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Job satisfaction and turnover of the first group of rural-oriented tuition-waived medical students in Guangxi, China: a mixed-method study

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Abstract

Background In 2010, China launched a rural-oriented tuition-waived medical education (RTME) programme to train more general practitioners (GPs) to meet the needs of the rural health workforce. Motivating and maintaining GPs is an important consideration for the shortage in the rural health workforce. This study aimed to investigate job satisfaction and turnover among the first group of rural-oriented tuition-waived medical students (RTMSs) who had completed a three-year compulsory service in Guangxi, as well as the factors affecting RTMSs turnover.

Methods This study adopted a mixed-method approach. A quantitative survey of 129 RTMSs was analysed (81.6% response rate), and qualitative interviews were conducted with 30 stakeholders, including 18 RTMSs, six administrators of the County Health Bureau, and six administrators of township health centers (THCs). A t-test, chi-square test, Fisher's exact test, and logistic regression analysis were used to examine the quantitative data, and thematic analysis was used to analyse the qualitative data.

Results Among the 129 participants, the turnover rate was high, with 103 RTMSs reporting turnover (79.84%). Interpersonal relationships scored the highest in job satisfaction (3.63 ± 0.64) among RTMSs, while working conditions were rated the lowest (2.61 ± 0.85). Marital status (odds ratio [OR] = 0.236, 95% confidence interval [95%CI] = 0.059–0.953, $P = 0.043$), only child status (OR = 8.660, 95%CI = 1.714–43.762, $P = 0.009$), and job return satisfaction (OR = 0.290, 95%CI = 0.090–0.942, $P = 0.039$) were significantly associated with turnover. Univariate analyses showed that income had a significant influence on turnover, but the relationship gone by multivariable; however it was deemed important in the qualitative study. Qualitative analysis revealed that turnover was influenced by the working atmosphere, effort-reward imbalance, professional competence, and opportunities for training and promotion.

Conclusions This study provides insights for the policymakers about the priority areas for retaining GPs in rural locations and provides reference values for the retention of GPs in other regions with a shortage of rural health workers. For RTMSs to continue providing services to rural areas, the government should improve their salaries, balance their income and workload, provide more opportunities for training and career promotion, and managers should recognise their efforts and create an optimistic working atmosphere.

Keywords RTME, RTMSs, GPs, Job satisfaction, Turnover, Rural areas

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Background

General practitioners (GPs) play an essential role in primary care. One of the most distinct challenges in primary care in China is that qualified GPs still constitute only a small proportion of physicians since the establishment of the GP system [23, 47]. People living in rural areas lack access to health-care and have poor health outcomes owing to a shortage of GPs [58]. Moreover, the difficulties in recruiting and retaining health workers caused by a reduction in health-care utilisation, as well as a lack of financial support, have led to low-quality care and a lack of trust from patients in rural areas [30, 31]. To solve this intractable problem, China launched a national programme called rural-oriented tuition-waived medical education (RTME) in 2010 [33]. The RTME programme recruits students from rural areas of central and western China and trains them as qualified GPs. After five years of tuition-free undergraduate medical education and three years of standardised residency training, they are required to work as GPs for three years in their hometown township health centers (THCs) which provide public health services and primary care services in rural China [45]. More GPs will be trained and recruited to work in THCs in rural areas through the programme, which aims to address the demand for a rural health workforce in Central and Western China [52].

The retention of working GPs in rural and remote locations remains a longstanding global challenge [17]. For instance, previous studies have shown that Australia and Thailand were experiencing shortages of primary care workers and that many GPs in these countries stayed in rural health facilities for a short period [37, 42]. In Canada, 4.6 million Canadians lack access to primary care, and in certain rural areas, approximately 75% of the population have no GPs [10]. Doctors in all specialties prefer to live and work in urban areas over rural ones [1]. According to a Vietnamese survey, 80% of physicians had a desire to work in urban areas rather than rural facilities [49]. Similarly, a mixed methods study conducted in the Philippines found that 18% of physicians preferred to stay in rural areas after compulsory services [11].

