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Exploring opportunities to strengthen rural tuberculosis health service delivery: a qualitative study with health workers in Tibet autonomous region, China

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ABSTRACT

Objectives This qualitative study aimed to explore opportunities to strengthen tuberculosis (TB) health service delivery from the perspectives of health workers providing TB care in Shigatse prefecture of Tibet Autonomous Region, China.

Design Qualitative research, semi-structured in-depth interviews.

Setting The TB care ecosystem in Shigatse, including primary and community care.

Participants Participants: 37 semi-structured interviews were conducted with village doctors (14), township doctors and nurses (14), county hospital doctors (7) and Shigatse Centre for Disease Control staff (2).

Results The three main themes reported include (1) the importance of training primary and community health workers to identify people with symptoms of TB, ensure TB is diagnosed and link people with TB to further care; (2) the need to engage community health workers to ensure retention in care and adherence to TB medications; and (3) the opportunity for innovative technologies to support coordinated care, retention in care and adherence to medication in Shigatse.

Conclusions The quality of TB care could be improved across the care cascade in Tibet and other high-burden, remote settings by strengthening primary care through ongoing training, greater support and inclusion of community health workers and by leveraging technology to create a circle of care. Future formative and implementation research should include the perspectives of health workers at all levels to improve care organisation and delivery.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Through semi-structured in-depth interviews conducted in Tibetan and Mandarin languages, this study contributes to the limited body of knowledge on the perspective of health workers, in particular village doctors, in Shigatse, Tibet.
⇒ Framing the results through the lens of the tuberculosis cascade of care contextualises health worker perspectives and frames the opportunities they identify.
⇒ Desirability is a potential limitation as participants may have more positively framed their experiences.
⇒ The study may not reflect all perspectives given recruitment constraints in the setting due to heavy workloads and vast travel distances in the region.

INTRODUCTION

Providing high-quality and accessible tuberculosis (TB) care remains a major challenge for health systems globally. Estimates from 2020 suggest that of the over 1.3 million deaths from TB, approximately 469 000 were due to poor quality TB care. Further 467 047 deaths were due to people with TB not being able to use health services.[1] Gaps in high-quality and accessible care exist across the care cascade, that is, from diagnosis to treatment to retention in care and beyond.[2] Barriers to care described globally include lengthy and overly complex pathways to accessing health services, a preference for first contact with informal or private providers and insufficient primary care services for retention in TB care.[2 3] These challenges are particularly difficult for resource-constrained and rural health systems to overcome given their limited funding, inadequate infrastructure, and human resource constraints.

Yet, rural and resource-constrained health systems are those most burdened by TB globally.[4 5] China, for example, has both a large rural population (39% of the total population live in rural areas) and the third largest burden of TB globally (8.5% of the global total of people with TB).[4 6] China has devoted significant resources to build capacity in its rural health workforce and optimise its National Tuberculosis Programme. For example, the Healthy China Initiative 2019–2030 includes 'TB Control Action', which sets ambitious targets to reduce pulmonary

TB prevalence to 55/100,000 nationally.[7 8] Despite these efforts, delivering high-quality and accessible TB care to rural and remote areas remains a persistent challenge.[9] Indeed, while the overall TB prevalence rate in China is estimated to be 442/100 000, TB prevalence in the largely rural Tibet Autonomous Region (hereafter Tibet), is estimated to be nearly twice as high (758/100 000).[10–12]

Tibet has unique contextual considerations that affect the implementation and uptake of TB prevention and care services. Importantly, limited human resources, stretched over a vast geography, intensify existing barriers to accessing care. These barriers include travel distance, local beliefs about TB and prohibitive diagnostic costs.[13] The most recent data from the second largest prefecture in the region, Shigatse, reported that in 2016 only 72% (769/1073) of people newly diagnosed with pulmonary TB completed the treatment. Of those who did not complete the treatment, 83% (252/304), were lost to follow-up.[14] While there are significant gaps in TB prevention, care and service delivery across the region, there are also opportunities for improvement. Nascent efforts have been made to embed TB health services closer to communities, both through policy and programmatic initiatives. These aim, in various ways, to improve the quality of TB care in the region by engaging primary and community health workers more closely in person-centred care across the TB care cascade. Yet, little is known about these efforts from the perspective of health workers in the region.

