

What are the tuberculosis care practices of informal healthcare providers? A cross-sectional study from Eastern India

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Abstract

India is the highest TB burden country, accounting for an estimated 26% of the global TB cases. Systematic engagement of the private sector is a cornerstone of India's National Strategic Plan for TB Elimination (2017–25). However, informal healthcare providers (IPs), who are the first point of contact for a large number of TB patients, remain significantly underutilized in the National TB Elimination Program of India. Non-prioritization of IPs has also resulted in a limited understanding of their TB care practices in the community. We, therefore, undertook a descriptive study to document IPs' TB care practices, primarily focusing on their approach to screening, diagnosis, treatment and referral. This cross-sectional study was carried out from February to March 2020 in the Birbhum District of West Bengal, India. Interviews were conducted utilizing the retrospective case study method. A total of 203 IPs participated who reported seeing at least one confirmed TB patient in 6 months prior to the study. In that duration, IPs reported interacting with an average of five suspected TB cases, two of which were later confirmed as having TB. Antibiotic use was found to be common among IPs (highest 69% during the first visit); however, they were prescribed before the patient was suspected or confirmed as having TB. We noted the practice of prolonged treatment among IPs as patients were prescribed medicines until the second follow-up visit. Referral was the preferred TB case management approach among IPs, but delayed referral was observed, with only one-third (34%) of patients being referred to higher health facilities during their first visit. This study presents important findings on IPs' TB care practices, which have consequences for achieving India's national goal of TB elimination.

Keywords: Informal healthcare providers, tuberculosis care, tuberculosis, India

Introduction

Tuberculosis (TB) is a leading cause of death worldwide (an estimated 1.2 million deaths). In total, 87% of cases occur in 30 high-burden countries, including India, which in 2019 accounted for 26% of TB cases, 27% of drug-resistant TB and 17% of the TB case notification gap globally (World Health Organization, 2021). These figures demonstrate the substantial TB burden faced by the country. India has made a bold commitment to eliminate the disease by 2025, guided by India's National Strategic Plan (NSP) for TB Elimination (2017–25) (Central TB Division, 2017). The NSP recognizes the importance of the private sector in achieving the national goal of TB elimination and recommends taking concrete actions to scale up their engagement in TB care. Despite TB care services being available free of cost in public health facilities, around 50% of patients are managed by the private sector, highlighting their particular role in TB care (Satyanarayana *et al.*, 2011; Central TB Division, 2021).

India's private sector is large, heterogeneous and includes formal and informal healthcare providers (IPs) (Hooda,

2017). The engagement of the formal private sector (such as qualified doctors) in the National TB Elimination Program (NTEP) is progressing (Central TB Division, 2021), but the role of IPs, who are the first point of contact for a significant proportion of TB patients (Samal, 2016; Bronner Murrison *et al.*, 2016b; Yellappa *et al.*, 2017), remains largely missing from the current NTEP of India. The guidance document on TB partnership developed by the Ministry of Health and Family Welfare lists IPs as important TB care providers. But it lacks clarity on IPs' actual role and scope in the public–private partnership model (Central TB Division, 2019).

The role of providers involved in primary care delivery is vital in TB care (Ahamed *et al.*, 2004), as TB patients usually present to these services with general symptoms such as cough (Islam *et al.*, 2014). Findings from multiple studies indicate that IPs are the primary care providers delivering as much as 70% of care in India, especially in rural and underserved areas (Gautham *et al.*, 2011; MAQARI Team, 2011; Das *et al.*, 2016). Additionally, and specific to TB, in a systematic scoping review paper undertaken by the present authors focusing

Key messages

- Our results corroborate existing evidence reporting informal healthcare providers (IPs) as a first point of contact for some tuberculosis (TB) patients in their care pathway.
- Antibiotics use was common among IPs (highest 69% during the first visit); however, they were prescribed before the patient was suspected or confirmed as having TB.
- Referral was reported as the preferred case management approach, but delayed referral was observed, with only one-third (34%) of the patients being referred by IPs to higher health facilities during the first interaction.
- We found no evidence of IPs initiating treatment with anti-TB drugs, but the practice of prolonged treatment of patients for presenting symptoms was identified.
- The study presents important findings on IPs' TB care practices. It highlights the importance of prioritizing these providers in the National TB Elimination Program to support the achievement of goals set out in India's National Strategic Plan for TB Elimination.

on IPs' role in low and middle income countries, all studies ($n = 13$, including some from India) reported improvement in care outcomes after IPs' engagement in TB care (Thapa *et al.*, 2021a). Such positive impacts have also been documented in other studies conducted in India (Dutta *et al.*, 2018; Kelamane *et al.*, 2021). Hence, considering both evidence demonstrating their ubiquitous presence in India's health system and their potential in improving TB care outcomes, the underutilization of IPs by the NTEP is a missed opportunity to strengthen the achievement of national as well as global TB targets.