To retain GPs in rural locations, it is important to investigate factors associated with their turnover. These factors are generally understood, such as previously identified sociodemographic factors and their perception of work status [6, 14]. For example, gender, marital status, educational level, income, workload, and whether the person is an only child have all been shown to affect the retention of health professionals in rural areas [13, 24, 27, 51, 57]. Limited job opportunities for spouses and inadequate educational provisions for children are additional reasons why GPs leave rural areas [19]. In addition, a systematic review showed that job satisfaction and dissatisfaction were significant predictors of GP retention and turnover [28]. Job satisfaction can be defined as one's attitude toward all aspects of one's job [40]. Existing research indicates that attitudes and evaluative judgments of working status, including working environment, relationships with colleagues, and professional autonomy, play an important role in GPs retention [20, 34, 50].

Existing research into the retention of RTMSs has mainly focused on turnover intention rather than turnover [26, 56, 61]. Although turnover intention is a strong predictor and reliable proxy for actual turnover, it does not always result in turnover [36, 41]. If the RTMSs left their site after three years of compulsory services then that were considered as turnover. Additionally, most studies on RTMSs' retention have employed a quantitative approach, which is unable to provide a deep understanding of the findings [26, 56]. Based on the conceptual framework of human capital theory, several factors have been shown to affect the turnover of employees such as income, training, and job satisfaction [32]. The research question in this study is what factors influence RTMSs' turnover in the RTME programme? Our study used a mixed-method approach to comprehensively analyse the results. In this study, we aimed to explore the impact of sociodemographic factors and job satisfaction components on actual turnover among GPs who had completed a three-year compulsory service in the RTME programme to identify the most influential factors. This study provides insights for the policymakers about the priority areas for retaining GPs in rural locations and provides consolidated evidence for improving the availability of the rural health workforce.

Methods

Study design

We used a sequential explanatory mixed-method study design because it enabled a better understanding of the factors related to job satisfaction and turnover of RTMSs than can be achieved using an individual quantitative or qualitative approach. A quantitative survey was followed by qualitative interviews. Interviews were coded using quantitative data as an analytic framework, and the qualitative results were used to explain and enrich the quantitative findings.

Study participants

This study was conducted from November to December 2021 in Guangxi, Western China, one of the provinces that has been implementing the RTME programme since 2010. A purposive sampling method was used to recruit the RTMSs. The inclusion criteria were as follows: (1) graduated on time, (2) completed three years of standardised residency training and three years of

compulsory services, and (3) provided informed consent to participate in the study. In 2021, the first group of RTMSs in Guangxi completed the compulsory service. No one failed to complete the 3 years of service, and 158 RTMSs were invited to complete the web-based questionnaire online, with a response rate of 81.6% and 129 valid survey questionnaires. Additionally, we recruited 18 RTMSs (including both retention and turnover RTMSs), six administrators of the County Health Bureau, and six administrators of THCs to participate in telephone interviews. Eighteen RTMSs were selected purposively. The administrators of the Health Bureau and THCs came from six different counties in Guangxi: Mengshan, Mashan, Gongcheng, Sanjiang, Gangbei, and Wuming. The 30 stakeholders were interviewed by two PhD researchers (WC and WX) who were familiar with the research design and background and were trained in qualitative research methods. One researcher (WX) conducted the interviews and the other (WC) recorded the responses.

This study was approved by the Ethics Review Board of the School of Public Health at Guangxi Medical University. All participants provided informed consent before participating the study.

