

Delays in Diagnosis and Treatment of Tuberculosis in Bangladesh: A Cross-Sectional Study and Program Implications

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Abstract

Background: Bangladesh is a high burden country for tuberculosis (TB). Delay in TB diagnosis and treatment leads to a more advanced disease state at presentation, with poor response to treatment allowing more transmission. This study aimed to calculate the amount of patient and health system delay and investigate the factors causing the delays.

Methods: A cross-sectional study was conducted to calculate patient, diagnosis, and treatment delay for patients receiving TB services in eight government facilities. Face-to-face interviews were conducted with 80 patients and 28 health providers in order to understand both the individual-level and health system-level factors contributing to delay.

Results: The study found a total mean delay of 77 days, including 57 days of patient delay, 18 days of diagnostic delay, and 2 days of treatment delay. The median delays were 30 days of patient delay, 3 days of diagnostic delay, and one day of treatment delay. Patients said they delayed seeking care because they were not aware of the severity of their symptoms, which were usually prolonged cough and fever. Almost half of patients (48%) initially sought care at the UHC, although a significant proportion (39%) also sought care from private providers, despite the increased cost for transportation and service fees. Over half (59%) of the patients visited a provider three or more times before they received their TB diagnosis, and almost half (43%) initially received a diagnosis other than TB. Health system delays were longer for patients who were initially seen by private providers. Fewer private providers had training in TB service delivery, experience treating TB, and they were less likely to use sputum smear microscopy or provide counseling on TB.

Conclusion: While identifying patient-level factors that influence TB delay is important for targeting case-finding and quickly diagnosing cases, attention also needs to be paid to health system factors, including provider knowledge and skills as well as availability of diagnostics and drugs, influencing delay. In particular, the capacity of private providers, who serve as the initial health system contact for a significant proportion of the population, to rapidly and accurately diagnose TB needs to be strengthened.

Keywords: TB Diagnosis; Patient Delay; Health System Delay; Bangladesh

Abbreviations

AFB: Acid-fast Bacillus; DOTS: Directly Observed Treatment Short course; DST: Drug Susceptibility Testing; MDR-TB: Multi-drug Resistant Tuberculosis; TB: Tuberculosis; UHC: Upazila Health Complex

Background

Effective control of tuberculosis (TB) requires early diagnosis and immediate treatment initiation in order to better manage the disease and to limit further transmission. Delays in obtaining diagnosis and treatment result in a more advanced disease state at presentation and a poor response to treatment. Delays also result in more transmission, as a person with active TB can infect 10 - 15 contacts annually [1]. Understanding and identifying why people with symptoms do not seek care for the TB symptoms, do not receive a timely and accurate diagnosis, and do not begin treatment is critical to planning programs that effectively reduce TB incidence.

The amount and causes of delay vary greatly between countries. A multi-country study in the Eastern Mediterranean Region found the delay from onset of symptoms to treatment initiation to range from 1.5 to 4 months [2]. A systematic review of 8 studies found slightly shorter delays, ranging from 60 - 90 days from the onset of symptoms to the time of diagnosis or start of treatment [3]. Factors that increase delay also vary from one country to the next, but often include older age or rural residence, alcohol or substance abuse, poverty, lack of access to health care, and poor knowledge about TB. Health system factors that contribute to TB delays can include inability of the provider to correctly diagnose TB due to unclear symptoms or the presence of chronic cough or other lung diseases, or extrapulmonary or negative sputum smear TB. The provider may also lack the needed diagnostic and treatment supplies and need to refer the patient to other facilities [3].

