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ORIGINAL RESEARCH

What are the Real-Life Dilemmas and Facilitators of Medication Adherence of Patients with Drug-Resistant Tuberculosis: A Qualitative Exploration of Patient Perspectives

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Introduction: Drug-resistant tuberculosis (DR-TB) constitutes a global public health crisis, which endangers patients' health, poses a significant transmission risk, and imposes a substantial strain on the healthcare system. Medication adherence is essential for enhancing treatment outcomes and mitigating the proliferation of DR-TB.

Purpose: This study aims to explore the real-life dilemmas and facilitators affecting medication adherence in DR-TB patients and provide a reference for improving medication compliance in DR-TB patients.

Patients and Methods: A descriptive qualitative study was conducted. 26 patients with DR-TB who were treated with oral medication regimen in a tertiary hospital in Luzhou City, Sichuan Province from March to May 2025 were selected through purposive sampling method for semi-structured interviews, and thematic analysis was used to analyze the data.

Results: Five themes and fourteen sub-themes affecting medication adherence of DR-TB patients were identified, encompassing: Individual physiological traits (age-related variations in the perception of future time, polypharmacy in patients with comorbidities), intricate psychology and behaviors (misconceptions of medication effects, psychological distress resulting from stigma, misunderstanding of disease conditions, downward social comparison, divergences in medicine administration practices), synergy in social networks (multi-dimensional support of family members, support and communication from health providers), differences in family finances and living situations (significant family financial strain, influence of family roles), and constraints on medical insurance services (disparities in health insurance coverage, intricacy of the reimbursement procedure, constraints on reimbursement amounts and coverage).

Conclusion: Adherence to medication among DR-TB patients is influenced by intricate factors. Health professionals should intervene on the basis of a comprehensive and dynamic assessment of medication adherence to address these influencing factors at various levels, thereby enhancing adherence and therapeutic outcomes.

Keywords: drug-resistant tuberculosis, medication adherence, qualitative research, influencing factors, health ecology model

Introduction

Tuberculosis (TB) is a globally prevalent chronic infectious disease caused by infection with mycobacterium tuberculosis (Mtb), with pulmonary tuberculosis being the predominant type and posing a serious threat to human health.[1,2] According to the WHO Global Tuberculosis Report 2024, there were 1.25 million deaths and 10.8 million new cases of tuberculosis worldwide (134 cases per 100,000 people), making it the leading infectious agent-related cause of death worldwide.[3] Drug-resistant tuberculosis (DR-TB) is a condition in which Mtb is resistant to at least one antituberculosis medication.[4] Approximately 400,000 new cases of multidrug-resistant tuberculosis/rifampicin-resistant tuberculosis

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(MDR/RR-TB) were recorded globally in 2023, corresponding to an incidence rate of 3.7%, indicating that the epidemiological trend of DR-TB remains notably severe.[3] China, as one of the 30 countries with a high global burden of tuberculosis, had an estimated 25,000 new cases of MDR/RR-TB in 2023, accounting for 7.3% of the world's cases and ranking fourth globally.[3] DR-TB has become a significant public health concern in China and around the world, posing a serious threat to tuberculosis prevention and control and seriously impeding the objective of "ending tuberculosis" by 2035.[2,5]

The mental and physical health of patients, the security of the public health system, and societal and economic advancements are profoundly impacted by DR-TB. First, a patient's prolonged infectiousness due to a delayed diagnosis or improper treatment could exacerbate the TB epidemic by allowing drug-resistant strains of the disease to proliferate.[6,7] Additionally, compared with drug-susceptible tuberculosis, the treatment regimen for DR-TB is usually more complicated, with more potent side effects, higher costs and greater difficulty in curing it.[1,8,9] The global cure rate is only 68%, which places a heavy burden on patients, families and society.[1,8,9] Consequently, efficient strategies for managing disease patterns are essential.[10]