Measurement and data collection

The questionnaire included three sections: sociodemographic characteristics, job satisfaction scale, and turnover. Sociodemographic variables included age ($\leq 30, > 30$), gender (female, male), education level (bachelor, master), marital status (unmarried, married), only child or not (yes, no), daily working hours (< 6, 6–8, > 8), and monthly income in CNY (≤ 3000, 3001–5000, 5001–7000, > 7000). Data on job satisfaction were gathered using self-designed questionnaires with 26 items that evaluated the five aspects of the RTMSs, including work itself (seven items), job return (six items), working conditions (five items), professional growth (five items), and interpersonal relationships (three items) (Appendix Table S1 and Table S2). Items were developed based on existing questionnaires, such as the Minnesota Satisfaction Questionnaire (MSQ) and the Job Satisfaction Survey (JSS). Satisfaction with the RTMSs was reported using a five-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied). Using a five-point Likert scale, RTMSs with a score of less than three were classified as dissatisfied in the regression. The Cronbach's alphas for the five subscales were 0.903, 0.925, 0.891, 0.936, and 0.795, respectively, indicating high reliability. A single item was developed to measure actual turnover by asking, "Did you continue working in the same THC you were posted after a three-year mandatory service?".

We conducted semi-structured telephone interviews to better understand the working status, job satisfaction, and retention concerns of RTMSs in rural locations. In addition, we conducted telephone interviews to determine what actions should be taken for RTMSs' retention from the administrators' perspectives (Appendix Table S3). Each interview lasted for 30 to 60 min using a semi-structured interview guide, and all interviews were audio-recorded and transcribed verbatim.

Data analysis

Descriptive statistics were used to describe the sociodemographic characteristics, job satisfaction, and turnover rates of RTMSs. We obtained frequency (n) and percentage (%) statistics to show the sociodemographic factors and turnover rate, in addition to the mean ± standard deviation (SD), to report the levels of job satisfaction. Differences in turnover according to sociodemographic characteristics and job satisfaction were analysed using t-tests and chi-square tests. Fisher's exact test was used as an alternative to the chi-square test in cases where the expected frequency fell below five. Logistic regression analysis was used to examine the factors influencing turnover. We used a P value of 0.25 as a cut-off point for the stopping rule to select predictors in the multivariable logistic regression analysis [2]. Odds ratios (ORs) with corresponding 95% confidence intervals (CI) are reported. All analyses were performed using Stata 17, and statistical significance was set at $P < 0.05$.

A confirmatory factor analysis (CFA) was conducted to verify the measurement model of the job satisfaction constructs. The goodness-of-fit of the models was evaluated using a set of indices, including the chi-square value/degrees of freedom (χ^2/df), root mean square error of approximation (RMSEA), goodness-of-fit index, adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), Tucker-Lewis index (TLI), and incremental fit index (IFI). The model fit was considered acceptable if $\chi^2/df < 3$, RMSEA < 0.08, GFI > 0.90, AGFI > 0.90, CFI > 0.90, TLI > 0.90, and IFI > 0.90 [9, 12]. The CFA was performed using AMOS 25.0; further information and CFA results are included in Appendix Table S4 and Figure S1.

For the semi-structured interviews, qualitative data were analysed using thematic analysis with a combination of deductive and inductive processes. Subsequently, we organised and categorised the codes into different themes/subthemes and generated a final coding framework by two researchers (WC and WX), considering inter-rater reliability. Interview transcripts were read repeatedly and open-coded. Second, the concepts were grouped into 2nd order themes based on their relationships, similarities, and differences. Finally, these themes

were further abstracted as aggregate dimensions [41, 60]. Theoretical coding was performed using NVivo 11.0 plus.

Results

Quantitative results

Characteristics of participants

Table 1 presents the sociodemographic characteristics of the RTMSs. The mean age of the RTMSs was 30.59 years (range, 29–34 years). Among the 129 RTMSs, 65 (50.4%) were male, and 103 (96.1%) had a bachelor's degree. Most RTMSs (92.2%) were not the only child, and approximately two-thirds were married (67.4%). Most RTMSs (over 70%) worked for more than eight hours per day. Almost half earned 3001–5000 CNY per month (58.9%), 24% earned 5001–7000 CNY per month, and only 8.5% earned over 7000 CNY per month. The average wage rate of urban non-private sector employees in Guangxi in 2021 was 7348 CNY per month [3]. Overall, 103 of the 129 (79.84%) RTMSs in the present study reported that they had left THCs, suggesting a high turnover rate. Among the 129 participants, 103 (79.84%) reported that they had left THCs and the overall retention rate was 20.16%, suggesting a high turnover rate.