A majority of the previously conducted studies focusing on private sector TB care practices have been carried out among formal (qualified—allopathic or non-allopathic) practitioners and provide documentation of their screening, diagnosis, treatment and referral practices in TB care (Uplekar *et al.*, 1998; Vandan *et al.*, 2009; Achanta *et al.*, 2013; Bronner Murrison *et al.*, 2016a). The existing evidence base for IPs is limited (Bell *et al.*, 2011). One qualitative study reports IPs treating TB patients for 3–4 months with inappropriate regimens before making a referral (Yellappa *et al.*, 2017), and a study conducted in Delhi found that unqualified providers (IPs) were more likely to abstain from prescribing TB drugs to patients (Das *et al.*, 2015). On the other hand, a study done in the Haryana state of India found that 34% of surveyed IPs treated TB patients with anti-TB drugs (Anandhi *et al.*, 2002). In these studies, IPs were included as a sub-population, or the focus was narrowed to a single aspect of TB care practices, such as treatment. At an aggregate level, the existing findings are mixed and inconclusive. We believe, therefore, that focusing on this group requires urgent attention. This is particularly true, given that IPs' role in TB care remains unclear and practising as an IP is illegal and punishable in many states of India (Pulla, 2016). In addition to this, the present study is focused on untrained allopathic practitioners, a group of IPs who prescribe medicine, including antibiotics, as part of their regular practice, thus making it essential to document their approach to TB care (Khare *et al.*, 2019). Given this context, we, therefore, aimed to conduct a descriptive study to quantitatively document IPs' (untrained allopathic practitioners) TB

care practices comprehensively, focusing on their approach to screening, diagnosis, treatment and referral.

Materials and methods

Study design and setting

This descriptive cross-sectional study was carried out from February to March 2020 in the Birbhum District of West Bengal. The research was conducted in collaboration with the Liver Foundation, West Bengal (LFWB), a not-for-profit healthcare organization with extensive experience in the field of IPs (Liver Foundation). We chose West Bengal as it is the only state in India where IPs are recognized by the state government, making it logistically convenient to approach and enrol participants in the study (Kaul, 2016). In addition to this, West Bengal is one of the 10 states prioritized by NTEP as they account for 62% of the TB notification gap and 70% of nationwide TB treatment in the private sector (Central TB Division, 2021). Similarly, the Birbhum district was chosen as it is one of the working sites of our local partner. Birbhum district has 19 blocks and six municipalities and is spread over 4545 sq. km in the Burdwan division of West Bengal. The district's total population is 3 502 404, and 36% belong to scheduled tribes or castes. The literacy rate is 70.9%, and the majority of people are dependent on agriculture, with an annual per capita income of 53 122 Indian rupees (~USD 723) (Thukral, 2019).

Study population

The population for this study are IPs who participated in a previous survey measuring their knowledge using a standard vignette method. This was conducted by our team and involved 331 IPs covering all 19 blocks of the Birbhum district (Thapa *et al.*, 2021b). Previous studies using vignettes have reported that providers' knowledge of TB care may not translate into their actual clinical practice (Mohanani *et al.*, 2016). Hence, this additional study was conducted to document IPs' actual TB care practices in the community. In the previous knowledge study, we developed a sampling frame of 589 IPs with support from the LFWB and local IPs association, and based on the calculated sample size, 331 IPs were randomly chosen for participation. All selected participants prescribed allopathic medicine (as reported by IPs) as part of their regular practice. To minimize recall bias in the current study, participation was limited to those IPs who reported seeing at least one confirmed case of TB in the 6 months preceding the survey. We defined a confirmed case of TB as anyone who first visited IPs at their clinic with symptoms that resembled TB or general symptoms such as cough and cold and later had a positive sputum test either ordered by an IP or at a private or public health facility. Out of 331 IPs who participated in the knowledge survey, 203 (61%) who consented and met the above-mentioned inclusion criteria were enrolled in this study. None of the IPs we approached declined our request for participation.