By exploring health workers' perspectives, including primary and community health workers, this study aims to identify opportunities to strengthen the TB health service delivery in rural Shigatse prefecture, Tibet, China.

METHODS

This study in Shigatse prefecture adopts a qualitative descriptive approach to explore health workers' perspectives on providing TB care in the region.

Study setting and health service delivery context

Tibet is divided into prefectures, which are further divided into counties, townships and villages. Shigatse prefecture is situated west of Lhasa, the regional capital of Tibet. The area is characterised by sparse population density, high altitude and rugged terrain, particularly along the mountainous southern border. Tibet has experienced yearly economic growth, ongoing development, increased migration and modernisation, which have led to increasing life expectancy and other health gains across the region, such as reduced maternal mortality.[15] Yet, TB remains an ongoing challenge, with high out-of-pocket expenditure spent by people with TB on tests and travel to health centres, despite government programmes and financial subsidies that offer free TB medications.[13] Recent TB health service delivery reforms aimed to streamline assessment and referral processes through county hospitals, while ensuring ongoing management and support is provided at the most local levels of primary care—township hospitals and community health centres, in partnership with village doctors. Village doctors are community health workers who undergo 3 to 6 months of medical training that equips them to offer basic acute and preventative care services and to follow up on ongoing care in communities. Village doctors are the first line of contact with primary care for rural residents in China and are an important referral pathway to their counterparts in township hospitals and community health centres as part of the primary care ecosystem in Tibet.[16]

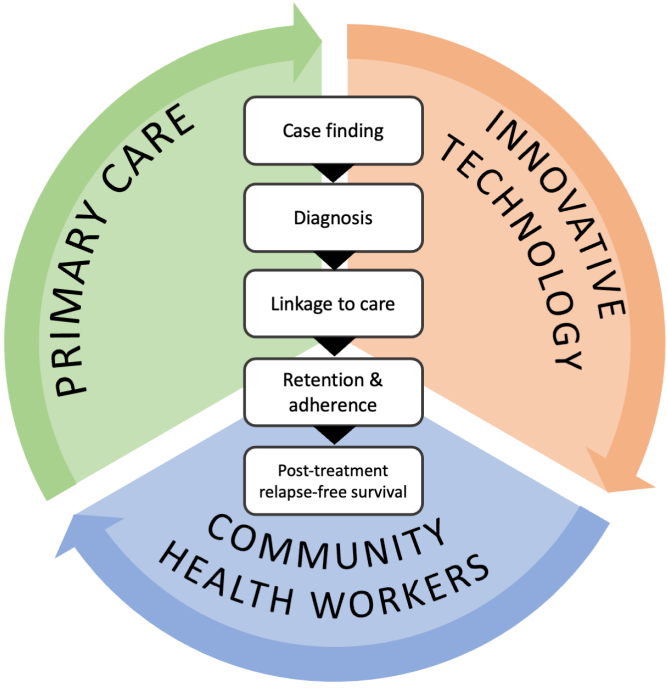

Figure 1 Framework describing key factors for tuberculosis care strengthening across the cascade of care in Shigatse, Tibet.

Conceptual framework

This study employs a framework grounded in the TB cascade of care (figure 1). The TB cascade of care describes a model of TB health services that emphasises ensuring people remain engaged across sequential stages of care, starting with identifying people with TB symptoms so they can be directed onward to receive diagnosis and care and ending in survival after treatment without relapse.[2 17] The TB care cascade has been proposed as a strategy for programmatic monitoring and evaluation, as well as a conceptual tool to identify gaps in care.[18] Based on inductive thematic analysis from our interview findings, we report how this cascade of care is underpinned and can be strengthened in Shigatse by developing and investing in three key areas—primary care, community health workers and innovative technology. Primary care providers in Shigatse are considered township hospital health workers who are responsible for TB management in the prefecture. Community health workers, in this context, are village doctors given both the scope of

Box 1 Summary interview guide

1. To start, could you tell us about yourself and your current position?
2. How long have you worked in this role?
3. What are your main responsibilities related to TB service delivery?
4. Can you tell me about any other members of your team? Who do you work with to provide TB services?
5. Can you tell me about your patient mix?
6. Can you tell me about the first consultation with TB patients?
7. During the first consultation, what things do you explain to the patient?
8. During the first consultation, what are patients most concerned about?
9. What can be done to address their concerns during the consultation?
10. Can you tell me about your experience conducting follow-ups/home visits?
11. How often do you conduct follow-ups/home visits?
12. What are the biggest concerns patients talk to you about during follow-ups/home visits?

their duties and their close links with communities. Innovative technologies are conceptualised as those systems, platforms and interventions that use technology or digital health to support health workers in providing TB care or that support people in accessing care. These three factors work together to ensure that people with TB are better able to be retained along the cascade of TB care and achieve positive health outcomes.