Bangladesh has invested strongly in TB control, achieving a treatment success rate of 94% and reducing mortality to 36 deaths per 100,000 population [4]. However, incidence remains high at 221 per 100,000 population, making it one of the top 20 countries in terms of burden of TB [4]. Several studies have examined the amount and causes of delays in Bangladesh [5-12]. However, the studies have tended to focus on the influence of patient socio-economic characteristics (e.g. age, sex, education, residence), type of disease (e.g. pulmonary versus extrapulmonary, new versus relapse), and the type of provider first contacted (e.g. public hospital or center providing directly observed therapy, short course (DOTS), private provider, or pharmacist). While this is valuable to efforts to target case-finding to individuals who are more likely to delay care-seeking, information is also needed on health system factors that contribute to delay. This study aims to expand the investigation to include how both patient and health system characteristics influence delay and to make recommendations for health program improvements.

Methods

Study design and study population

The cross-sectional study was conducted in four upazilas (geographic regions or sub-districts) of Bangladesh, Barisal, Faridpur, Joypurhat, and Khulna, as part of a TB control program being conducted by University Research Co. LLC under the USAID TB CARE II Project. To obtain comprehensive information on patient and health system delays, two different groups were studied: TB patients and TB service providers (Table 1).

District	Upazila	Patients	Health providers
Barisal	Muladi	10	7
	Bakergonj	10	
Faridpur	Alfadanga	10	7
	Char Bhadrasan	10	
Joypurhat	Joypurhat Sadar	10	7
	Kalai	10	
Khulna	Batiaghata	10	7
	Terokhada	10	
Total: 120		80	28

Table 1: Study population.

Patient exit interviews were conducted with 20 randomly selected patients in each district, ten each from two randomly selected upazila (government) health complexes (UHC) providing TB services. Every third patient was invited to participate in an exit interview. Both new and returning patients who had received treatment for eight weeks or less were included in the sample, but very sick patients and children were excluded. Sampling categories for gender and urban-rural residence aimed for broad representation.

Provider interviews were conducted with 28 randomly selected health providers, including one TB service provider from each of the eight UHCs, eight private practitioners (medical graduates), and 12 pharmacists and village doctors unqualified to provide direct TB service delivery but engaged in referring patients with TB symptoms. Village doctors are informally trained practitioners who provide clinical services and run the local pharmacy, usually from their own home. The sampling frame for the private providers and pharmacists/village doctors the UHC's catchment area was developed in collaboration with the health authorities and TB control partners in the area.

Data collection and analysis

Questionnaires for each of the study populations were tested and piloted. The patient questionnaire included items on factors that might influence their health-seeking behavior, such as need for permission to seek care, fear of social isolation, stigma, knowledge regarding the disease, attitudes towards TB, sources of information, satisfaction with care, estimation of delays and others. The provider questionnaire asked about general clinic information, number of days the clinic is open, volume of patients, capacity building activities for management of TB, diagnosis and treatment delays and patient education activities.

The study was approved by the of National Research Ethics Committee and the University Research Co. LLC Institutional Review Board. Data collectors and field supervisors were trained on the objectives and importance of the study and orientation about the formats used. Informed consent was obtained from each participant before the interview and confidentiality was assured.

Data from interviews with patients, community TB leaders, TB program managers, and service providers were cleaned to reconcile data entry errors. Data from the patient questionnaires was analyzed using SPSS® software version 17.0 and Excel software. Chi-square test and student t-test were used for variable comparison and association analysis. Generalized linear regression models were used to assess significance of associations and to control for confounding effects.

Definitions and measures

Data was analyzed to provide information on three major types of TB delays - patient, diagnostic, and treatment - and the causes of the delays. The study adopted the following definitions of TB delays:

- TB total delay: days between the onset of TB symptoms and TB treatment initiation.
- Patient delay: days between the onset of symptoms and the first contact with any health care service (formal or informal).
- Health system delay, including:
 - Diagnostic delay: days between a patient's arriving at any type of provider (public, private, traditional healers) and the patient's receiving a TB diagnosis.
 - Treatment delay: days between TB diagnosis and initiation of anti-TB drugs.

Both mean and median were calculated.