RTMSs' job satisfaction

Table 2 presents the job satisfaction of the RTMSs. The subscale with which RTMSs were most satisfied was interpersonal relationships (81.4%), followed by work itself (55.8%), job return (31.0%), professional growth (26.4%), and working conditions (22.5%).

Univariate analysis of turnover

There was a statistically significant difference in turnover according to gender, marital status, only child, income, work itself satisfaction, and job return satisfaction ($P<0$ 0.05). The RTMSs who were female, married, and non-only child were more likely to leave their positions, and the RTMSs with lower incomes were more likely to leave their positions. The RTMSs who were dissatisfied with work itself and job return were more likely to leave their positions than those who were satisfied (Table 2).

Table 1 Sociodemographic characteristics of RTMSs ($N=129$)

Variable	N (%)	Turnover		χ^2/t	*P* value
		Yes	No		
		N (%) or Mean ± SD	N (%) or Mean ± SD		
Gender				4.625	0.032
Male	65 (50.4)	47 (72.3)	18 (27.7)		
Female	64 (49.6)	56 (87.5)	8 (12.5)		
Age (years)		30.50 ± 0.96	30.92 ± 1.35	1.484	0.148
≤ 30	71 (55.0)	57(80.3)	14(19.7)		
> 30	58 (45.0)	46(79.3)	12(20.7)		
Education level				1.313	0.582*
Bachelor	124 (96.1)	98 (79.0)	26 (21.0)		
Master	5 (3.9)	5 (100)	0 (0)		
Marital status				6.552	0.010
Unmarried	42 (32.6)	39 (92.9)	3 (7.1)		
Married	87 (67.4)	64 (73.6)	23 (26.4)		
Only child or not				6.000	0.028*
Yes	10 (7.8)	5 (50.0)	5 (50.0)		
No	119 (92.2)	98 (82.4)	21 (17.6)		
Daily working hours				0.057	0.812
≤ 8 h	27 (20.9)	22 (81.5)	5 (18.5)		
> 8 h	102 (79.1)	81 (79.4)	21 (20.6)		
Monthly income (CNY)				12.376	0.008*
≤ 3000	11 (8.5)	11 (100)	0 (0)		
3001–5000	76 (58.9)	64 (84.2)	12 (15.8)		
5001–7000	31 (24.0)	23 (74.2)	8 (25.8)		
> 7000	11 (8.5)	5 (45.5)	6 (54.5)		

* Fisher's exact test

Table 2 Job satisfaction of RTMSs ($N=129$)

Variable	N (%) or Mean ± SD	Turnover		χ^2	*P* value
		Yes	No		
		N (%)	N (%)		
Work itself	3.30 ± 0.92			3.935	0.047
Satisfied	72 (55.8)	53 (73.6)	19 (26.4)		
Dissatisfied	57 (44.2)	50 (87.7)	7 (12.3)		
Job return	2.71 ± 0.87			10.839	0.001
Satisfied	40 (31.0)	25 (62.5)	15 (37.5)		
Dissatisfied	89 (69.0)	78 (87.6)	11 (12.4)		
Working conditions	2.61 ± 0.85			1.284	0.257
Satisfied	29 (22.5)	21 (72.4)	8 (27.6)		
Dissatisfied	100 (77.5)	82 (82.0)	18 (18.0)		
Professional growth	2.62 ± 1.00			2.458	0.117
Satisfied	34 (26.4)	24 (70.6)	10 (29.4)		
Dissatisfied	95 (73.6)	79 (83.2)	16 (16.8)		
Interpersonal relationships	3.63 ± 0.64			0.223	0.782*
Satisfied	105 (81.4)	83 (79.0)	22 (21.0)		
Dissatisfied	24 (18.6)	20 (83.3)	4 (16.7)		
Overall job satisfaction	2.96 ± 0.69			6.400	0.011
Satisfied	56 (43.4)	39 (69.6)	17 (30.4)		
Dissatisfied	73 (56.6)	64 (87.7)	9 (12.3)		