Oral therapy is currently the primary treatment for DR-TB, and one of the main factors influencing cure rates is medication adherence.[11,12] Medication adherence refers to the degree to which a patient's medication-taking behavior aligns with the therapeutic recommendations established by a healthcare provider.[13] Maintaining medication compliance is crucial for improving treatment outcomes, preventing the spread of DR-TB, and preventing additional drug resistance.[11,14] However, among DR-TB patients, poor medication adherence is typical. Anley[15] reported that nonadherence behavior was present in 25.7% of MDR-TB patients. According to Aibana,[16] nonadherence behavior during treatment was present in up to 31.9% of MDR-TB patients. Gui[17] reported that the treatment nonadherence rate of DR-TB patients in China was as high as 46.52%. To maximize treatment results and manage the DR-TB epidemic, investigating the factors impacting medication adherence in patients with DR-TB and enhancing adherence is imperative.

Research on the factors impacting medication adherence among Chinese DR-TB patients is limited, and most of these studies are quantitative in nature, making it challenging to gain a thorough understanding of patients' subjective experiences and emotions. Developed from socioecological frameworks, the Health Ecological Model (HEM) is widely used in health behavior,[18,19] mental health,[20] and other fields. The HEM provides a thorough understanding of the variables affecting DR-TB drug adherence and comprises five dimensions: personal traits, behavioral psychology characteristics, interpersonal networks, work and life, and the policy environment.[20–22] This study utilized the HEM as a theoretical framework to thoroughly explore the multifaceted aspects that impact medication adherence in patients with DR-TB and provide a basis for formulating a comprehensive adherence improvement strategy.

Materials and Methods

Study Design

The HEM and a descriptive qualitative research approach were used in this study, which allowed the researcher to thoroughly examine the factors impacting medication adherence in patients with DR-TB and visually and richly express the experiences of the individuals.[23] Furthermore, the COREQ guidelines were followed in the reporting of this qualitative investigation.

Study Setting

From March to May 2025, the research team conducted the study at the Affiliated Hospital of Southwest Medical University tuberculosis clinic in Luzhou, Sichuan Province. The hospital is a general tertiary grade A hospital affiliated with the Health Commission of Sichuan Province and is the designated institution for DR-TB treatment in Luzhou city.

Participants

The study employed purposive sampling to identify participants and adhered to the principle of maximum difference to collect more comprehensive interview content. Inclusion criteria: 1) patients who were currently receiving home-based oral medication for DR-TB. 2) at least eighteen years of age; and 3) knowing about their illness and voluntarily agreeing

to participate in this research. Exclusion criteria: suffering from severe mental illness, communication problems, or cognitive disabilities. The data saturation principle was used to determine the study's sample size.[24] When no new codes or themes emerged in the content of three consecutive interviews following the completion and analysis of at least ten interviews, data collection was stopped.

The Interview Outline

Based on the HEM theoretical framework, the initial interview outline incorporated information from the literature review, group discussions. To ensure the quality of the interview guide, the research team solicited the opinions of two experts in qualitative research and tuberculosis care. In light of this, two DR-TB patients who satisfied the inclusion requirements for pre-interviews were selected for pre-interviews; the results of these interviews were excluded from the final analysis. The outline was modified in response to pre-interview comments and expert opinions Table 1.

Study Procedures

Face-to-face, semi-structured individual interviews were conducted by two researchers: a male nurse leader (Tang) with a PhD in nursing and a female nursing graduate student (Xia) rotating in a tuberculosis-specialized outpatient clinic. To prevent interruptions from unrelated staff, the interviews took place in a separate room within the TB clinic. One of the interviewers (Xia) used audio recording and handwritten notes to document the whole interview process after gaining the interviewees' written and verbal agreement. The interviews lasted 20–40 minutes. Nonverbal responses, including body language, tone of voice, and facial expressions, were closely watched and documented.