Results

Patient sample characteristics

Of the 80 patient respondents, 69% were male and 31% female. All were adults, and 89% were married. Most (89%) lived in rural areas. Just over half (65%) had at least primary or secondary education level. About half (45%) were not working or were working at home (e.g. housewife).

Amount of delay

The mean total delay was 77.2 days from onset of symptoms to the initiation of treatment (Figure 1). The mean patient delay time, 57.2 days, was almost three times higher than the health system delay of 20 days (diagnostic and treatment). Of the health system delay, 17.8 days was diagnostic delay and 2.2 were treatment delay.

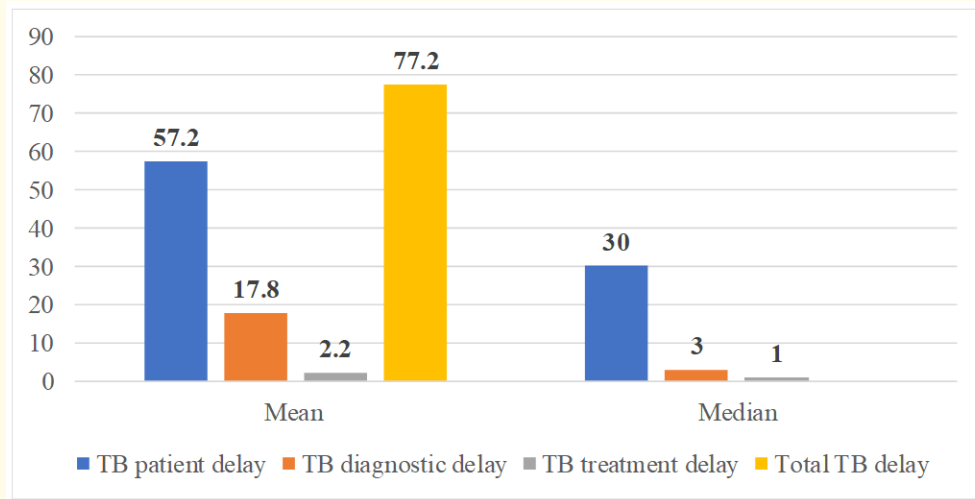


Figure 1: Days of patient, diagnostic, treatment, and total delay.

Several outliers in diagnostic delay were reported, including three patients with nine-, seven- and six-month delays. Another nine patients waited more than a month to receive results. Given the number of extreme outliers in the sample, the median was also analyzed. The median patient delay of was 30 days, almost ten times higher than the median health system delay (3 days diagnostic delay and 1-day treatment delay).

Causes of patient delay

Symptom recognition

The study asked patients to recall the symptoms that caused them to seek care (Figure 2). The main symptom influencing the decision to seek care was a prolonged cough (83% of patients). Sputum with blood, which is usually recognized as a sign of TB, was reported by only 10% of patients.

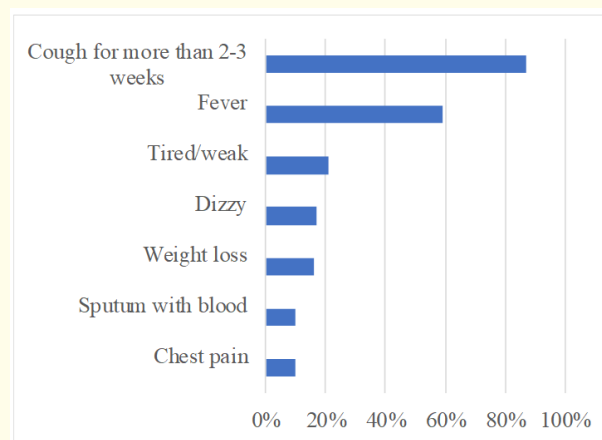


Figure 2: Initial symptoms reported by TB patients that led them to seek health care.

Patients were asked why they delayed seeking clinical attention once they had symptoms. Ninety percent of patients said that they were not aware of the severity of the symptoms and did not think that they needed medical assistance; 10% said they lacked time.