Selection of participants, data collection and processing

This study was conducted between April 2019 and November 2020. Participants included village doctors, township hospital doctors and nurses, county hospital doctors and Centre for Disease Control (CDC) staff working in Shigatse, Tibet. Participants were invited to the study by the research team conducting an ongoing randomised controlled trial in the region.[19] All participants approached agreed to be interviewed. Recruitment was purposeful and aimed for a balance of job roles, gender, age and location across four counties representing a mix of locations. The study team made efforts to ensure interviews took place in comfortable, private locations suitable to the respondent.

Table 1 Description of Study 2 qualitative interview participant characteristics

Participant characteristics	Female	Male	Total
Location			
Samzhubze	6	3	9
Sa'gya	5	6	11
Gyantse	4	4	8
Tingri	4	5	9
Participant type			
Village doctor	7	7	14
Township hospital/community health centre doctor/nurse	9	5	14
County hospital doctor	3	4	7
CDC staff	0	2	2

Trained researchers on the study team conducted semi-structured interviews using a pre-designed interview guide covering topics related to TB service delivery, health worker roles and experiences caring for people with TB (box 1). Interviewers included local researchers familiar with the setting and trained in health service research, as well as the trial coordinator who has extensive experience in the research setting. Ethical approval for the study was obtained from the Office of Research Ethics at the University of Toronto (Ref: 36569) and the Ethics Review Committee of the Shigatse Centre for Disease Control and Prevention (Ref: 006). The information and consent form were translated into Chinese or Tibetan via an interpreter and permission to be audio-recorded was collected. We ensured participant confidentiality by removing participant identifiers and assigning identification numbers as well as quoting participants using pseudonyms. Participants were offered the option to refuse any question and to withdraw from the study at any time without repercussion. Research staff conducted semi-structured interviews in Mandarin with simultaneous interpretation to Tibetan at the time of the interview. Research staff transcribed the recordings in full into Chinese and then translated these into English. A bilingual translator checked transcripts against original recordings to ensure accuracy between recordings and transcriptions. More information can be found in our collaborative autoethnography describing the translation process.[20] Data were securely stored as per protocols defined by the University of Toronto Office of Research Ethics including password protection and use of secure drives.

A qualitative descriptive approach guided our analysis. Qualitative description is a common approach when conducting cross-cultural qualitative health service research as it emphasises literal interpretation of translated narratives and discourages movement into the text to assume meaning.[21] An initial set of five interviews was coded inductively using elements of thematic analysis as described by Braun and Clarke and then organised into a framework given that identified themes were complementary to the TB cascade of care. After which, we applied framework analysis as described by Ritchie and Lewis to subsequent transcripts, while being open to identifying any additional themes.[22 23] Data were organised using QSR NVivo 12 software. Through discussion, codes were organised into thematic groupings. We stopped interviewing when it was decided, through discussion, that no new concepts were being heard in subsequent interviews.[24]

Patient and public involvement

None.