* Fisher's exact test

Logistic regression analysis of turnover

Table 3 presents the ORs and 95%CI calculated using the multivariable logistic regression models. We found that marital status (OR = 0.236, 95%CI = 0.059–0.953, $P=0.043$), only child status (OR = 8.660, 95%CI = 1.714–43.762, $P=0.009$), and job return satisfaction (OR = 0.290, 95% CI = 0.090–0.942, $P=0.039$) were associated with turnover.

Table 3 Logistic regression analysis on turnover of RTMSs ($N=129$)

Variable	OR*	*P* value	95%CI
Gender			
Male	Ref		
Female	0.722	0.577	(0.230–2.268)
Age (years)	0.720	0.198	(0.437–1.187)
Marital status			
Unmarried	Ref		
Married	0.236	0.043	(0.059–0.953)
Only child or not			
Yes	Ref		
No	8.660	0.009	(1.714–43.762)
Monthly income (CNY)	0.506	0.062	(0.248–1.034)
Work itself			
Dissatisfied	Ref		
Satisfied	1.288	0.700	(0.355–4.670)
Job return			
Dissatisfied	Ref		
Satisfied	0.290	0.039	(0.090–0.942)
Professional growth			
Dissatisfied	Ref		
Satisfied	0.758	0.638	(0.239–2.405)

* Adjusted odds ratio

Qualitative results

Table 4 presents the aggregate dimensions, themes, and concepts of the interview codes with the RTMSs. The major aggregate dimensions were job demands, working conditions, career prospects, and personal factors.

Job demands

Some RTMSs faced high job demands in rural areas. They said that their workload was heavy, working more than ten hours a day, and that the RTMSs employed at THCs were overloaded with work. Beyond a heavy workload, they also experienced stress owing to job performance and disease prevention and control work as well as limited clinical practice guidelines from THCs.

Table 4 Aggregate dimensions, themes, and concepts of codes of the interview with RTMSs

Aggregate Dimensions	2nd Order Themes	1st Order Concepts
Job demands	Workload	"In fact, the hospital where I work is busy, and the workload is quite heavy" (RTMS who stayed in the position) "The workload is heavy, and I work more than ten hours per day. Almost everyone who works here has a lot of work to do" (RTMS who left the position)
	Job stress	"Pressures come from two major sources: hospital performance and disease prevention and control" (RTMS who stayed in the position) "There is limited guidance regarding clinical practice at THCs, which makes me feel stressed" (RTMS who left the position)
Working conditions	Team cohesion	"I enjoy my job and get along well with my managers and colleagues" (RTMS who stayed in the position) "I have a good relationship with colleagues, and my managers care for me" (RTMS who left the position)
	Working environment	"The issues of working in THCs are the shortage of medical equipment and drug" (RTMS who stayed in the position) "There are some difficulties of working in THCs, such as the poor working environment. Additionally, it takes five or six hours to drive from THCs to counties, so I have to engage in long-distance commuting" (RTMS who stayed in the position) "The biggest challenge is the shortage of staff, and there are less than 30 healthcare workers at this health facility" (RTMS who left the position)
	Working atmosphere	"The working atmosphere at THCs was not good, and my colleagues did not have a passion for studying" (RTMS who left the position) "The working atmosphere was another reason for turnover" (RTMS who left the position)
Career prospects	Promotion	"I had opportunities for promotion in THCs, so I stayed in my position" (RTMS who stayed in the position) "I stayed in my position because of managers" support, and I got a promotion during working in THCs" (RTMS who stayed in the position)
	Opportunities for CME and training	"I have few opportunities for CME and training" (RTMS who left the position) "I left my position because there were no opportunities for training." (RTMS who left the position)
	Income	"The dominant reason for turnover was the poor remuneration" (RTMS who left the position) "The salary was lower than expected, which was the reason for turnover" (RTMS who left the position)
	Effort-reward imbalance	"There was an imbalance between effort and reward, and I perceived a gap between ideals and realities at work" (RTMS who left the position) "Another reason for turnover was the effort-reward imbalance" (RTMS who left the position)
	Professional competence	"I left my position because I want to improve my professional competence, and I intended to pursue a PhD degree" (RTMS who left the position) "I left my position because I felt incompetent and wanted to improve myself" (RTMS who left the position)
Personal factors	Distance from home	"I stayed in my position because it will be difficult to spend time with my family members if the health facility is far from home" (RTMS who stayed in the position) "I left my position because the distance from home separated me from my husband." (RTMS who left the position)
	Sense of accomplishment	"In fact, it gives me a sense of accomplishment when providing needed services to rural patients." (RTMS who stayed in the position) "I learned a lot in college but could not demonstrate my competence in rural areas." (RTMS who left the position)

