



A qualitative exploration of challenges in childhood TB patients identification and diagnosis in Bangladesh[☆]

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ABSTRACT

Background: As childhood tuberculosis is difficult to identify and diagnose, the experiences of the caregivers and healthcare providers of childhood tuberculosis patients remain a potential area of study. This study aims to illustrate the challenges caregivers and healthcare providers encounter in identifying and diagnosing childhood tuberculosis in two sub-districts of Bangladesh.

Methods: We conducted semi-structured in-depth interviews with eight caregivers of childhood tuberculosis patients and key informant interviews with 36 healthcare providers from September 2020 to December 2020 from different levels of the tuberculosis control program in Keraniganj (with high childhood tuberculosis cases notification), Faridpur Sadar (with low childhood tuberculosis cases notification), and Dhaka city.

Results: There is a dearth of understanding among caregivers about childhood tuberculosis. Passive case finding process and focus on cough during community mobilisation contribute to the delay in childhood tuberculosis identification. The stigmatisation that caregivers anticipate and experience has an impact on their mental health and implies that there are misunderstandings about tuberculosis in the community. Furthermore, diagnostic dilemma among healthcare providers accounts for diagnosis delays. Some, but not all, institutions in different geographical locations provide free diagnostic tests and have GeneXpert devices.

Conclusions: Various factors, including caregivers' knowledge and experience, the process of case finding and community mobilization, healthcare providers' way of service provision and diagnosis, and the unavailability of required logistics at facilities challenge the identification and diagnosis of childhood tuberculosis that need to be minimized for childhood tuberculosis's early identification, diagnosis, treatment initiation, and successful completion of treatment. Awareness should also be raised in the community of childhood tuberculosis.

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1. Introduction

Although tuberculosis (TB) is infectious and curable, the disease burden of childhood TB remains underestimated as countries with high TB burdens lack notification data [1]. In 2019, among reported cases worldwide and in Bangladesh, 8% of children were in Southeast Asia [2], and 4% were in Bangladesh [3], respectively. However, according to World Health Organization (WHO) estimates, childhood TB accounts for 10–15% of overall TB cases in countries with a higher TB burden [4–6]. In addition, the 3.2% of the multidrug-resistant (MDR)-TB global prevalence can be attributed to childhood TB [7]. Despite having excellent treatment outcomes for most forms of TB, including drug-resistant (DR) TB in children [8], uptake of treatment is low [9] due to challenges in case finding and prompt diagnosis. Childhood TB is a primary concern in Bangladesh, where poverty, childhood malnutrition, an increased number of adult tuberculosis cases, and a dense population are all high-risk factors [10]. However, a paucity of data remains on the challenges experienced by caregivers and healthcare providers in the identification and diagnosis of childhood TB.

Caregivers are the decision-makers of treatment-seeking for the childhood TB patient. The intention of care-seeking is influenced by the knowledge, presence, and severity of TB symptoms among the patients [11,12]. Many studies have reported poor knowledge of TB among caregivers as a challenge while seeking treatment for their children [13,14]. A study in Indonesia reported low screening practice for children with TB [15]. This study also found a delay in taking childhood TB patients for treatment as the caregivers were unaware that their children's signs and symptoms were of TB [15]. A study in Delhi, India among childhood TB patients reported a median three days (range 1–300) delay between the onset of symptoms and a visit to a health provider [16].

Caregivers of childhood TB patients have also reported diagnostic delay [17,18]. A study in Pune, India among childhood TB patients treated in a general hospital reported a median 51 days (interquartile range [IQR] 27–86) delay in time-to-treatment initiation [19]. Provider's low suspicion of TB, caregivers' visits to multiple providers for a child to be diagnosed, provider's lack of adherence to the national TB guidelines, provider's lack of interaction with caregivers, long waiting time for caregivers, less frequent advice from providers, and caregivers' dissatisfaction with TB service can delay diagnosis and treatment initiation [20]. Delays in proper treatment-seeking and treatment initiation lead to severe health outcomes among the children [21]. Mortality among children with TB is higher because of the gap between diagnosis and treatment [22].