Table 2 Overview of themes used in the analysis of health worker perspectives

Theme	Sub-theme	Exemplary quotes
Training primary and community health workers to identify people with symptoms of TB, diagnosis and linkage to care	► Lack of primary and community health worker knowledge of TB. ► Primary and community care training must reach the most local level of health workers (eg, township/community health centre and village doctors). ► Training to support both passive and active approaches to identify people with symptoms of TB.	► 'Some patients have tuberculosis, but the village doctor fails to recognise it… Some village doctors do not know what tuberculosis is'. (P06_Township hospital nurse) ► 'Usually training at the municipal and autonomous regions is only for county-level staff. If possible, the usual training can incorporate the staffs at the township level, as some knowledge is not transmitted to the township and village levels'. (P13_Township hospital doctor) ► 'Allow for the active screening of the disease because patients are less motivated to be actively seeking medication attention'. (P13_Township hospital doctor)
Engaging community health workers to ensure retention in care and medication adherence	► Need for local, accessible and trusted health workers to support people with TB as they undergo treatment. ► Village doctors able to provide counsel, treatment management and address local (mis)conception of TB and its treatment. ► Need to adequately train, protect and compensate village doctors.	► 'The patients are worried about the economic pressure, as well as the overwhelming psychological stress…I patiently explain and solve their concerns and guide the patient through the steps with scientific facts and methods'. (P31_Village doctor) ► 'Health workers lack protective materials and village-level doctors cannot buy protective materials.' (P19_County hospital doctor) ► 'Village doctor supervisor could give some labour subsidies to the village doctors, they have little wage, 1000 RMB/month, some village doctors are also busy – they also have other part time jobs'. (P11_Township hospital doctor)
Innovative technologies to coordinate linkage to care, retention and medication adherence	► Inadequate information management systems for tracking care for people with TB. ► Challenges to monitoring medication adherence. ► E-monitoring technologies to improve medication adherence tracking.	► 'It is difficult to track patients, 40–50% of patients are long-term out of town and is difficult to manage…(patient) tracking needs improvement… tuberculosis is hard to manage'. (P22_County CDC) ► 'I didn't know if they were taking their medications or not, the computers didn't show anything, it could only be recorded in the book. If they lied, I would not know. Whether or not the medication was taken, I would not know. I made the telephone call and my supervisor can only check whether or not I made the phone call'. (P01_Township hospital nurse) ► '(By having electronic monitoring) in addition to knowing the actual situation of patients' medication history, you can also know which aspects of disease control need to be strengthened, you can intuitively see the patient's medication adherence and find the targeted direction of work'. (P13_Township hospital doctor)

RESULTS

A total of 37 semi-structured interviews were conducted with health workers involved in TB service delivery in Shigatse including village doctors, township hospital doctors and nurses, county hospital doctors and CDC staff. The study was conducted in four locations: three counties (Gyantse, 18 people/km^2; Sa'gya, 8.5 people/km^2; and Tingri, 4.2 people/km^2) and one district (Samzhubze, 43 people/ km^2). Interviewees were purposively sampled based on location to ensure representation from different settings (table 1).

We broadly organise our data using our conceptual framework based on the TB cascade of care, emphasising how three key areas of opportunity—primary care, innovative technologies and community health workers (village doctors)—underpin the cascade of care to strengthen the TB health service delivery in Shigatse. Table 2 offers an overview of themes and inductively identified sub-themes in the analysis.

The first theme highlights the importance of training primary and community care workers to support identifying people with TB symptoms, diagnosis and linkage to care. The second theme describes how village health workers must be engaged to ensure people with TB are retained in care and able to adhere to their medications. The third theme explores how innovative technologies can coordinate linkage to and retention in care, as well as medication adherence.

Training primary and community care to identify people with TB symptoms, diagnosis and linkage to care

Primary care (ie, care provided in township hospitals/community health centres in our setting) and community care (ie, care provided by village doctors in our setting)

are important to reduce morbidity and mortality from TB in vulnerable populations.[25] Participants described how primary and community health workers play a critical role in identifying people with possible TB infection, ensuring diagnosis and linkage to care. However, participants emphasised that to provide comprehensive TB care requires a primary and community care workforce with the knowledge and resources to both identify TB infection and access the available health services and referral pathways for people with TB.

Some participants highlighted that a lack of provider knowledge on TB and limited orientation on updated referral processes may contribute to missing people with TB symptoms or delays in accurate diagnosis. Participants described how if all primary and community care health workers are trained to identify TB symptoms and know the referral pathways for testing and linkage to care, identifying people with TB symptoms could be strengthened in the region. As one township hospital doctor explained, 'usually training at the municipal and autonomous regions is only for county-level staff. If possible, the usual training can incorporate the staff at the township level, as some knowledge is not transmitted to the township and village levels' (P13_Township hospital doctor).