Working conditions

Most RTMSs believed that they experienced high levels of team cohesion and poor working environments at THCs. They got along with their managers and colleagues. However, the main challenges of working in THCs were a poor working environment, including inadequate medical equipment and drugs, a shortage of healthcare workers, and the long distances they had to commute from THCs and counties. Additionally, some RTMSs expressed dissatisfaction with their working atmosphere in rural workplaces. For example, their colleagues showed no enthusiasm for continuing medical education (CME).

Career prospects

Attitudes toward career prospects influenced RTMSs' decisions to work in rural areas. For instance, some RTMSs remained in rural areas because they were promoted at THCs. Some RTMSs departed from rural areas because of limited opportunities for CME and training in THCs. Some RTMSs mentioned that their salaries were lower than expected and poor remuneration was the primary cause of turnover. Some RTMSs perceived a gap between ideals and realities at work, and they left because of the effort-reward imbalance. Furthermore, some RTMSs left because they wanted an increase in their competency. For instance, after leaving the THCs, one RTMSs wanted to pursue a PhD.

Personal factors

Personal considerations, such as a sense of self-accomplishment and distance from home, influenced their decision to leave or remain in rural areas. Regarding distance from home, some RTMSs remained in their positions because they wanted to spend time with their families, whereas others left because their family members lived elsewhere. The RTMSs also noted a sense of accomplishment in providing the services needed for rural patients as a factor in their ongoing employment in THCs.

Table 5 presents the aggregate dimensions, themes, and codes of the interviews with administrators at the County Health Bureau and THCs. The major aggregate dimensions identified were financial incentives, non-financial incentives, and success in the RTME programme.

Financial incentives

Most administrators believed that financial incentives provided incentives for RTMSs to continue serving rural areas. Thus, financial investment was needed not only for RTMSs but also for the RTME programme.

Non-financial incentives

In addition to financial factors, administrators noted non-financial incentives as incentives for RTMSs retention. These included improving their working environment, enhancing their sense of fulfilment, and offering them more career pathways.

Success in the RTME programme

All administrators acknowledged that more GPs provided high-quality health care in rural areas as a result of the nationwide RTME programme. The RTME programme successfully alleviated the shortage of GPs and addressed the recruitment problem in Central and Western China.

Discussion

To the best of our knowledge, this is the first study to investigate job satisfaction and turnover among RTMSs who have completed a three-year compulsory service in western China. This study maintains a stable health workforce in rural China and provides concrete suggestions for the retention of GPs in other regions experiencing a shortage of rural health workers. We explored the factors affecting RTMSs turnover by integrating quantitative and qualitative data, enabling a comprehensive analysis of the findings. Quantitative findings showed that interpersonal relationships scored the highest in job satisfaction among RTMSs, while working conditions were rated the lowest. Besides, marital status, only child status, and job return satisfaction were associated with turnover. The qualitative analysis of interviews of 18 RTMSs identified four themes, including job demands, working conditions, career prospects and personal factors; results from interviews with 12 administrators revealed three themes such as financial incentives, non-financial incentives and success in RTME programme. Both quantitative and qualitative elements validated the findings of this study.