Data collection tool and method

We used the retrospective case study method as this approach allowed us to document IPs' TB care practices based on their recent interaction with a case of confirmed TB (Mills *et al.*, 2010). By focusing on one confirmed case with each IP, we could document IPs' practices referring to an actual patient

and capture the complete picture of their interaction with a patient from an initial stage (presenting with symptoms) to final management (such as referral). This level of detail would not have been obtained with the traditional survey approach with a close-ended questionnaire. As the study aimed to interview a large sample (203) of IPs and quantitatively document their practices, we prepared a documentation format (please refer to [Supplementary File 1](#)) to streamline the data collection process by only collecting specific information during the interview. The interviewers focused on four domains of TB care: screening, diagnosis, treatment and referral capturing data such as presenting symptoms, action taken by IPs during each visit, the details of tests ordered, medication provided and the referrals made. The documentation format was tested among 10 IPs for 3 days by the researcher (P.T.) with the help of two trained research assistants (RAs). Minor changes were made after the testing, and the final study tool is available as a [Supplementary File \(S1\)](#).

Data collection was undertaken in Bengali (local language) by two trained RAs having previous experience collecting data with IPs. At the beginning of the interview, RAs collected socio-demographic information such as age, education and work experience. Then, three close-ended questions were included to broadly assess IPs' willingness to engage in NTEP, including the roles they were willing to take and the motivating factors. Interviewers (RAs) then followed the case study method in which IPs were asked to share and discuss their interaction with the most recent case of TB using a pseudonym to ensure patient confidentiality. The interviewers (RAs) followed the interview schedule provided in the [supplementary file \(S1\)](#) and documented the details using the documentation format (S1). An average of eight IPs were interviewed each day at the LFWB office in Suri, Birbhum. Each interview lasted for an average of 30 min.

Data analysis

A data entry format was developed in Excel, which was structured to enter data based on the number of visits made by a patient. For instance, during the first visit, if an IP prescribed medication or ordered a test, the details of the medicine or test were entered, and similar approach was followed for subsequent visits. The data in Excel were later imported to STATA software version 17 [StataCorp (2021), College Station, TX, USA] for cleaning and analysis. The study findings are presented quantitatively: mean and standard deviation or median and interquartile range for continuous variables and percentages and frequency to summarize the categorical data. There were no missing data as all the information was verified by the interviewers (RAs) at the end of each interview.

IPs practices

Data presented in [Table 3](#) show IPs' TB care practices based on their (IPs) interaction with one recent case of confirmed TB, so even though findings denote IPs' practices, the interpretation is based on the action taken for each patient (such as referral and prescription of medication or test) during each visit. As the case study method was adopted, the patients were tracked from the initial presentation with symptoms until the final management (such as referral to higher health facilities), meaning that the total sample size during subsequent visits only included patients invited for a follow-up visit by IPs.

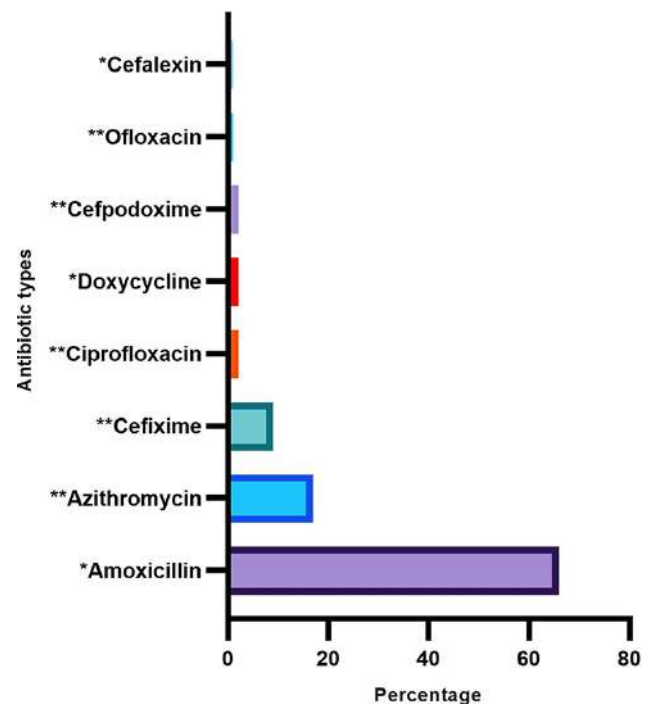


Figure 1. Types of antibiotics prescribed by IPs
*Access, **Watch (WHO classification of antibiotics).