Data Analysis

The process of gathering and analyzing data was carried out concurrently. Within 24 hours following each interview, two researchers (Xia and Huang) independently listened to the audio recordings, converted them into Word text documents, and then collaboratively reviewed them to ensure that the texts were consistent. Two participants (Xia and Wang) imported the text into Nvivo14 software for coding analysis once the transcription was finished. This study employed Braun and Clarke's six-stage theme analysis to assess the data within the HEM framework. The procedure involved familiarizing yourself with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report.[25]

Ethical Consideration

This study adhered to the ethical guidelines of the Declaration of Helsinki and was approved by the Affiliated Hospital of Southwest Medical University Ethics Committee (approved number: KY2025154). Before starting, the researcher

Table 1 The Interview Outline

Dimension	Questions
Personal traits	1. Are there any physical factors that may affect your ability to take medication?
Behavioral psychology characteristics	1. What do you know about your condition and medication? How did you learn about it? 3. Is there anything you can do to help you take your medication on time, regularly, and in the right dosage? If so, please tell us more. 4. How do you feel about taking medication for a long period of time? Do you think there are any factors that prevent or encourage you to take your medication? 5. What kind of emotional/psychological feelings may affect your medication taking?
Interpersonal network	6. How do people around you view your illness and long-term medication? 7. Have you received any support from people around you while taking medication? If yes, please tell us more. 8. Have you ever received any help from medical staff during the treatment? If yes, please tell us more.
Work and life	9. Do your life, work, and finances have any impact on your medication? If so, please discuss this in detail.
Policy environment	10. Do you think the healthcare environment or policies have any impact on your medication taking? If so, please discuss this in detail.

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provided a self-introduction and explained the study's purpose, significance, procedures, and methodologies to the participants in simple language. The researcher also ensured that all the data would be kept confidential and emphasized that participation was entirely voluntary, allowing participants to leave at any time without facing any consequences. The subjects voluntarily participated in this study and signed the informed consent form, which included publication of anonymized responses/direct quotes and audio recording. All participants are kept private and anonymous throughout the experiment via the P1–P26 number code.

Quality Control

Credibility, dependability, confirmability, and transferability are the four quality requirements that this study complies with.[23,26] Each researcher had completed specialized knowledge training and systematic qualitative research courses prior to the study, and they were all registered nurses with at least a bachelor's degree. Before conducting the interviews, the researchers built cordial and trustworthy connections by regularly participating in patient care and follow-ups. Throughout the interviews, the participants' responses were repeated, and the transcribed text was returned to them for verification, ensuring the authenticity and correctness of the data. During the data analysis phase, several researchers used researcher triangulation, completing separate analyses and discussing their findings. In addition, we maintained reflective diaries to encourage continuous reflection, and we conducted regular team discussions to determine the themes and address the research questions collectively.

Results

Participant Characteristics

Three patients rejected participation, out of the 29 who were invited by the research team (two due to privacy concerns and one due to time constraints). Finally, a total of 26 patients (mean age: 55.5 ± 14.63 years, ranging from 21–77 years) were included, comprising 15 males and 11 females. Most participants had educational attainment of primary school or lower (n = 18, 69.2%), lived in rural regions (n = 20, 76.9%), and were diagnosed with MDR-TB (n = 17, 65.4%). More patients were treated for six to twelve months (n = 11, 42.3%). Comprehensive demographics are provided in Table 2.

Table 2 Participant Demographics (n=26)

Characteristic	N(%)
Gender	
Female	11(42.3)
Male	15(57.7)
Age (years)	
<45	5(19.2)
45~59	11(42.3)
≥60	10(38.5)
Marital status	
Unmarried	4(15.4)
Married	20(76.9)
Divorcee	2(7.7)
Education Level	
Primary school or lower	18(69.2)
Junior high school	2(7.7)
High school / Vocational secondary school	5(19.2)
Bachelor's degree or higher	1(3.8)
Living areas	
Rural	20(76.9)
Town	1(3.8)
Cities	5(19.2)

(*Continued*)

Table 2 (Continued).