Table 5 Aggregate dimensions, themes, and concepts of codes of the interview with administrators

Aggregate Dimensions	2nd Order Themes	1st Order Concepts
Financial incentives	Salary and welfare	"It is necessary to raise RTMSs' wages" "It is critical to increasing the salary and welfare of RTMSs"
	Financial investment	"The large increase in financial investment is beneficial for RTMSs' retention"
Non-financial incentives	Working environment	"The working environment should be improved to the greatest extent possible"
	Professional fulfilment	"We need to pay more attention to RTMSs, and give them an opportunity to demonstrate their competence"
	Opportunities for career development	"It is important to provide RTMSs with more opportunities for training" "Providing opportunities for promotion is beneficial for RTMSs' retention"
Success in RTME programme	GPs recruitment	"This programme alleviates the shortage of GPs and, to some extent, addresses the problem of recruitment"
	Healthcare services	"The RTME programme can improve the efficiency and quality of healthcare services"

The univariate analysis revealed that female RTMSs were more likely to experience turnover. This finding is inconsistent with a study conducted in England, which found that male GPs were more likely to leave their jobs than female GPs [8]. A possible explanation for this gender difference is that female GPs in rural China may be more affected by work-family conflict, and their employment decisions are more influenced by family commitments and responsibilities [7, 39]. Additionally, our study found that the working atmosphere was a critical factor influencing RTMSs' turnover. This finding contradicts a report from Australia in which GPs had a good working atmosphere in rural areas and identified rural practices as opportunities to improve their skills [21]. One possible explanation is that most primary healthcare workers at THCs in China had low levels of educational attainment and showed no enthusiasm for CME, which failed to generate healthy competition among the RTMSs and prevented them from developing their abilities [18]. To retain RTMSs, administrators should endeavour to foster a positive working atmosphere and increase their enthusiasm for work. In addition, the RTMSs reported higher turnover rate than overall doctors [46]. One possible explanation for this is that the service RTMSs provided was compulsory and they did not have a good understanding of the policy of the RTME programme when they graduated from high school [26].

In this study, the sampled RTMSs were mostly satisfied with their interpersonal relationships while working in rural areas. This was confirmed by the qualitative findings that they got along with their managers and colleagues at the THCs. This finding is consistent with a report from Germany in which GPs generally reported high levels of satisfaction with their interpersonal relationships [43]. This is a positive signal because being recognised by managers and building harmonious relationships with colleges could motivate GPs to stay in rural areas [44]. However, we also observed that the RTMSs were subject to poor working conditions at the THCs. This finding is in line with that of an Indian study that indicated that GPs expressed dissatisfaction with their working conditions [15]. Poor working conditions, including an insufficient supply of medical equipment and drugs, a lack of medical staff, and the long distance they had to commute from THCs and counties, were identified as challenges in our qualitative analysis. Targeted actions are essential to improve RTMSs' working conditions satisfaction. In particular, the availability of medical equipment and drugs is vital for healthcare delivery at THCs [4].

Our study found that those who were unmarried and not the only child were more likely to experience turnover. In terms of marital status, our findings are in line with those of a report from Tanzania, where unmarried primary healthcare workers were more likely to leave their jobs than those who were married [35]. One possible explanation is that unmarried RTMSs have fewer family responsibilities, thus they do not have to consider relocating their family members when leaving their current positions [35, 48]. The RTMSs who were not the only child were more likely to leave rural areas than those who were the only child. This may be because those who are the only child are the main care-giving providers for their ageing parents, forcing them to remain in rural areas to fulfil their obligations [5, 59]. In addition, our qualitative analysis revealed that RTMSs prefer to leave rural areas because their family members live in other places. This finding is consistent with that of a survey in Australia, where sufficient time to stay with family members influenced GPs' decisions to work in rural areas [55]. To retain RTMSs, employment opportunities for spouses should be provided, and early childhood education should be developed in rural areas.