TB knowledge

Patients were asked about what they knew about TB, how it is transmitted, and how it is diagnosed and treated. Since exit interviews were conducted with patients already diagnosed with TB and during their treatment phase, it was expected that they had received counseling and education on TB symptoms and treatment. The TB knowledge measured by the patient exit interviews is therefore not a fully accurate measure of patient delay, but was considered a proxy for the measure of the effectiveness of TB counseling and education the health facilities provided.

Seventy-one percent of TB patients interviewed knew that TB is an infectious disease transmitted by germs in the air. Most patients (90%) recognized cough and fever as the symptoms most frequently associated with the disease. Ninety percent also knew that TB was diagnosed through sputum examination and X-ray. Almost all patients (99%) knew that TB could be cured and that some types of TB such as multi-drug resistant TB (MDR-TB) may require a longer treatment time to achieve a cure.

Access to TB services

More than half of patients (62%) said it was difficult for them to access the health facility closest to their households. The facilities were an average of 4.5 km from the patient's home, requiring 45 minutes of travel time. Most patients used transportation (public or the patient's) when visiting a pharmacy or private facility (70% and 77%, respectively); only 40% used transportation when visiting a government facility. Patients were more likely to walk to the government facility (40%) than to private providers (24%) and pharmacies (30%). Out-of-pocket costs for transportation was reported to be approximately US\$0.25 (19 takas) per trip.

Patients reported that they were not required to pay for TB services and lab tests done in government facilities. Women had an additional access barrier: 60% of women interviewed said that they needed permission from their husbands to access the health services.

Stigma and discrimination

Patients were asked if there were negative social norms around TB infection that discouraged them from disclosing the illness to their friends and family, and that might have caused them to delay seeking care for TB symptoms. Most respondents (93%) had disclosed their disease to family and community members. About a quarter of respondents (28%) said they were discriminated against after revealing their illness and 18% were afraid of losing their job.

Discrimination seemed to affect both women and men, although differently. Patients said that men with TB suffer more discrimination than females when diagnosed with TB, especially in the work environment. At the same time, half the female respondents perceived TB disease as having a negative impact on their ability to become pregnant and have healthy children and on their marriage or marriage prospects.

Type of provider first visited

Approximately half (48%) of TB patients first sought care for their symptoms at the UHC, 39% visited trained private providers, 8% private pharmacists/healers, and 5% self-treated (Figure 3). The decision on the type of facility where to first seek care was influenced by distance to the government health clinic and the cost of transportation for 23% of patients. Twenty-five percent of patients said they attended the government facility because they had previously used its services and 22% because the facility was recommended by a relative/friend.