Characteristic	N(%)
Whether living alone	
Yes	21(80.8)
No	5(19.2)
Careers	
Workless	11(42.3)
Student	1(3.8)
Farmer	7(26.9)
Worker	3(11.5)
Other	4(15.4)
Diagnosis	
RR-TB	7(26.9)
MDR-TB	17(65.4)
Pre-XDR-TB	1(3.8)
XDR-TB	1(3.8)
Duration of medication (mouths)	
<6	10(38.5)
6~12	11(42.3)
>12	5(19.2)
Treatment categories	
Newly treated	16(61.5)
Retreatment	10(38.5)
Comorbidity (types)	
0	13(50.0)
1	6(23.1)
2	5(19.2)
≥3	2(7.7)

Abbreviations: RR-TB, Rifampin-resistant tuberculosis; MDR-TB, Multidrug-resistant tuberculosis; Pre-XDR-TB, Pre-extensively drug-resistant tuberculosis; XDR-TB, Extensively drug-resistant tuberculosis.

Dilemmas and Facilitators

Through a comprehensive analysis of the interview data, five themes were discerned for this study: individual physiological traits, intricate psychology and behaviors, synergy in social networks, differences in family finances and living situations, and constraints on medical insurance services. The themes are shown in Table 3.

Theme 1: Individual Physiological Traits

Most participants noted that differences in medication adherence can be caused by physiological characteristics, such as age and comorbidities.

Age-Related Variations in the Perception of Future Time

The medication adherence of participants of different ages tended to differ. Some older patients (n = 5) were more likely to stop taking their medication because they believed that even if they were cured, they would only have a small amount of time left.

> Even if I do not get sick, I will not have much time left now that I'm over 70. Going without medication is OK. (P9, male, age 77, RR-TB)

> I don't want to take any more medication since I think it's useless at my age. (P17, male, age 58, MDR-TB)

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Table 3 Factors Affecting Medication Adherence of DR-TB Patients

Themes	Sub-themes	Codes
Individual physiological traits	Age-related variations in the perception of future time	Limited/expanded future time perspective
	Polypharmacy in patients with comorbidities	Impact of past treatment experiences for other diseases
		High pill burden
		Drug interactions among multiple diseases
Intricate psychology and behaviors	Misconceptions of medication effects	Perceived inefficacy of treatment
		Burden of adverse drug reactions
	Psychological distress resulting from stigma	Treatment-related stigma
		Disease-related stigma
	Misunderstanding of disease conditions	Denial of illness
		Equating symptom relief with cure
	Downward social comparison	Compared to patients with worse conditions
	Divergences in medicine administration practices	Habit integration
		Use of reminder tools
		Proactive psychological management
		Over-reliance on external support
Synergy in social networks	Multidimensional support of family members	Financial support
		Emotional support
		Participate in drug management
		Participate in medication decisions
	Support and communication from health providers	Emotional support
		Information support
Differences in family finances and living situations	Significant family financial strain	Financial burden
	Influence of family roles	Family role
Constraints on medical insurance services	Disparities in health insurance coverage	Perceived inequity in health insurance coverage
	Intricacy of the reimbursement procedure	Lack of transparency in reimbursement information
		Cross-regional reimbursement barriers
	Constraints on reimbursement amounts and coverage	High out-of-pocket costs

Relatively, younger respondents (n = 3) were more likely to adhere to their prescribed regimen because they were more conscious of having enough time in the future.

> I'm still young and want to recover and pursue my graduate studies, so adhering to my medication regimen poses minimal difficulty for me. (P4, female, age 24, MDR-TB)

> Since I am still young and have a lot of good life ahead of me, I have adhered to my medication regimen. (P5, male, age 49, MDR-TB)

Polypharmacy in Patients with Comorbidities

Some participants (n = 8) experienced multiple medication burdens caused by many illnesses, making it more difficult to manage their prescriptions from several perspectives.

Some participants' medication distress was caused by chronic physical suffering from prior comorbid treatment experiences.

> I had radiation treatment for a laryngeal tumor, which caused discomfort in my throat. I have to make myself take medicine because I feel like I cannot swallow what I eat! (P10, male, age 67, MDR-TB)

Patients with comorbidities take several drugs, which add to the quantity of tablets and make it more difficult to follow the prescribed dosage.