Others emphasised that this training must reach village doctors, as one participant explained, 'I hope the village doctor can be informed of the basic knowledge about tuberculosis… some patients have tuberculosis, but the village doctor fails to recognise it. They treat it as cold…The basic prevention of tuberculosis was not explained clearly. Some village doctors do not know what tuberculosis is' (P06_Township hospital nurse). Some participants explained the need for specific topics to be covered, as one participant emphasised that there is a need to 'increase training on aspects of multidrug resistance of tuberculosis and new diagnosis and treatments' (P23_County hospital doctor). One participant described how even if some health workers have received updated orientation on TB health service pathways in the region, human resource constraints may pose a challenge unless all staff are adequately oriented on TB care. The participant explained that 'we can't have one doctor that has received orientation start to work on other things while letting an unoriented doctor take over the TB management' (P34_CDC staff).

Participants highlighted how training primary and community care workers on TB and available referral pathways can strengthen 'passive case finding', wherein people self-present to care with TB symptoms. However, passive approaches to identifying people with TB may not be enough and participants reflected how 'active case finding', where populations are systematically screened for TB, may be better suited to addressing the burden of TB in Shigatse. This process also requires training. One participant emphasised that a more cohesive policy approach to TB screening, diagnosis and management is needed in the region. They explained that 'the government has to put a strong emphasis on this task (of managing TB), and publish some relevant guidance, and allow for the active screening of the disease, since patients are less motivated to be actively seeking medical attention' (P13_Township hospital doctor).

Other participants described how people with TB symptoms will often first seek care from informal traditional Tibetan medicine providers before seeking care from formalised providers in township hospitals (either Western or Tibetan doctors) or from village doctors. One participant explained what they perceived to be the motivations for seeking this type of care, reporting that, 'some have confirmed tuberculosis but still go to the Tibetan doctor for Tibetan medicine, and do not take tuberculosis medication. Elderly patients are more likely to take Tibetan medication because there are many side effects of the (Western) tuberculosis medications' (T08_ Township hospital doctor).

Engaging community health workers to ensure retention in care and medication adherence

Village doctors have close ties to communities and are an important resource to promote retention in TB care as people with TB undergo lengthy and difficult treatment courses. Several participants described how perceptions of TB and treatment can make adherence and follow-up difficult. One township doctor reflected how 'some patients condition did not improve after 6 months or 1 year of taking the medication, thus they think the disease is untreatable, so they don't want to take the medication anymore' (P13_Township hospital doctor). Another county hospital doctor explained that people with TB want faster results, reporting that they 'want to use an infusion or other relatively faster ways to accomplish rapid treatment' (P16_County hospital doctor). All participants emphasised that greater education on TB is needed in communities and people with TB need a trusted local health worker to advise them as they go through their course of treatment. Several township and county hospital doctors highlighted that village doctors are instrumental in providing this ongoing and frequent support.

Village doctors themselves reported how they were able to work closely with people with TB to address their concerns. As one village doctor explained, 'the patients are worried about the economic pressure, as well as the overwhelming psychological stress (of diagnosis)…I patiently explain and solve their concerns and guide the patient through the steps with scientific facts and methods' (P31_Village doctor). All village doctors described how they counsel people not only on medication adherence but also on overall lifestyle habits to help them during treatment. As one village doctor reported 'when I saw tuberculosis patients for the first time I was worried that they would forget to take their medication…I reinforce healthy eating habit, reinforce sanitation habit, take medication on time' (P21_Village doctor). Another underscored that their proximity and community rapport make in-person visits convenient. They described how

'the distance for us to reach the patient's home is quite close, it is only a 5 min walk…At the family's home, the patient and family members are quite welcoming to us' (P08_Village doctor). Village doctors also have frequent contact with communities for ongoing health needs such as prenatal care and routine immunizations, which presents an opportunity for TB education tailored to local needs. One participant shared how village doctors play an important role in dispelling misinformation about TB. They shared that 'the most important thing is public education, publicising the main purpose and side effects of free tuberculosis medications, and to allow everyone to realise that tuberculosis can be cured and eliminate the misunderstanding that everyone has: that free medications are ineffective' (P15_Village doctor).

Other participants emphasised that village doctors must be provided appropriate protection and compensation to safely carry out their duties. One participant explained how village doctors need personal protective equipment to safely carry out their duties as currently 'workers lack protective materials and village-level doctors cannot buy protective materials' (P19_County hospital doctor). Another explained how village doctors could be supported financially to undertake TB management, reflecting how 'the village doctor supervisor could give some labour subsidies to the village doctors, they have little wage, RMB 1000 per month (USD 140), some village doctors are also busy – they also have other part time jobs' (P11_Township hospital doctor).