Types of antibiotics prescribed by IPs

We listed the total of all antibiotics prescribed by IPs (during any visits) and classified them by referring to the 2019 World Health Organization (WHO) Access Watch Reserve (AWaRe) framework. Hence, the presented finding ([Figure 1](#)) is a cumulative summary of the total antibiotics (classified by type) prescribed by IPs. AWaRe classifies antibiotics into different groups where 'Access' refers to widely accessible antibiotics, 'Watch' refers to priority antibiotics with higher potential to develop antimicrobial resistance and 'Reserve' refers to a group of antibiotics with restricted use and availability limited to specific healthcare levels ([World Health Organization, 2019](#)).

Results

Background characteristics

A total of 203 IPs participated in the study. [Table 1](#) shows the background characteristics of the respondents. A majority (99%) of the participants were male. More than two-thirds (80%) of the respondents reported receiving vocational training in health and around 50% also had secondary training. Different private institutions (a majority of them unrecognized by the government) provided vocational training, including courses such as Health Worker Training, Community Medical Service Training, Community Medical Service and Essential Drugs Training, with a duration ranging from 6 months to 1.5 years. The majority (81%) of IPs had a post-secondary and above qualification. The higher degrees were in non-health-related courses. Around two-thirds (64%) of IPs received training in TB care in the last 5 years. Around 95% of IPs received 1 day of training (ranging from 1 to 3 days) delivered by various providers, such as non-government

Table 1. Background characteristics of IPs ($n = 203$ IPs)

Variables	Frequency (%)
Age, mean (SD)	43 (8)
Sex, male, n (%)	200 (99)
Highest education received, n (%)	
Primary	1 (0.4)
Secondary and below	37 (18)
Post-secondary	91 (45.6)
Higher degree education	74 (36)
Received first vocational training, n (%)	173 (85)
Received second vocational training, n (%)	95 (47)
Experience working as IP (years), mean (SD)	18 (7)
Work hours (each day), mean (SD)	7 (2)
Patients served (each day), median (IQR)	17 (10–25)
Learned to work as IP, n (%) ^a	
Working with a doctor/nurse	100 (49)
From parents/grandparents	33 (16)
After vocational training	31 (15)
Working at a hospital/pharmacy	15 (7)
From relatives/siblings	15 (7)
Working with another IP	9 (6)
Received training on TB in last 5 years, n (%)	
Yes	129 (64)
No	74 (36)
Reasons why people seek care from IPs, n (%) ^a	
Easy access—service at any time	134 (66)
Low cost	132 (65)
Trust	95 (47)
Convenience—close to home	45 (22)
Flexible payment options	24 (12)
Tribal region in the catchment area, n (%)	137 (67)
Working as IP—Primary occupation, n (%)	
Yes	178 (88)
No	25 (12)
Smartphone ownership, n (%)	203 (100)
Capable of using social media applications, n (%)	149 (73)

^aMultiple choice question.

SD: Standard deviation.

IQR: Interquartile range.

organizations implementing the Axshya project, the German Leprosy and TB Relief Association, and Government Block Primary Health Centers. The mean length of work experience was 18 years, and, on average, they saw 17 patients each day. About two-thirds of the IPs explained that patients seek their services due to easy access (66%) and low cost (65%), followed by trust (47%). For the majority (88%), working as an IP was their primary occupation. All IPs owned a smartphone and more than two-thirds (73%) could use social media applications.

Perspectives regarding engaging with the NTEP

All IPs (100%) who participated in the study expressed willingness to engage formally with the NTEP [Table 2](#). Sixty-two percentage (125/203) stated that they were willing to act as a directly observed treatment provider. Around half (95/203) of the IPs were willing to raise awareness of TB by providing information to patients visiting their clinic, and a similar percentage (90/203, 44%) expressed their willingness to refer a presumed case of TB to higher health facilities and, once diagnosed, provide counselling while on treatment. Interestingly, IPs were less interested in roles that required them to leave their clinic, such as active case finding and transportation of sputum samples. Training from the government was described as the primary motivating factor (65/203, 32%)

for their potential engagement. Around one-fourth (28%) of the IPs expected an incentive or remuneration for their work, and 11% expressed their social responsibility to support the government in TB elimination.