> My health is quite bad and complicated. I must take many medicine because I have silicosis and diabetes. This makes me miss some medicine sometimes (P3, male, age 60, MDR-TB)

The participants found it challenging to stick to their prescription regimens because of their fears of adverse outcomes from drug interactions, which compelled them to make decisions that they believed would be "optimal".

> I had to take antituberculosis and antitumor medications since I had lung tumors. I decided to cease taking the anti-tuberculosis medication on my own for more than a month because taking both at once caused severe vomiting symptoms. (P6, male, age 58, RR-TB)

Theme 2: Intricate Psychology and Behaviors

This study explored how cognitive, perceptual, and behavioral factors influence health behaviors, emphasizing the impact of participants' psychological and behavioral responses during medication administration on adherence.

Misconceptions of Medication Effects

The drug effects did not meet their expectations, or the drug side effects were serious, which led most respondents (n = 17) to have misconceptions of medication effects and affected their medication adherence.

> Since this drug is truly expensive and does not seem to have any effect after taking it, I will no longer take it. (P1, male, age 66, MDR-TB)

> The adverse drug reactions of this drug were so harmful that I stopped using it. I think it has made my body worse and exacerbated my suffering. (P16, male, age 68, Pre-XDR-TB)

> I experienced hallucinations after eating it, then I never tried it again. (P11, female, age 52, RR-TB)

Psychological Distress Resulting From Stigma

The participants (n = 5) experienced psychological distress and internalized stigma because of drug-induced changes in appearance and disease-related social stigma, which led to medication refusal.

> After taking one kind of the medicine, my skin would feel like fish scales. I was too scared to keep taking it. (P23, female, age 21, RR-TB)

> I never take my medicine out during work because I do not want my colleagues to know I have TB. I'm worried they'll look down on me if they know my disease. (P25, female, age 33, RR-TB)

Misunderstanding of Disease Conditions

The participants' (n = 6) evaluations of the necessity of medication adherence were impacted by differences in their comprehension of individual disease status perceptions. Some participants rejected the need for medication and denied being sick.

> I do not believe this to be TB, so I do not see any issues with skipping TB medication. (P6, male, age 58, RR-TB)

Several individuals discontinued treatment because they confused symptomatic improvement with physical healing.

> I feel better now; there is no need to take medicine anymore. (P9, male, age 77, RR-TB)

Downward Social Comparison

For several participants (n = 4), downward social comparison—that is, comparing their circumstances to those of people with more serious diseases, such as cancer—formed a comparatively positive perspective on DR-TB.

I have always believed that if I take the medication as prescribed, I will get better because this is not cancer. (P26, male, age 35, RR-TB)

Compared to others who have cancer, my situation is already rather good—at least it is treatable (P15, male, age 58, MDR-TB)

Divergences in Medicine Administration Practices

To improve adherence to regimens, some participants (n = 8) integrated medication adherence into their everyday routines, developed regular medication-taking behaviors.

Taking medication is now a part of my life; it has become a habit. (P5, male, age 49, MDR-TB)

Some participants (n = 6) use reminder tools, such as medication organizers and alarms, to help them remember to take their prescriptions on time.

I set an alarm to remind me to take my pills. (P8, male, age 51, MDR-TB)

I collected vitamin pill bottles and used them to sort my daily medications every morning, and making sure that I took them on time. (P18, female, age 63, MDR-TB)

Additionally, a participant (n = 1) adopted strategies to increase their psychological tolerance to medications.

When I initially started taking medication, I was in a terrible mood. I took the initiative to see a psychologist, and eventually, I stopped overthinking and could keep to my medicine. (P2, female, age 47, MDR-TB)

Conversely, more reliance on family members' drug arrangements reduced patients' (n = 2) ability to manage medications independently.