Innovative technologies to coordinate linkage to care, retention and medication adherence

Participants reflected on how inadequate information management systems and processes negatively affect their ability to provide high-quality TB care in the region. One participant reflected on the burden of TB in the prefecture saying, 'this is a severe tuberculosis affected area, the population is large, and many patients are positive. There are two people (working) in (tuberculosis) management…It is difficult to track patients, 40–50% of patients are out of town long-term, and it is difficult to manage. (Patient) tracking needs improvement… tuberculosis is hard to manage' (P22_CDC Staff). Many health facilities rely on paper records, resulting in inconsistent and non-transferrable TB reporting across the region. For those that do use electronic records within their health facility, facility-specific electronic records use a different system than the national Tuberculosis Information Management System (TBIMS) used for reporting and registering people with TB. Indeed, one participant reflected on how differing systems can undermine health workers' ability to effectively manage health data, explaining that '(recording) TB patients uses another reporting system, so maybe the doctors are a little short-handed and confused when it comes to TB patient management' (P22_CDC Staff).

Participants also reflected on challenges tracking medication adherence, a core pillar of TB care. Participants reported being unable to verify adherence based on self-reporting alone. One participant summarised these difficulties by saying, 'I didn't know if they were taking their medications or not, the computers didn't show anything, it could only be recorded in the book. If they lied, I would not know. Whether or not the medication was taken, I would not know. I made the telephone call (to the patient) and my supervisor can only check whether or not I made the phone call' (P01_Township hospital nurse). Several participants reflected positively on the opportunity to strengthen adherence monitoring by using electronic medication adherence monitoring technologies (e-monitoring). One township hospital doctor related the benefits of e-monitoring towards the overall strengthening of TB care provided to people in the region explaining, '(by having electronic monitoring) in addition to knowing the actual situation of patients' medication history, you can also know which aspects of disease control need to be strengthened' (P13_Township hospital doctor). However, these systems must be user-friendly, and staff must be trained on their use to ensure all health workers, including village doctors, can effectively use the technology.

DISCUSSION

This qualitative study explored health workers' perspectives on TB care in rural Shigatse, Tibet, China. Through this exploration, we highlight how three interrelated factors—primary care, community health workers and innovative technologies—present important opportunities to strengthen TB health service delivery across the cascade of care in the region.

First, our study emphasises that strengthened primary care is critical to ensuring high-quality TB care in Shigatse. China's rural health system has had a primary care focus since the 1960s, yet training as well as 'knowledge to practice' gaps in TB care at the local level persist.[26–28] The quality of the initial diagnosis and management of TB has been identified as a particularly poorly understood part of the care cascade globally, and this is no different in Shigatse.[29] Without trained health workers at the first point of care, the quality of TB care across the care cascade will inevitably suffer. A shared aspect of primary care strengthening and TB quality of care improvement is investment in ongoing training and skills development of the health workforce, particularly in regard to identifying and managing TB.[30] Our study underscores that it cannot be assumed that primary care providers in high prevalence rural settings, in China or elsewhere, have been trained on TB risk factors, presentation, diagnosis, clinical care or referral processes—all necessary aspects of training for TB care providers. Studies elsewhere in China have explored primary and community care providers' awareness of TB and found several training gaps.[31] There have been ongoing efforts in resource-constrained settings to improve training on TB and make it more accessible for rural primary care providers in

China. Some have proposed innovative training methods, such as offering e-training TB modules for village doctors over the popular Chinese mobile phone application WeChat. However, studies using WeChat for TB training have shown only modest improvement in TB management knowledge among rural doctors.[31] Future research should adopt co-design principles and take a holistic approach to better develop and deliver applicable and user-friendly training.