However, despite having policies in practice, childhood TB possibly remains under-identified and underdiagnosed in Bangladesh. It is globally established that diagnosis of childhood TB is a challenge due to the paucibacillary nature of TB, children's incapacity to expectorate sputum and overlapping symptoms with non-TB pneumonia [23,24]. Thus the children initially receive empirical medication [25–27]. Moreover, age and immunological sensitivities make children more susceptible to TB [28]. Children usually contract the disease through close interactions with adult TB patients in the house or community [29]. After being exposed to or infected with *Mycobacterium tuberculosis*, children can acquire TB within one year [21]. However, most children with TB remain undiagnosed and untreated because of poor access to diagnosis, treatment, and difficulty in diagnosis [1], which may be the case for Bangladesh as well, as often sputum results may contradict with clinical diagnosis, as shown in a retrospective cohort study conducted between 2018 and 2019 [30]. Moreover, delayed proper treatment [31], empirical medication including prescription of excessive drug with unwanted side effects [32] and ineffective treatment [33,34] all contribute to the development of drug resistance in children. DR TB can serve as a reservoir for upcoming fatal cases [35]. It can also negatively affect the physical and mental health of the children and their academic career [36].

Moreover, there is inadequate evidence on the barriers to identifying and diagnosing childhood TB from caregivers' and providers' perspectives. The existing literature reports only the lack of knowledge [13,14] of caregivers and transportation costs [37]. A study in Dhaka at the BRAC urban directly observed therapy short course (DOTS) sites reported managerial officials' frequent turnover in government, stigma, care-seeking delay, inadequate diagnostic facilities, and private practitioners' limited involvement as challenges in the implementation of childhood TB control program [38]. Therefore, an in-depth investigation of the experiences of both caregivers and providers in different geographical locations is needed to improve the early detection and inform better policies in screening, treatment, and management of childhood TB across the country.

2. METHODS

2.1. Study design

The paper presents the qualitative findings of a mixed-method study with an integrated sequential explanatory design. First, a survey of caregivers was conducted to learn about TB health-seeking practices (symptoms, time of appearance of symptoms, place of testing, screening, and advice received after diagnosis), the contact history of the childhood TB patient, besides sociodemographic information. This was followed by in-depth interviews (IDIs) with selected caregivers from the survey to investigate further the health-seeking practices, diagnosis and treatment and the challenges experienced while doing so. Finally, key informant interviews (KIIs) with implementers and providers also explored their challenges in identifying, treating, and managing TB.

2.2. Study site

The research took place in six districts (three with high and three with low notification rates of childhood TB) from September 2020 to December 2020. Six sub-districts with the greatest number of childhood TB patients were chosen from the six districts for the research. Following this, two unions were selected from each selected sub-district. Since the prevalence of childhood TB is low, the purpose behind choosing the largest sub-district and union was to include as many childhood TB patients as possible in the survey. As a

result, 12 unions from the six districts were selected. However, qualitative data collection took place in Keraniganj sub-district from Dhaka district (high notification region), Faridpur Sadar sub-district from Faridpur district (low notification region), and Dhaka city (to conduct KIIs among implementers) only to minimize travel during the COVID-19 pandemic.

2.3. Study participants

We interviewed 111 households of childhood TB patients, where half were of male patients and the remaining female. Around 38% and 33% of children with TB were smear-negative and smear-positive, respectively. Twenty-eight percent of the children had extra-pulmonary TB. Only for one case, the type of TB could not be determined as the caregiver could not show the treatment card. Out of those who said that their child had symptoms (108 out of 111), the most reported symptoms were fever ($n = 93$), followed by cough for more than two weeks ($n = 74$) and loss of appetite ($n = 52$). Around 32 caregivers also mentioned weight loss as one of the symptoms. Around 10 caregivers reported their child showed bulge on the body. Around 35 caregivers also mentioned other symptoms that include night sweat, coughing up blood, fatigue, leg pain, dizziness, and difficulty breathing.