My wife manages my medication, and I rely entirely on her for administration. If she doesn't provide it, I would skip doses. (P10, male, age 67, MDR-TB)

Theme 3: Synergy in Social Networks

Most participants reported that their social network, which included family members and healthcare professionals, influenced their medication adherence.

Multidimensional Support of Family Members

Family members could help patients (n = 10) with financial, emotional, and medication management and decision-making assistance, which are crucial for medication adherence.

Emotional and financial support from family members increased participants' motivation and confidence when taking medication.

My parents and wife are extremely supportive and willing to pay for my treatment so that I can continue to take my medication. (P5, male, age 49, MDR-TB)

My family has been a great source of comfort and strength to keep me motivated to stay on my medication. (P13, male, age 38, MDR-TB)

Family members' active involvement in medication management through reminders and supervision could help improve adherence.

My son cares about me a lot. He often calls me to remind me to take my medication and marks the time for me to take it on the top of the calendar, so I never forget to take it. (P22, female, age 52, MDR-TB)

Family members had a significant effect on participants' drug decisions, and their attitudes and actions had a direct effect on their adherence.

When my family witnessed my severe side effects, they advised me to discontinue the medication, leading me to abandon follow-up treatment. (P12, female, age 70, XDR-TB)

Three times a day, my wife brings me my medication, but before that, she was so angry when she saw me smoke that she did not give me my morning and noon pills. (P10, male, age 67, MDR-TB)

Support and Communication From Healthcare Providers

Enhancing participants' (n = 6) adherence required emotional support and treatment-related information from healthcare providers.

According to some participants, the care, comfort, and encouragement of medical professionals might increase their confidence in taking their medications as prescribed.

Every time I get my medication, my doctor comforts me and encourages me to stick to my medication, telling me that the only way to heal is to stick to my medication, so I'm sticking to it. (P4, female, age 24, MDR-TB)

Medication adherence was strongly related to health providers' support regarding treatment-related information, such as side effects, medical issues, and the consequences of nonadherence. Participants' comprehension of the illness could be improved, and adherence could be strengthened with adequate information support.

I never skipped taking my medication because my doctor informed me that if I stopped taking it privately, it would most certainly result in drug resistance in the future. (P22, female, age 52, MDR-TB)

When information support is inadequate, it might affect some participants' perceptions of disease side effects and reduce their adherence to medication.

During treatment, I experienced discomfort but received no clear explanation from my doctor about potential side effects. I am uncertain how to proceed, so I stopped taking the medication. (P16, male, age 68, Pre-XDR-TB)

Theme 4: Differences in Family Finances and Living Situations

According to the majority of participants, financial strain and role conflict in the family had considerable impacts on medication adherence.

Significant Family Financial Strain

The majority of participants (n = 13) said that a great financial burden prevented their families from covering the costs of treatment, forcing them to cut back on medication or stop treatment completely.

Purchasing the medication drained all my savings. Therefore, I've had to reduce my dosage temporarily until I can borrow money to resume treatment. (P8, male, age 51, MDR-TB)

The financial burden on the family is very heavy. After six months of treatment, my family could no longer afford the medication. (P3, male, age 60, MDR-TB)

Influence of Family Roles

When participants (n = 5) simultaneously occupy multiple roles (eg, patient, caregiver), the expectations and responsibilities associated with these roles may conflict.

Some participants who identified as "breadwinners" perceived their health as fundamental to the family's future, and their medication adherence was consistent with their obligation to support the family, fostering positive motivation.

I must stick to taking my medicine. Because if my health deteriorates, how can the whole family survive? (P14, male, age 50, MDR-TB)

The participants perceived themselves as burdens in their families, and stopped taking their medications because they felt guilty to their families.

> I stopped taking medication to avoid burdening my child. (P7, male, age 73, RR-TB)

Theme 5: Constraints on Medical Insurance Services

Medical insurance services are directly tied to medication adherence, and factors such as reimbursement amount and procedures can seriously affect patients' medication adherence.

Disparities in Health Insurance Coverage

Patients (n = 4) pay different out-of-pocket costs due to differences in health insurance coverage for different TB diseases and areas, which creates a sense of unfairness that affects medication compliance.