Practices

As shown in [Table 3](#), IPs reported that in the 6 months prior to the study, the average number of suspected TB cases was five, and among these, an average of two were later confirmed as having TB. The most common symptoms reported by patients during the first visit were cough (88%) and fever (86%), followed by weakness (35%) and blood in sputum (28%). During the first visit ($n = 203$ confirmed TB patients), 63% of the patients were prescribed drugs by IPs to treat the most common presenting symptoms, such as cough and fever. Among those patients ($n = 128/203$) who were prescribed drugs, 69% were prescribed antibiotics by IPs. Of all the patients ($n = 35$) who were ordered lab tests, 100% were asked to do a sputum test. For those patients who were asked to come for a first follow-up visit ($n = 135$ patients), around 20% (29/135) were prescribed medicine or lab tests during that visit. Similarly, for those who were invited for a second follow-up visit by IPs ($n = 29$), 90% (26/29) were referred, but 10% (3/29) were asked to attend a third follow-up visit. The endpoint for referral of patients (who were asked to come for follow-up visits) was if the patient showed no sign of improvement (for the majority of patients), or if symptoms of TB were obvious during follow-up visits, or if a lab test confirmed TB. None of the IPs reported prescribing an anti-TB drug to a confirmed case of TB. Their preferred management approach was to refer patients to higher health facilities after they suspected or confirmed patients as having TB. The additional details on medicines and lab tests are provided as a [Supplementary File \(S2\)](#).

Antibiotic prescribing practices

[Figure 1](#) gives a summary of the type of antibiotics prescribed by IPs. Of note, this includes total antibiotics that were prescribed by IPs to patients either during first or follow-up visits. Based on the 2019 AWARe classification framework, out of the total number of prescriptions in this study, 69% of antibiotics belonged to the Access group and 31% were Watch antibiotics. The most commonly prescribed antibiotic was amoxicillin (66%), followed by azithromycin (17%). None of the antibiotics prescribed was a first-line anti-TB drug used in India.

Referral practices

[Figure 2](#) represents the referral practices of IPs during each interaction with patients. Only 34% (68/203) of the patients were referred by IPs during the first interaction, with the highest number referred (106/135, 78%) during the second visit. IPs preferred referring patients to the government system, either directly to a health facility (such as a government peripheral health centre or hospital) or through accredited social health activists (government community health workers). The majority (197/203, 97%) of referrals were verbal and the remaining were on paper forms.