Forty-four participants were interviewed in depth in the qualitative phase. This number consisted of eight caregivers (who also participated in the survey earlier) (Table 1) of the diagnosed children with TB (aged 15 years or less whose treatment has been completed or is ongoing) (Table 2), seven implementers from national tuberculosis control programme (NTP), BRAC, and Damien Foundation, three physicians, five community health workers (CHWs) from both NTP and BRAC, 17 supervisors who oversaw the field activities of CHWs, and four informal providers (Table 3). During our selection for the IDIs of the caregivers, we attempted a good balance of gender, type of TB (smear positive, smear-negative, extrapulmonary) and health seeking practice (delay versus less delay, formal versus informal care as the first point of contact) and location (Keraniganj and Faridpur to minimize travel during the COVID-19 pandemic). During our selection of the KII participants, we attempted to include representatives from all levels of childhood TB identification, treatment, and management.

2.4. Sampling

Caregivers for the IDIs were purposively recruited from the survey respondents in Keraniganj and Faridpur, considering their diverse experiences in health-seeking. The key informants were enlisted from all levels of TB care delivery in Keraniganj and Faridpur to gain a comprehensive picture of how TB detection and associated challenges work.

2.5. Data collection

The IDIs explored the caregivers' experiences and challenges in care-seeking for TB. Healthcare providers' and implementers were asked in the KIIs about their experiences in identifying and managing childhood TB. All the IDIs took place in person at the caregivers' homes. Most KIIs were conducted in person, whereas the remaining took place over telephone calls and online using Google Meet. The guidelines included open-ended questions that required probing based on the participants' responses. All interviewers received training before data collection. The IDIs and KIIs were conducted using pilot tested semi-structured Bangla guidelines and audio-recorded. Each interview lasted around 30 min. Notes were taken whenever possible. The research team regularly debriefed where the findings from the interviews were discussed in depth, and primary analysis was conducted following the debriefing. The primary analyses helped to understand what common findings and patterns were coming up and to what extent the data was getting saturated. The research team discontinued interviewing additional individuals after data saturation was attained. The research team also monitored the field activities.

2.6. Data analysis

The audio-recorded interviews were transcribed verbatim. Data was analysed concurrently with data collection. A list of a priori codes was made from the guidelines which made up the codebook. Four researchers read the transcripts repeatedly to familiarise themselves with the data and then applied the a priori codes. They discussed the emerging codes and added or modified the existing

Table 1
Profile of the caregivers of childhood TB patients.

Relation with the patient	Age (in years)	Level of education	Occupation
Mother	32	Formal primary schooling (up to class 5)	Domestic help
Mother	45	Formal secondary schooling (up to class 10)	Housewife
Mother	35	Formal secondary schooling (up to class 10)	Tutor
Mother	24	Formal secondary schooling (up to class 10)	Housewife
Mother	–	–	Housewife
Mother	38	Formal primary schooling (up to class 5)	Housewife
Aunt	32	Formal secondary schooling (upto class 10)	Housewife
Brother	20	Formal secondary schooling (upto class 10)	Employee

– = Data were unavailable; TB = Tuberculosis.

Table 2
Profile of the childhood TB patients whose caregivers were interviewed.

Gender	Age (in years)	Type of TB	Treatment Status
Male	12	Smear negative pulmonary TB	Completed
Male	14	Extra-pulmonary TB	Completed
Female	13	Extra-pulmonary TB	Ongoing
Female	12	Extra-pulmonary TB	Completed
Male	4	Smear positive pulmonary TB	Completed
Female	14	Smear positive pulmonary TB	Completed
Female	14	Extra-pulmonary TB	Completed
Female	14	Smear negative pulmonary TB	Completed

Table 3
Profile of the key informant interview respondents.