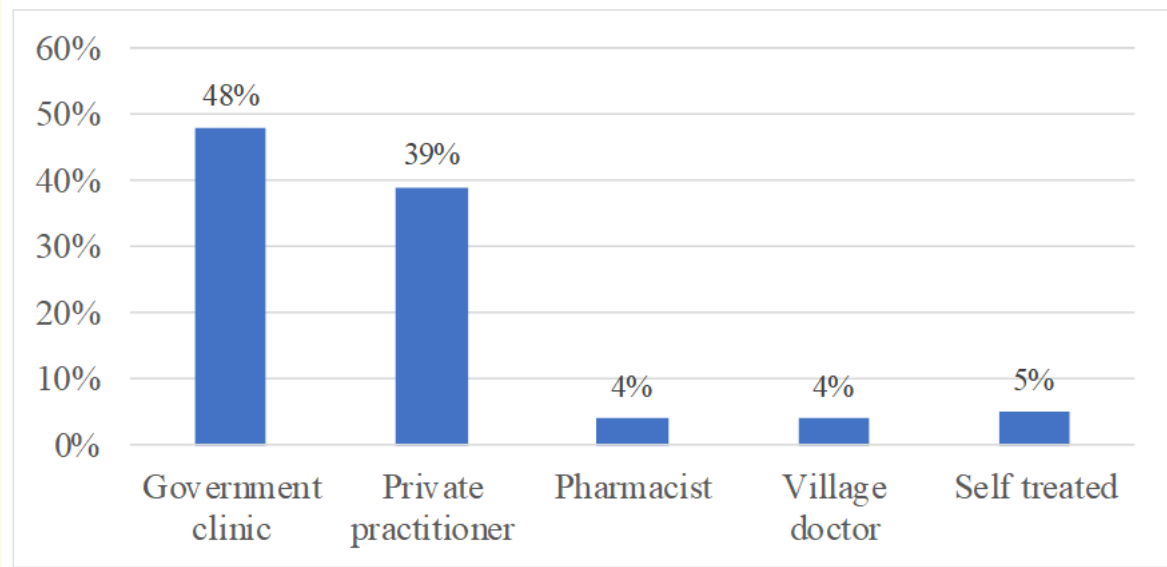


Figure 3: Type of provider first visited.

The type of provider varied by sex of the patient. Men were more likely to visit a private provider (40% of men versus 32% of women), while women were more likely to visit pharmacists and village doctors (20% of women versus 4% of men).

A third (31%) of patients who were screened by private providers, pharmacists, and village doctors said they were then referred to the government facility for diagnosis and treatment; two-thirds had not.

Causes of diagnostic delay

Provider training and treatment guidelines

Providers were interviewed about their TB service delivery. Eighty-seven percent of UHC providers, 50% of private providers, and 42% of pharmacists/village doctors were treating patients with TB. All providers in government facilities, 88% of private providers, and 84% of village doctors/pharmacists said they had received training in TB service delivery. Most providers said they had the Essential Drug List available for consultation: 87% of UHC providers, 62% of trained private providers, and 83% of pharmacists/village doctors. All UHC providers and half of private providers (50%) and pharmacists/village doctors (58%) said they had guidelines for infection prevention and control available in the clinic.

MDR-TB is treated only at government facilities. Half (50%) of UHC providers and 12% of private providers (some of whom worked in the government-run facilities during the day) had diagnosed or treated MDR-TB, suggesting that some private providers may also be working at UHCs. Eighty-seven percent of UHC providers and 25% of private providers said they had the guidelines for management of MDR-TB in the clinic.

Compliance with diagnostic TB guidelines

To identify new TB suspects in the facility, all of the UHC providers, 87% of private providers, and 92% of pharmacists/village doctors used symptom screening. Thirty-seven percent of UHC providers who are mostly health assistants, 50% of private providers, and 8% of pharmacists/village doctors conducted contact tracing.

The National TB Guidelines (5th edition) recommend that sputum microscopy be performed on all presumptive TB cases [13]. Almost all (93%) of providers used sputum smears for diagnosis: 100% of UHC providers, 87% of private providers, and 92% of pharmacists/village doctors. Chest X-rays were used by 75% of UHC providers, 75% of private providers, and 42% of pharmacists/village doctors. Tuberculin skin tests were conducted by 12% of UHC providers, 25% of private providers, and no pharmacist/village doctors.

Incorrect diagnosis

All 80 of the patients had received their diagnosis at the UHC. Only a quarter (26%) of patients received their diagnosis on their first visit. Most (74%) said it required several visits (Figure 4). This suggests that providers may not have requested a sputum sample during the patient’s first visit or that more investigation was needed for patients with a negative sputum test.