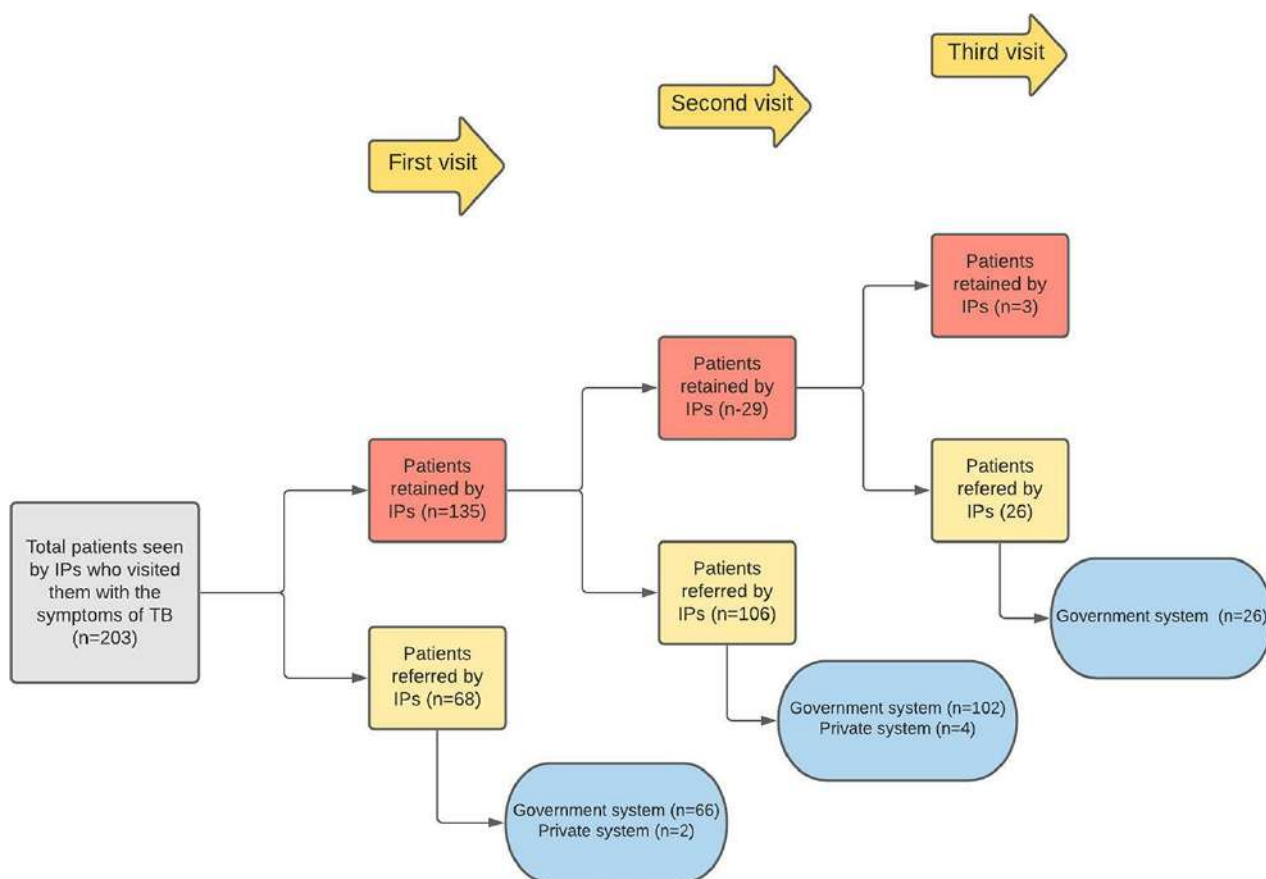


Figure 2. Schematic representation of IPVs’ referral practices (n = 203 confirmed TB patients)

*Retained means IPVs advised the patient to come for a next follow-up visit.

Table 2. IPVs perspective regarding their engagement in NTEP of India (n = 203 IPVs)

Variables	Frequency (%)
Willing to collaborate with NTEP	203 (100)
Perspective on potential role for IPVs in NTEP ^a	
Directly observed treatment provider	125 (62)
Community awareness	95 (47)
Referral of presumed TB case	90 (44)
Counselling of TB patient	90 (44)
Monitoring of patient loss to follow-up	26 (13)
Active case finding	14 (7)
Collection and transportation of sputum sample	14 (7)
Perspective on motivating factors ^a	
Training on TB	65 (32)
Incentive or remuneration for work	56 (28)
Work recognition by the formal system	56 (28)
Social responsibility	22 (11)
Support from the formal system	10 (5)

^aMultiple choice question.

Discussion

Our study examines the TB care practices of IPVs primarily focused on their approach to screening, diagnosis, treatment and referral. Importantly, we found that in the community, for some patients, IPVs are the first point of contact in a patient’s TB care pathway. This study provides further information on IPVs’ TB care practices, highlighting their role in achieving the

goal of early identification of a presumptive case of TB. It also documents practices such as prolonged treatment, including antibiotics use, and delayed referral that can have a greater impact on achieving the national goal of TB elimination. A further insight from this research is the willingness expressed by all IPVs (100%) to formally engage in the NTEP. This is a key finding to be explored using qualitative methods in future research.

As can be inferred from the number of suspected and confirmed TB cases reported by IPVs, an important finding from this study is that TB patients in the community seek care from IPVs during the early stage of the disease. IPVs reported interacting with an average of two confirmed TB patients in the 6 months prior to the study. Further, an average of two visits were made by patients before IPVs referred them to higher health facilities. These findings are consistent with the results from a systematic review (Samal, 2016) and a small number of cross-sectional studies (Kapoor *et al.*, 2012; Bronner Murrison *et al.*, 2016b), which also report IPVs as the first point of contact in TB patient’s care pathways. IPVs are ubiquitous in India, and TB patients at an early stage of disease progression generally present to primary care providers with symptoms of routine cough (Paramasivam *et al.*, 2016; Samal, 2016). Both of these circumstances provide a possible explanation for why IPVs are the first providers for TB patients in their care pathway. In order to achieve the goal of early identification of a presumptive case of TB at first contact (either in the public or private health system) as set out in India’s

Table 3. IPs practices in TB care ($n = 203$ confirmed TB patients^a)

Variables	Frequency (%)
Number of suspected cases in last 6 months, median (IQR)	5 (3–9)
Number of confirmed cases in last 6 months, median (IQR)	2 (1–4)
Findings below are based on one recent confirmed case of TB for each IP	
Presenting symptoms ^b (during first visit) ($n = 203$)	
Cough	179 (88)
Fever	176 (86)
Weakness	72 (35)
Blood in sputum	58 (28)
Loss of weight	56 (27)
Loss of appetite	50 (24)
Breathing difficulty	45 (22)
Chest pain	28 (13)
Night sweat	20 (9)
Running nose	2 (0.9)
Action taken by IP during first consultation ($n = 203$) (first visit)	
Prescribed medicine	100 (49)
Prescribed medicine and lab tests	28 (14)
Ordered lab tests	7 (3)
Referred patient	68 (34)
Proportion of providers who, n (%)	
Prescribed antibiotics ($n = 128$) ^d	89 (69)
Ordered sputum test ($n = 35$) ^e	35 (100)
Action taken by IP during second consultation ($n = 135$) (first follow-up visit) ^c	
Prescribed medicine	8 (6)
Prescribed medicine and lab tests	5 (4)
Ordered lab tests	16 (12)
Referred patient	106 (78)
Proportion of providers who, n (%)	
Prescribed antibiotics ($n = 13$) ^d	7 (53)
Ordered sputum test ($n = 21$) ^e	18 (85)
Action taken by IP during third consultation ($n = 29$) (second follow-up visit) ^c	
Ordered lab tests	3 (10)
Referred patient	26 (90)
Proportion of providers who, n (%)	
Ordered sputum test ($n = 3$) ^e	2 (66)