Category	Type of respondent	Number of interviews by respondent's gender	
		Male	Female
Community Health Worker	Health Assistant, Family Welfare Assistants, BRAC Shasthya Shebika	2	3
Field Supervisor	Community Health Care Providers, TB Program Officer (Govt), Field Worker, BRAC Programme Organizer	4	1
Facility Manager	Medical Officer Disease Control, Resident Medical Officer, Tuberculosis & Leprosy Control Assistant (Govt), Medical Technologist, Lab Technologist	9	0
Field Manager	District Manager, Upazila Manager (BRAC)	3	0
Senior Manager	Assistant Director & Deputy Program Manager (NTP), Senior Manager (BRAC & Damien Foundation), Programme Manager	5	2
Paediatrician	Child Specialist at tertiary care Hospital	2	0
Private Practitioner	Private Practitioner	1	0
Informal Provider	Village Doctor, Pharmacist	4	0
Total interviews = 36			

codes in the codebook. A data display matrix was created that helped identify themes and patterns.

2.7. Ethical considerations

Ethical approval was obtained from the institutional review board of BRAC James P Grant School of Public Health of BRAC University (approval number: IRB-18 July'20–034). Informed written consent was obtained from all the participants after they were briefed about the nature, confidentiality, and how and where the findings would be shared. They were also informed of the voluntary nature of the participation and their right to withdraw at any moment. Interviews were recorded, and notes were taken once the participants consented.

3. RESULTS

3.1. Challenges in the identification of childhood TB cases

3.1.1. Lack of knowledge among the caregivers

A lack of knowledge about childhood TB symptoms was found to hamper the timely identification of childhood TB. Caregivers did not know that clinical manifestation and expression of TB are different in children than in adults and that the former mostly have symptoms related to extrapulmonary tuberculosis (EPTB). Almost all the caregivers associated TB with cough, the absence of which caused them not to suspect TB. One caregiver said, "We only knew that a TB patient coughs. So, I told them [the doctors] that my daughter does not have a cough. Then they [the doctors] said, this is not that kind of TB; that is Pulmonary TB. This is Gland TB. Such patients do not have a cough" (Caregiver ID13).

Often caregivers became confused due to overlapping symptoms with other illnesses. They did not visit a doctor until they found the symptoms to be severe. They waited at home for nearly a month before consulting a doctor. One of the caregivers mentioned, "I thought that the child had cold and fever. I gave her medicine for that for one and half months. It subsided and recurred." (Caregiver ID16).

However, some caregivers were aware of the symptoms of TB in general and the fact that it is curable. This familiarity influenced their willingness to seek treatment which was a good sign in terms of identification. They knew they would have to undergo screening if the symptoms were persistent (see Table 4 for a summary).

“When you have TB, you have a cough, fever. These are the symptoms. When you have a cough for more than three weeks, you go and test. That is how it can be identified” (Caregiver IDI1)

3.1.2. Caregiver's preference for alternative treatment

There was a strong preference among the caregivers to seek alternative treatment when children exhibited symptoms other than cough, such as a swollen gland on the neck, as in the case of gland TB. Such a decision was mostly due to own instinct, elders' recommendations and low cost.

“I fed the child syrup provided by the homeopathy doctor. But the child was not cured As I am her mother, I must try to look for a cure for my child. I took her to the homeopath thinking that she would be cured.” (Caregiver IDI4)

“Elders say that swelling can be cured with homeopathy. Even I also take homeopathy. That is why I took my daughter there thinking it would be cheap and the child would be cured. But it (the swelling) did not subside.” (Caregiver IDI3)

3.1.3. Passive case finding process: a missed opportunity

The passive screening process seems to have contributed to a low notification. Health workers mentioned that they requested caregivers to bring their children with symptoms to facilities during household visits. Moreover, the health workers visited houses when most children were at school, thus leading to missed opportunities of identifying symptomatic cases (see Table 5 for a summary).