> I have heard from others that insurance covers tuberculosis and can be treated without cost. I also noted that some TB patients who were not drug resistant were able to obtain medications at very low prices. Therefore, why do I need to pay more than 2000 yuan? It is so unfair. (P1, male, age 66, MDR-TB)

Intricacy of the Reimbursement Procedure

According to some participants (n = 6), medication adherence was adversely affected by complex medical insurance reimbursement procedures and a lack of transparency in reimbursement details, which damaged confidence in hospitals and insurance systems.

> This medication's reimbursement seems irregular, and I am not sure if it is reimbursed. Therefore, I am less inclined to purchase it. (P14, male, age 50, MDR-TB)

> The reimbursement of cross-regional medical insurance is very complicated. Prepaying 10,000 yuan monthly for medical expenses and returning to my home for periodic reimbursements is financially unsustainable. (P5, male, age 49, MDR-TB)

Constraints on Reimbursement Amounts and Coverage

Low reimbursement rates or coverage gaps in health insurance may render high out-of-pocket costs unaffordable, prompting treatment discontinuation or dose reduction (n=8).

> The reimbursement rate of medical insurance here is not bad, but the monthly drug expenses after reimbursement are still a bit high and I can't afford it. (P19, female, age 65, MDR-TB)

Discussion

This study employed a descriptive qualitative study to explore the variables influencing medication adherence in patients with DR-TB. Based on the five levels of the HEM framework, the findings revealed that various levels and components of the HEM significantly impacted medication adherence. These levels interact synergistically, collectively shaping the adherence behaviors of DR-TB patients.

Age and comorbidities were found to be important factors for medication adherence in DR-TB patients. Age, a critical determinant of future time perspective, mediates variations in perceived future time, significantly influencing adherence behaviors.[27] Young and middle-aged DR-TB patients are more likely to adhere to their treatment regimens when they believe that they have ample time to achieve their long-term health goals. Conversely, older patients may discontinue treatment owing to a limited time perspective and prioritization of their current quality of life. To increase patients' positive future expectations, healthcare professionals could employ future-oriented interventions, such as positive future imagination interventions.[28,29] This approach increases patients' weighting of options for health maintenance and medication adherence.[28,29] Second, comorbidities have increased the complexity of symptoms and the challenges of multi-drug treatment in DR-TB patients, which in turn hampers adherence.[11] A multidisciplinary team

should be established for these patients to provide a personalized treatment plan, simplify drug regimens, and offer a personalized treatment checklist or manual to enhance medication adherence based on their unique physical condition.

Negative thoughts and attitudes sometimes compromise adherence in DR-TB patients during medication delivery. Previous studies have confirmed that the main obstacles to medication adherence include misunderstandings regarding the effectiveness of drugs and a strong sense of internalized stigma.[30,31] This study further supported the idea that patients' biased understanding of disease states leads to weakened motivation to take medication.[32] Moreover, this study preliminarily revealed that social comparison had an impact on the psychological aspects and health behaviors of DR-TB patients, which was in line with findings in patients with fibromyalgia, diabetes, and other illnesses.[33–35] This result lends some credence to the idea that patients can improve their adherence to health-related behaviors by adopting a more optimistic and adaptable view of their situation through downward comparison. At the behavioral level, positive medication management can improve drug tolerance, reduce memory load, and decrease nonadherence by giving patients a stronger sense of control over their medications. Therefore, medical providers can implement dual-path intervention of behavioral management reinforcement and psychological cognitive reconstruction. First, cognitive behavioral intervention techniques could be employed in conjunction with a dynamic evaluation of drug efficacy and side effects and frequent feedback interventions to help patients accept themselves, clear up misconceptions, and reinforce the value of their medications. Second, proactive and positive management practices (eg, self-monitoring of adverse effects, medication schedules, etc) are encouraged with a variety of medication management tools (eg, calendars, pill organizers, mobile applications, etc).[36,37]

In the social network level, multidimensional support from family members and healthcare workers are influencing factors for medication compliance in DR-TB patients.[38,39] Family members' involvement in medication decision-making could influence patients' treatment choices. Healthcare providers must emphasize the importance of family involvement in DR-TB patients' medication adherence and enhance patients' cognitive understanding through health education. Second, DR-TB patients' medication adherence can benefit from emotional, financial, and informational support from healthcare providers.[39] Providing patients with clear and easy-to-understand treatment information will help patients and their families fully comprehend the plan and be ready to handle any side effects, thereby improving medication adherence.