^aA confirmed case of TB is defined as anyone who first visited IPs at their clinic with symptoms that resembled TB or general symptoms (such as cough and cold) and later had a positive sputum test either ordered by an IP or at a private or public health facility.

^bMulti-response question.

^cSecond and third visit samples include those patients who were invited for a follow-up visit by IPs.

^d n represents total patients who were prescribed medicines during that visit.

^e n represents total patients who were prescribed lab tests during that visit.

NSP (2017–25), engaging IPs is crucial considering their role as primary care providers in the communities they serve (Central TB Division, 2017). Furthermore, the reasons people seek care from IPs, such as easy access, low cost, trust and convenience, found in this study are similar to those discovered by previous research (Sudhinaraset *et al.*, 2013; Gautham *et al.*, 2014). These are important factors determining health-seeking behaviour, further emphasizing the need to prioritize these providers in NTEP.

Our findings provide important evidence on IPs' role in treating TB patients. We found no evidence that IPs initiate TB treatment, contradicting previous findings (Anandhi *et al.*, 2002; Yellappa *et al.*, 2017). IPs in this study prescribed medicines to treat the most common presenting symptoms, such as cough and fever, but once IPs suspected or diagnosed

a TB case, the preferred management approach was referral of patients to higher health facilities. We observed the practice of prolonged treatment by IPs for the presenting symptoms with multiple drugs, including antibiotics. There could be a number of explanations for such practices. First, in a knowledge survey we conducted among 331 IPs in the same study site, IPs demonstrated an overall (history taking, ordering lab tests and making a correct diagnosis) sub-optimal level of knowledge in TB care, with the lowest in asking essential history-taking questions (5.4% enquired all four and 21.7% asked at least two essential questions) (Thapa *et al.*, 2021b). This indicates that IPs lack the appropriate knowledge to screen patients by asking essential history questions, resulting in prolonged treatment before referral. Second, we found that for a majority (88%) of survey participants, their role as an IP was their primary occupation, and as IPs do not charge a consultation fee, their primary source of their income is the medicines they prescribe. This is, therefore, a possible reason for treating patients with some medication before making a referral. To address such issues, it is essential to develop training programmes for IPs and include them in incentive programmes as part of the NTEP.

We found that antibiotic prescription was common among IPs (highest 69% during the first visit), and this pattern of high prescription aligns with the overall antibiotics use in India (Gandra and Kotwani, 2019), including in both formal (Pathak *et al.*, 2011; Alvarez-Uria *et al.*, 2014) and informal (Khare *et al.*, 2019; Gautham *et al.*, 2021) sectors. As IPs in this study prescribed antibiotics to patients before suspecting or diagnosing them as a case of TB, the consequence of such prescription can lead to significant diagnostic delay and increase the probability of drug-resistant TB (Wang *et al.*, 2006; Migliori *et al.*, 2012; Satyanarayana *et al.*, 2016). IPs reported the use of antibiotics mostly belonging to the 'Access' group, a finding consistent with a previous study by Gautham *et al.* (2021). However, the use of some of the 'Watch' category antibiotics, especially fluoroquinolones, needs serious consideration because of their ability to mask active TB (Wang *et al.*, 2006). The use of antibiotics is a complex problem, and there are various intrinsic and extrinsic factors that drive IPs' prescribing habits (Nahar *et al.*, 2020; Gautham *et al.*, 2021). Addressing this issue requires an inclusive approach by prioritizing these providers in broader policies and guidelines related to antibiotic use, such as India's action plan for antimicrobial resistance (Ranjalkar and Chandy, 2019).