“During community mobilisation, when somebody tells us I have a child with this symptom, we tell them to bring their children to our facilities. If the children have those signs and symptoms that I just spoke about, we tell them to screen [for TB] ... When they [children] are at school, we do not get the time to assess them. We do not visit their schools to see if they have TB [symptoms].” (Field manager, male, KII16)

3.1.4. Community mobilisation focused on cough

Even though all TB service delivery implementers were aware that children could not expectorate sputum, community mobilisation mainly focused on the cough. However, coughing for more than two weeks does not apply to children who mostly do not express this symptom. Children usually have a fever and weight loss. Therefore, the focus on cough misses out on the children who do not have cough as a symptom.

“Smear-positive are the ones who have the bacteria in their sputum. So, what is the main symptom of the ones who are smear-positive TB? Cough! You need to have a cough [as a symptom]. Therefore, the focus was on the sputum test that helped to detect TB. ... [...] ... The program's priority is smear-positive. But if we think in terms of children, they do not have a cough or other symptoms like adults. They also have extrapulmonary symptoms ... [...] ... they cannot produce sputum ... [...] ... A large proportion of our diagnosed patients come from sputum sample collection.” (Senior manager, female, KII3)

3.2. Challenges in the diagnosis of childhood TB cases

3.2.1. Long waiting time and service providers' misconduct at public diagnostic facilities

Though diagnostic tests at government and non-governmental organization (NGO) based facilities were free, a few caregivers experienced long waiting times and misbehaviour by staff at diagnostic facilities in the public hospitals. They had to go there as they did not have enough money to go to any other facility.

“At facility “X”, the service providers misbehave. Because we have less money, we have to go there.” (Caregiver IDI1)

3.2.2. Fear of social isolation

Several caregivers reported facing social isolation for their children and the whole family when people learned about their (children's) disease.

Table 4

Challenges in the identification and diagnosis of childhood TB cases in Bangladesh based on caregivers' experience.

Theme	Sub-theme	Summary of findings
Challenges in identification	Lack of knowledge among the caregivers	•Reported not knowing and recognizing the symptoms of childhood TB properly
	Caregiver's preference for alternative treatment	•Had confusion due to overlapping symptoms with other illnesses
Challenges in diagnosis	Long waiting time and service providers' misconduct at public diagnostic facilities	•A few reported experiencing long waiting times and misbehaviour by staff at diagnostic facilities in the public hospitals.
	Fear of social isolation	•Reported social isolation for the children with TB and their family •Reported concealing child's disease status out of the fear of a child being marginalized and gossiped about

Table 5
Challenges in the identification and diagnosis of childhood TB cases in Bangladesh based on healthcare providers' experience.

Theme	Sub-theme	Summary of findings
Challenges in identification	Passive case-finding process: a missed opportunity	•Reported following passive screening process that might have contributed to low notification
	Community mobilisation focused on cough	•Reported focusing on cough as a symptom during community mobilization. Thus, healthcare providers miss out on children who do not have cough as a symptom
Challenges in diagnosis	Diagnosis dilemma among the doctors	•Reported treating children suspecting non-TB infection as they do not consider TB immediately
	Unavailability of Mantoux test and GeneXpert: Reliance on conventional methods	•Reported dependence on diagnostic centres to detect presumptive cases due to unavailability of Mantoux test and GeneXpert. However, it becomes difficult for the low-income families to go far away and spend money in diagnostic center to detect the disease

“People did not let their children play with my son and daughter. They also did not socialise with us.” (Caregiver IDI6)

“Yes, when people got to know about TB, they said you should stay alone. Even if it is difficult, nothing can be done.” (Caregiver IDI8)

To avoid this problem, some caregivers reported concealing the disease status of their children. One caregiver stated, “No, I did not tell anybody. I kept it a secret as I think my child will face inconvenience due to this problem [disease]. He will not be allowed to mingle with other children. I may face such a situation or there may be gossips I will not tolerate if anybody says anything to my child.” (Caregiver IDI2)

3.2.3. Diagnosis dilemma among the doctors

Providers and implementers mentioned that a child could show other symptoms when infected with tuberculosis, leading the doctor to misdiagnose. The general practitioners do not consider TB immediately. Instead, they treat the child with antibiotics, suspecting non-TB infection. These challenges contribute to delays in TB diagnosis and treatment.