In the present study, RTMSs who were dissatisfied with their job return were more likely to experience turnover. The qualitative analysis confirmed that RTMSs complained of poor remuneration and an effort-reward imbalance when working in rural areas. This finding is consistent with previous studies which indicated that GPs' low salaries were disproportionate to their heavy workload and stress, which may have affected their turnover [16, 54]. Moreover, our study found that income and work itself satisfaction significantly influenced turnover in univariate analyses. To retain RTMSs, the government should raise wages and balance income and workload. The government should offer favourable policies to motivate RTMSs such as a performance-based pay system, housing allowance and transportation allowances, as the salaries of GPs are paid by the local government's treasury [22, 38]. In addition, managers should help RTMSs fulfil the value of their efforts.

Our qualitative findings indicated that professional competence and opportunities for CME and training were also key factors that influenced RTMSs' turnover. This finding is in line with previous studies which found that limited accessibility to CME and training hindered GPs from improving professional competency and further led to turnover [25, 31, 54]. To retain RTMSs, the government should provide them with more opportunities for CME and general practice on-the-job training program. The training program covers the basics knowledge of general practice and primary medical care, which will enhance trainees' knowledge and skills [53].. Furthermore, promotion opportunities were found to directly affect RTMSs' turnover. This is supported by a previous study showing that managers' support, such as promotions, could enhance GPs'

job performance and increase their commitment to rural practices [29]. According to the administrators surveyed in this study, even if the national policy is successful in alleviating the shortage of GPs and providing high-quality care to rural communities, financial investments and non-financial efforts should be considered in the future. For instance, to improve the RTME programme, urgent action is needed to create a better working atmosphere and provide RTMSs with more opportunities for career development.

This study had several limitations. First, because this study employed a retrospective self-report approach to collect data, recall bias was unavoidable. Second, self-reports were used to collect data from the RTMSs, which might have limited the reliability of some responses. For example, the respondents were inclined to report high satisfaction ratings. Third, although the sample covers all RTMSs that have completed a three-year compulsory service in Guangxi province, the extrapolation of conclusions to the national level could be challenging. Finally, owing to the cross-sectional nature of the quantitative design of this study, the association between sociodemographic characteristics, job satisfaction, and turnover could not be concluded as a causal relationship.

Conclusions

The findings of this study may be considered by healthcare administrations in the hope of informing recruitment and retention policies, as well as providing reference values for the retention of GPs in other regions with a shortage of rural health workers. Strategies are recommended to achieve the goal of retaining RTMSs, including raising wages, balancing income and workload, improving working conditions, particularly supplying adequate medical equipment and drugs, creating an optimistic working atmosphere, and providing more opportunities for CME and career development.

Abbreviations

AGFI	Adjusted goodness of fit index
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CI	Confidence intervals
CME	Continuing medical education
CNY	Chinese Yuan
GFI	Goodness of fit index
GPs	General practitioners
IFI	Incremental fit index
ORs	Odds ratios
RMSEA	Root mean square error of approximation
RTME	Rural-oriented tuition-waived medical education
RTMSs	Rural-oriented tuition-waived medical students
SD	Standard deviation
THCs	Township health centers
TLI	Tucker-Lewis index
χ^2/df	Chi-square/degrees of freedom

Supplementary Information

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Supplementary Material 1.

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Not applicable.

Authors' contributions

WX, CX, and JZ contributed to the data collection and screening. WX and WC were involved in the data analysis. WC wrote the original draft of the manuscript. YC, YZ and BZ revised this manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Review Board of the School of Public Health, Guangxi Medical University. Informed consent was obtained from all study participants and the study was carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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