Second, our findings underscore the important role of community health workers in providing high-quality TB care.[32 33] Treatment for TB is lengthy, challenging and complex for people with TB and their families to navigate. Village doctors in our setting provide a regular and familiar touch point for people during their treatment. Many TB programmes globally offer this type of support as a core feature of directly observed therapy, particularly in high-burden settings.[34–36] Based on guidelines in China, regular follow-up should be provided by township hospital staff and village doctors. However, in our setting, township hospital staff faced tremendous challenges in conducting visits due to the harsh travel conditions and shortage of trained and available human resources. Village doctors are embedded within these communities and provide not only TB care, but care across the lifecourse for families. This longstanding rapport and deep local knowledge positions them well to identify people with symptoms of TB, address context-specific health beliefs and behaviours, and dispel local rumours or misconceptions about TB and its treatment. Other studies in high-burden settings both in China and elsewhere globally have reported similar findings.[37–39] Some TB programmes have also leveraged community health workers for innovative risk communication and community engagement strategies to create context-specific public health messaging about TB. For example, community health workers in India provide TB education for hard-to-reach groups and effectively augment the cascade of care with greater rates of TB case detection and improved treatment success rates.[34] However, as the role of community health workers evolves and expands, so too must efforts to build capacity in this workforce through training. Indeed, as both our study and others from resource-constrained settings have identified, community health workers must be adequately trained, protected and compensated, as they carry out this work.[37]

Finally, our study highlights how, depending on its application and quality, information technology can both hinder and help TB care providers across the cascade of care. Shigatse lacks comprehensive and interoperable information technology platforms that span the health system. Our findings provide an important example of how vertical programmatic improvements at the national level, such as the TBIMS system, can hinder high-quality care when not integrated with local information systems. Studies in other countries with a high burden of TB such as South Africa and Indonesia have also reported the importance of, and current gaps in, interoperable information technology systems to ensure continuity of care and integration of TB care into other programmes.[40–42] Such systems provide an important foundation for receiving and managing data from patient-facing technologies to support people in adhering to their TB medications. Our findings highlight how e-Health modalities could be an important opportunity to create a circle of care around people with TB, their family members and health workers in this setting. Our participants highlighted electronic pillboxes, but other studies have reported the potential of mobile phones, smart phones, apps and videoconferencing technologies in supporting the provision of high-quality TB care.[43–45] However, the current evidence on e-Health interventions to enhance TB care is mixed.[46 47] To be successful, e-Health interventions must be user friendly (both for people with TB and health workers), context-specific and fit into larger efforts to improve the entire cascade of care for people with TB.[48] Particularly in high-burden low-resource settings, equity and accessibility for all people with TB are crucial to e-Health uptake and sustainability. By the same token, digital tools need to be accessible to all levels of the health workforce, including community health workers. Indeed, technology is neither a one-size-fits all panacea nor a replacement for a trained health workforce. Technology is an important tool to support people with TB and TB care providers. To reap its benefits, investment is needed in the development, contextualisation, embedding, monitoring and evaluation of innovative technologies. Efforts to do so are currently underway including contextualised e-monitoring for TB in Shigatse.[49]

These three areas—primary care, community health workers and innovative technologies—do not operate in isolation. They are synergistic and together emphasise the need for community-centred efforts to improve TB care in remote and rural settings. Our study highlights that capacity building must begin at the 'most local' level of the health system, where people first seek TB care or where they may be screened while seeking care for other conditions. To realise such an approach, future formative and implementation science research must include the voices and perspectives of health workers at all levels of care.

Strengths and limitations

This manuscript is strengthened by the perspectives of health workers providing TB health services in a rural and remote region. A further strength is our use of the TB cascade of care to explore their perspectives and experiences. This study contributes to the limited body of knowledge on the perspective of health workers, in particular village doctors, in Shigatse, Tibet. A particular strength is our administration of semi-structured interviews in the Tibetan language, which enabled village doctors to describe their experiences in greater detail.

A key limitation of the study is desirability bias. Participants may have presented a more positively framed account of their experiences. We attempted to limit the

influence of this bias by reassuring participants that the study was not related to their work performance and that all responses would be kept confidential. The impact of this bias was likely minimal as participants were candid in sharing their perspectives. Although we tried to recruit a breadth of health workers, given heavy workloads and vast travel distances, we may be missing the perspectives of some health workers providing TB care in the region.

CONCLUSION

This qualitative study has identified three key areas that pose opportunities to strengthen TB health service delivery in rural communities in Shigatse, Tibet, China, from the perspectives of health workers who provide TB care at different levels in the region. The quality of TB care could be improved across the care cascade in Shigatse by strengthening primary care through ongoing training on TB, greater support and inclusion of community health workers (village doctors in this setting) and leveraging technology to create a circle of care that supports people with TB and their care providers.

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Patient consent for publication Not applicable.

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