“A child may lose weight, and a doctor should be suspicious of that, but usually doctors may not pay attention because of patient load, or if TB is not thought of immediately.” (Senior manager, male, KII7)

3.2.4. Unavailability of mantoux test and GeneXpert: reliance on conventional methods

GeneXpert and Mantoux test (MT) are not readily available according to the interviews with the providers. Particularly, the MT is considered an essential supportive tool to diagnose childhood TB in the absence of a good sputum sample. According to the providers, due to the unavailability of MT at some facilities, the presumptive cases are referred to other diagnostic centres, which may be far and therefore involve increased out-of-pocket expenditure, which low-income families cannot afford.

“Doctors usually prescribe CBC [complete blood count], MT together. We confirm the ESR [erythrocyte sedimentation rate]. Then for MT, it is their [patients' family members] wish. Those who can afford it, do it, others who do not have money do not do MT.” (Facility manager, male, KII18)

The implementers were found to be hopeful about the improved situation of diagnosis drawing the example of the training of the paediatricians the completion of a comprehensive training module that were ongoing during the data collection period of the current research.

“In December, around 472 GeneXpert machines are going to be installed all over the country. At the moment, we have nearly 313. Because of GeneXpert, even if [TB] bacillary [load] is 50, the diagnosis is still possible. This addition of GeneXpert machines means there will be more diagnoses of childhood TB in the future.” (Senior manager, male, KII6)

4. Discussion

The key findings reveal a lack of knowledge among caregivers, fear of social isolation, passive case-finding procedures, focus on cough during community mobilisation, diagnosis dilemma among providers and unavailability of appropriate diagnostic facilities contribute to delays in the identification and diagnosis of childhood TB.

One of the key findings is that the lack of knowledge of childhood TB among caregivers and initial visits to informal providers contribute to delays in proper healthcare seeking. A systematic review in Sub-Saharan Africa also reported how delayed healthcare-seeking behaviour hinders the timely initiation of TB treatment among children [39]. According to a past study, caregivers' recognition and response to a child's illness can be influenced by their education, knowledge regarding the health issue, media exposure, and socioeconomic status [40]. If the caregivers have inadequate knowledge, they are less prompt to recognise and respond to their child's condition. They would also seek treatment for other illnesses or not visit the right provider. Such practices allow the spread of TB to continue and the deterioration of the child's health. Therefore, increasing awareness about childhood TB and its infectiousness is essential. For most Bangladeshis, informal providers are the first contact point for seeking care. Intensive training with regular brief

refresher orientation with the informal providers will ensure the correct identification and timely referral to the diagnostic facilities.

The fact that caregivers were more aware of cough as a TB symptom might be linked to community mobilisation efforts that strongly emphasise cough. This, along with poor awareness of non-cough related symptoms such as bulges, make childhood TB grossly undiagnosed. A survey (n = 111) findings of BRAC James P Grant School of Public Health (unpublished) reported that other than a cough, 17% of diagnosed childhood TB patients had a history of loss of appetite, 10% lost their weight, and 4% reported chest pain [41]. The caregivers would not communicate the other symptoms with the community health workers if the focus is on cough, resulting in a missed opportunity. Community health workers should develop and disseminate specific messages, including all relevant symptoms related to childhood TB.

Fear of social isolation was also found among the caregivers of childhood TB patients upon the diagnosis of the disease. The caregivers were concerned about their children's acceptance in the community if other people found out about the disease. This finding is consistent with one study in Malaysia, where parents of childhood TB patients expressed the same fear of their children being left out and not having any friends [37]. This social isolation can cause irritability, tension, pessimism, and depression among childhood TB patients [42], and also among caregivers, as revealed in the current research. This fear can prevent caregivers from seeking diagnosis for their children who may have symptoms of childhood TB. As a result, care must be taken to consider that the intervention to increase awareness does not lead to the stigmatisation of children and people because of TB.