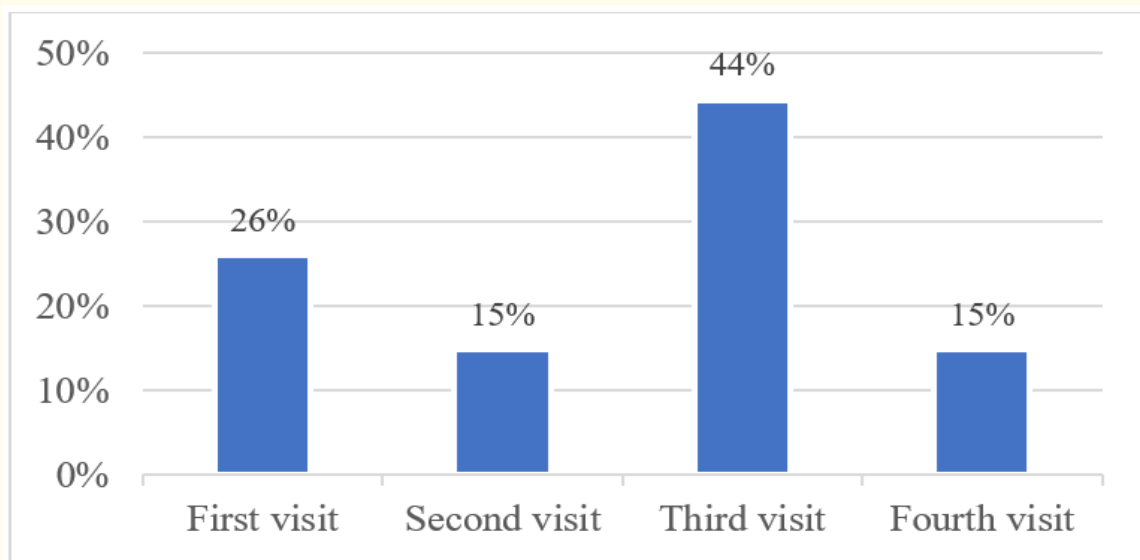


Figure 4: Number of visits to receive a TB diagnosis.

Delay in receiving lab results

UHC providers said that the average time to receive microscopy (acid-fast bacillus or AFB) results was one or two days; for private practitioners it was three or four days, and for pharmacists/village doctors approximately five days. Results from AFB culture and drug susceptibility testing (DST) were said to usually take 61-90 days and were available only in a few districts.

Causes of treatment delay

Availability of TB drugs

In addition to provider competencies on TB service delivery (described under diagnostic delay), the study asked about delays resulting from unavailability of drugs and supplies. Twelve percent of UHC providers and none of private providers and pharmacists said they had experienced stock outs of TB drugs during the last year.

Patient counseling

Patient counseling is important to help the patient understand potential side effects as well as the importance of starting treatment as soon as possible and adhering to treatment. All UHC providers and pharmacists/village doctors and 87% of private providers counseled patients on their TB symptoms. Most also provided counseling on treatment adherence: 100% of UHC providers, 87% of private providers, and 92% of pharmacists/village doctors. UHC providers were more likely to provide counseling on side effects: 75% versus 37% of private providers and 42% of pharmacists/village doctors.

TB delays by sex of patient

TB delay was calculated by participants' sex to assess the role of gender in TB patient delays (Table 2). Five male outliers had extremely long delays in seeking care (patient delay) for their symptoms with 6, 6, 12, 12, and 24 months' delay; three also reported longer-than-usual delays in receiving a TB diagnosis (6, 7, and 9 months). No specific characteristic could be identified to explain their long delays: all three individuals lived in rural area within 2.5 - 7 km of the health facility, were 55 - 60 years old, and married; two were working. We removed these last three to calculate TB delays in males. Differences in patient delay, diagnostic delay, and treatment delay among females and males in Bangladesh were not statistically significant, possibly due to the small sample.