The family's financial burden significantly increased the risk of medication interruption. The mechanisms might involve not only the high cost of the treatment itself but also potential economic vulnerabilities, such as a reduced family labor force due to illness.[40,41] The implementation of a family economic grading evaluation system in the future could increase medication adherence by offering DR-TB patients targeted material assistance, such as economic and nutritional subsidies. Additionally, DR-TB patients who have unfavorable views of family roles (such as guilt or helplessness) are less likely to be motivated to take their medications as prescribed.

Health insurance is critical for ensuring DR-TB patients' treatment completion, and plays an important role in reducing the economic burden of patients and promoting medication adherence.[42] Presently, most Chinese regions have included DR-TB in the coverage of chronic disease outpatient medical insurance, which lowers patients' pharmaceutical costs. Nonetheless, medical insurance for DR-TB has limitations such as regional differences, reimbursement ratios, and complex reimbursement procedures, which affect medication adherence. Therefore, it is necessary to simplify the reimbursement process, increase the reimbursement ratio, and reduce the medication burden on DR-TB patients.[43–45]

Limitations

Based on the HEM, this study revealed the real-life dilemmas and facilitators that affect medication adherence in patients with DR-TB, providing new information for the design of interventions. However, some limitations remain: (1) This study only included patients with medication treatment experience in Luzhou City, which may not fully reflect the situation in other regions of China; (2) This study only explored the factors affecting medication compliance from the perspective of patients, and did not include the perspectives of family members, medical staff, etc.; and (3) DR-TB patients' dynamic observation of medication adherence was constrained by the study's single time point interviews. Future studies could employ longitudinal studies, expand the sample recruitment area, and interview patients' families and health professionals to enrich the perspective of the research results.

Conclusion

Adherence to medicine among patients with DR-TB is influenced by five themes and fourteen sub-themes that are related to individual physiological traits, intricate psychology and behaviors, synergy in social networks, differences in family finances and living situations, constraints on medical insurance services. Patients with DR-TB continue to encounter formidable obstacles to enhancing medication adherence, including financial constraints, health insurance services, and misconceptions about medications, according to research findings. Healthcare providers should intervene on the basis of a comprehensive and adaptive evaluation of medication adherence to address various influencing factors, hence enhancing adherence and therapeutic outcomes.

Abbreviations

TB, Tuberculosis; DR-TB, Drug-resistant tuberculosis; MTB, Mycobacterium tuberculosis; MDR-TB, Multidrug-resistant tuberculosis; RR-TB, Rifampin-resistant tuberculosis; Pre-XDR-TB, Pre-extensively drug-resistant tuberculosis; XDR-TB, Extensively drug-resistant tuberculosis.

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author (Tang, email: tangjian034@swmu.edu.cn) upon reasonable request.

Ethical Approval Statement

This study adhered to the ethical guidelines of the Declaration of Helsinki and was approved by the Affiliated Hospital of Southwest Medical University Ethics Committee (approved number: KY2025154). Before starting, the researcher provided a self-introduction and explained the study's purpose, significance, procedures, and methodologies to the participants in simple language. The researcher also ensured that all the data would be kept confidential and emphasized that participation was entirely voluntary, allowing participants to leave at any time without facing any consequences. The subjects voluntarily participated in this study and signed the informed consent form, which included publication of anonymized responses/direct quotes and audio recording.

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Disclosure

The authors report no conflicts of interest in this work.

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