Another key challenge from the providers' side was that doctors do not suspect childhood TB immediately. Instead, they start treatment for a different disease or refer for further investigations. This finding is similar to a study in Peru that also reported misdiagnosis and caregivers' visits to multiple places for diagnosis [17]. Such approaches delay the treatment and lead to catastrophic expenditure for unnecessary investigations. Moreover, wrong treatment can put children with TB in danger. Finally, the transmission of TB continues due to delays in treatment.

Another significant barrier to the diagnosis of childhood TB is the reliance on conventional methods for diagnosis. As smear-positive TB is the TB program's primary focus, sputum examination is the most widely used diagnostic method. But children can neither expectorate quality sputum for sputum tests nor clearly show TB features in x-rays. In the current study, doctors interviewed were reportedly hesitant to diagnose smear-negative or those with unclear x-ray findings as TB. If paediatricians and general practitioners do not consider TB one of the primary provisional diagnoses, then children with TB will continue to be unidentified. Therefore, childhood TB diagnosis needs to be strengthened, ensuring appropriate diagnostic facilities are available. Also, future research should explore the reasons behind doctors' reluctance to consider TB a provisional diagnosis.

Despite these challenges, the availability of free diagnostic tests at government and some NGO-managed facilities encourages diagnosis. Many caregivers visited the local diagnostic centres directly to test their children free of cost. It indicates the community is well aware of these services. Notably, the expansion of GeneXpert facilities in Bangladesh is a promising aspect. Such an expansion would efficiently and effectively identify more childhood TB patients within a shorter time.

This study had several limitations. Firstly, additional in-depth interviews with the caregivers and healthcare providers of childhood TB patients from different regions of Bangladesh could provide a comprehensive understanding of their challenges. Secondly, including more children with TB below five years would have added diversity in the experiences as this group is at a higher risk of developing a severe form of TB. Thirdly, no analysis of knowledge about DR forms of TB was conducted in the study. Finally, the study might have recall bias in which the challenges experienced by the caregivers might be under or over-reported.

5. Conclusion

The current study shows that the identification and diagnosis of childhood TB are challenged by various factors including caregivers' knowledge and experience, the process of case finding and community mobilization, healthcare providers' way of service provision and diagnosis, and the unavailability of required logistics at facilities. These challenges need to be minimized so that children with TB can have an early identification, diagnosis, treatment initiation, and successful completion of treatment. Awareness should be raised in the community on childhood TB. Future interventions should take these challenges into account and ensure better identification and diagnosis and reduction in tuberculosis burden.

Ethics declarations

- This study was reviewed and approved by BRAC James P Grant School of Public Health, with the approval number: IRB-18 July'20-034.
- All participants provided informed consent to participate in the study.
- All participants provided informed consent for the publication of their anonymised case details and images.

Data availability statement

The data that has been used is confidential.

CRedit authorship contribution statement

Sharmin Akter Shitol: Formal analysis, Writing – original draft. **Avijit Saha:** Data curation, Formal analysis, Writing – review & editing. **Mrittika Barua:** Data curation, Formal analysis, Writing – review & editing. **Kazi Md Saleheen Towhid:** Resources. **Akrumul**

Islam: Conceptualization, Funding acquisition. **Malabika Sarker:** Conceptualization, Methodology, Writing – review & editing.

Declaration of competing interest

The authors declare the financial support and administrative support provided by BRAC which may be considered as potential competing interests.

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ABBREVIATIONS

TB	tuberculosis
WHO	world health organization
MDR	multidrug-resistant
DR	drug-resistant
IQR	interquartile range
DOTS	directly observed therapy short course
IDIs	in-depth interviews
KIIs	key informant interviews
NTP	national tuberculosis control programme
CHW	community health worker
NGO	non-governmental organization
MT	mantoux test
CBC	complete blood count
ESR	erythrocyte sedimentation rate

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