We identified that referral was the preferred case management approach among IPs in TB care, and we identified four trigger points for referral. First, referrals were made based on the presenting symptoms for 34% (68/203) of patients. For those remaining, referrals were made either if no improvement was observed in a patients' health, or if the symptoms of TB were obvious during follow-up visits, or if the patient was confirmed to have TB by a sputum test. However, we also noted delayed referral among IPs as the majority (97%) of the patients were referred to higher health facilities only by the third visit. This finding of delayed referral is consistent with previous studies that report seeking care from IPs as one of the reasons for diagnostic delay among TB patients (Sreeramareddy *et al.*, 2014; Bronner Murrison *et al.*, 2016b). The importance of appropriate and timely referral is crucial in TB care, considering the infectious nature of the disease and the importance of early identification in achieving TB targets, as stated in the WHO's End TB Strategy (World Health

Organization, 2015) and India's NSP (Central TB Division, 2017). We did not explore the reasons for delayed referral as part of this study, but preliminary data from a forthcoming qualitative study conducted by our team have identified factors related to IPs as well as policy and health system gaps such as IPs' knowledge, lack of TB guidelines and IPs' role unclarity in NTEP, all of which could influence IPs' referral practices (Thapa *et al.*, 2022). Furthermore, our findings from the current study show that verbal referral was the common method among IPs, which can also lead to a loss of patients in the TB care pathway. Hence, there is a need for a well-established referral mechanism between the formal and informal system, which improves TB care outcomes (Thapa *et al.*, 2021a) as well as protects patients from unnecessary catastrophic health expenditure (Veesa *et al.*, 2018). Such a referral system can be developed using a digital platform (Lee *et al.*, 2020). The findings from this study show that all (100%) IPs owned a smartphone, and 73% were capable of using social media applications. This presents an opportunity for NTEP to develop mHealth intervention tailored for IPs.

Limitations

This study has several limitations. First, the data were collected through IPs, discussing their recent interaction with a confirmed case of TB; therefore, recall bias is a possibility for details such as the medications prescribed and lab tests ordered. There is a possibility of over- or underestimation in the count of suspected and confirmed TB cases, as this was based on the information provided by IPs. Second, we limited participation to those IPs who had consulted at least one case of confirmed TB in the 6 months preceding the survey. It is, therefore, possible that we might have missed those IPs who suspected and referred a case, but the patient declined or could not undergo a confirmatory TB test. Third, the IPs may have chosen a case that was managed appropriately as the case studies are self-reported. Fourth, the study was conducted in West Bengal, the only state in India where the government recognizes IPs, leading to a better environment for training and engagement; so, the findings from this study may not be generalizable to other states in India. Finally, we only collected quantitative data in four domains of TB care; therefore, we lacked in-depth data to provide a clear explanation of IP practices.

Conclusions

Our study generates important evidence on IPs' TB care practices focused on their approach to screening, diagnosis, treatment and referral. Our findings corroborate the existing evidence highlighting IPs as the first point of contact for some TB patients in the care pathway. The willingness expressed by IPs to engage in NTEP is a positive indication and an opportunity to mobilize this large cadre of health workforce with broader reach and acceptance in the community. The study findings highlight the need to prioritize these providers in TB care as their practices, such as prolonged treatment, including antibiotic use and delayed referral, could have severe consequences on patients and the NTEP. However, with systematic engagement, IPs could strengthen the early identification of a presumptive case of TB

by enhancing timely referral to government health facilities, thus supporting the overall achievement of the goals set out in India's NSP.

Supplementary data

Supplementary data are available at *HEAPOL Journal* online.

Data availability

The data underlying this article will be shared upon reasonable request to the corresponding author.

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Author contributions

P.T., J.J.H., R.J., P.S.M., K.B. and P.N. collaborated on the conception or design of the work. P.T., P.S.M., D.K.D. and T.M. contributed to data collection. P.T., D.K.D. and T.M. contributed to data analysis and interpretation. P.T. contributed in drafting the article. P.T., J.J.H., R.J., P.S.M., K.B. and P.N. contributed to critical revision of the article. All authors provided approval of the final version to be submitted.

Reflexivity statement

The authors include one female and seven males and span multiple levels of seniority with expertise in various fields, such as tuberculosis, primary care, qualitative research, health system research, informal healthcare providers and operational research. The authors represent three different countries: Nepal, India and Australia. One author is a PhD student in public health, and two co-authors are first-stage researchers.

Ethical approval. This study was approved by University of New South Wales Human Research Ethics Committee (HC191006) and Liver Foundation Institutional Ethics Committee for Human Research (IILDS/IECHR/01/202).

Conflict of interest statement. None declared.

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