate place to contact with patients in PHC sectors, which could lead to high infection risks. Good work environmental conditions could eliminate TB HCWs' fear of infection and play an important role in ensuring their job satisfaction and their quality of work] [43]. The training does not meet HCWs' needs and they had psychological pressure on supervision and assessment, which belonged to hygiene factors. HCWs have different needs for the content, frequency, and form of training [44], and it is difficult to meet the needs of every TB HCWs in a unified training, resulting in the insufficient improvement of their patient communication skills, which may affect TB HCWs' service quality and lead to DP [38] and the decrease in PA similar to that in CDC. This study found that the reasons for TB HCWs' dissatisfaction included the emotional tension, much attention paid to patients but little to TB HCWs' work

situation, and the stress caused by leadership criticism. The pressure of superior supervision and assessment faced by TB HCWs often affected their work status. Studies have found that TB HCWs tended to lose empathy for patients under stress, develop negative emotions and job burnout [45], which leads to the decline of service quality and attitude resulting in DP and the decline in PA. Besides, insufficient management has led to the disorder of TB prevention and control in PHC sectors, which belonged to hygiene factors. Previous study mentioned that TB HCWs' lack of care from organizations led to their dissatisfaction and negative working attitudes [46]. One study found that the strong organizational support can improve medical personnel's ability to deal with public health emergencies, increase loyalty, reduce dissatisfaction, and ensure positive work attitudes [47]. This study found that the poor organization and management led to DP among TB HCWs. Notably, interpersonal relationships influenced TB HCWs' sense of identity in PHC sectors, which belonged to hygiene factors. This study found that people with poor interpersonal relationships had a more severe decrease in PA, similar to Guan's findings of [48]. In addition, doctor-patient relationship on EE has also been found in PHC sectors, which belonged to hygiene factors. Compared with designated hospitals, PHC sectors have higher requirements for TB HCWs on communication, frequency and duration, and needs to establish good relationship with patients. When TB HCWs encounter doctor-patient conflicts, they not only need to spend extra time which increases their workload, but also have a long-term impact on their mentality which leads to EE. As for motivation factors, this study found that TB HCWs with insufficient work support in PHC sectors had more severe EE, which is consistent with Xu's finding that anxiety and depression caused by insufficient work support can easily lead to job burnout [49]. There are problems such as low resources, high pressure, heavy burden, and few development opportunities in PHC sectors, which lead to EE and leaving intention among TB HCWs [50]. The needs of TB HCWs were not met in PHC sectors so it was difficult to stimulate their sense of responsibility, which belonged to motivation factors. Previous studies found that HCWs had low sense of responsibility and enthusiasm for work [51, 52]. The sense of responsibility belongs to the higher level in Maslow's hierarchy of needs, and the lack of lower-level needs such as personal safety and job identity may lead to the insufficient sense of responsibility [53]. This study found that TB HCWs as well as their children were unwillingness to engage in the prevention and control work, which may indicate that TB HCWs no longer value the significance of their work and responsibilities.

Implications

The job burnout among TB HCWs may be not only at a high level, but also affected by a variety of factors, which pose challenges to TB prevention and treatment. Therefore, TB prevention and control institutions at all levels should pay more attention to the job burnout among TB HCWs, and provide them with sufficient motivation and confidence in TB prevention and treatment.

As for hygiene factors, the CDC could cultivate TB HCWs' abilities to cope with stress through training and counseling, to resolve negative emotions' impact on work [54]. Online platforms such as WeChat and TikTok could be facilitated for online answering, to improve the personnel's awareness, satisfaction and PA. TB HCWs in designated hospitals need to have more training on empathy and communication skills with patients [55]. As for PHC sectors, the local government and health administrative departments should provide more financial support to improve their environmental conditions, ensure the adequate supply of professional equipment such as N95 masks and disinfectants, and set up special patient reception rooms to ensure TB HCWs' safety. Besides, the performance assessment indicators could be improved to prevent TB HCWs' dissatisfaction. Leaders in PHC sectors could pay attention to TB HCWs who have interpersonal conflicts and provide psychological support [56]

As for motivation factors, designated hospitals could provide psychological assessment and interventions to TB HCWs [57, 58], so as to improve stress resistance and work enthusiasm. Health Commission at all levels could strengthen the construction of human resources and establish the reasonable evaluation system. Given the situation that the family did not support TB HCWs' work, TB HCWs could strengthen communication with the family and PHC sectors could hold seminars on the importance of the prevention work and the knowledge of protection, so as to alleviate their worries of being infected. PHC sectors could take initiatives to cooperate with government departments and use local media to strengthen the publicity of TB prevention, to enhance the public's understanding and trust and to further improve TB HCWs' enthusiasm for work.

Conclusion

This study investigated the job burnout among TB HCWs in Chongqing, and also analyzed the associated factors based on the two-factor theory model. This study found that there were different associated factors influencing the job burnout among TB HCWs under integrated TB control model in Chongqing. Therefore, governments, organizations and individuals should pay attention to the job burnout and take cooperative and comprehensive measures under the integrated TB control model

according different associated factors in different workplaces. Further research will be conducted in-depth to verify existing research results and form comprehensive strategies to deal with TB HCWs' job burnout among in Chongqing.

Abbreviations

CDC	Centers for Disease Control and Prevention
PHC	Primary Health Care
CHCs	Community Health Centres
THCs	Township Hospital Centres
EE	Emotional Exhaustion
DP	Depersonalization
PA	Personal Accomplishment
WHO	World Health Organization
UN	United Nations
KMO	Kaiser–Meyer–Olkin

Supplementary Information

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Additional file 1. Questionnaire for healthcare workers in tuberculosis prevention and control

Additional file 2. Interview guide for healthcare workers in TB prevention and control and interview guide for key leaders in TB prevention and control institutions

Additional file 3. COREQ Checklist

Additional file 4. Univariate analysis of hygiene and motivation factors associated with job burnout of TB HCWs in Chongqing

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Authors' contributions
Ying L designed this survey, GW, XF, TZ, JZ, QW, QH, SL and YC collected data and controlled quality of data collection, YL and GW analyzed data. QY, GW, WZ and YL drafted the manuscript. YL and WZ edited the manuscript. All authors interpreted the results, revised the report and approved the final version.

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Availability of data and materials
The datasets generated and/or analyzed during the current study are not publicly available to avoid compromising individual privacy. Data may be made available from the corresponding author based on a reasonable request.

Declarations

Ethics approval and consent to participate
The project proposal was approved by the Institutional Review Board of Army Medical University, Chongqing, China (2021–03-02). This study was conducted in accordance with the Declaration of Helsinki. All participants had completed the written informed consent before participating in the study. And participants who were under the age of 18 years old were approved by the ethics committee, and the written informed consent was obtained from their parents.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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