		Mean (\pm SD)	Median	Min	Max
TB patient delay: Time from TB symptoms recognition to health care consultation (p = 0.21)					
Male	3 outliers removed * (n = 52)	54.5 (\pm 108.0)	30	1	720
Female	Total sample (n = 25)	40.8 (\pm 38.6)	28	7	180
Total diagnostic delay: Time from health care consultation to TB diagnosis (p = 0.47)					
Male	3 outliers removed * (n = 52)	10.0 (\pm 13.1)	3	1	60
Female	Total sample (n = 25)	9.8 (\pm 10.6)	3	1	30
TB treatment delay: Time from TB diagnosis to TB treatment (p = 0.11)					
Male	Total sample (n = 55)	1.6 (\pm 1.1)	1	1	8
Female	Total sample (n = 25)	3.5 (\pm 7.4)	1	1	28

Table 2: TB delays in days disaggregated by sex, Bangladesh.

TB delays by type of provider

TB delay was calculated by the type of provider who was first visited (Figure 5). The patient delay for patients who first visited a trained private provider was found to be 78% longer than for those who initially sought care from a UHC (81 days versus 45 days, respectively). The least patient delay - 30 days - was for patients who first sought care from pharmacists/village doctors.

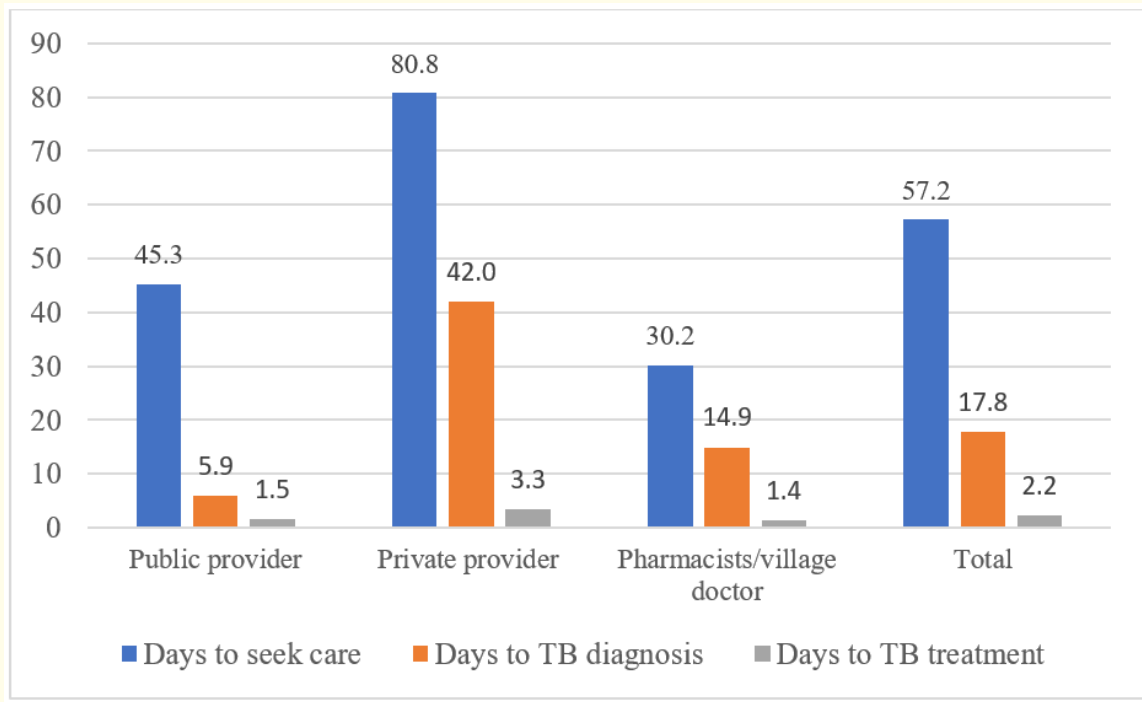


Figure 5: Mean number of TB delay days disaggregated by type of provider first visited, Bangladesh.

After the first visit to a provider, the fastest route to a diagnosis was from government providers, with whom it took 5.9 days. Patients who received their diagnosis from private providers only received it after 42 days of seeking care. Diagnosis from pharmacists/village doctors took 14.9 days. This was less than private providers because pharmacists/village doctors usually referred patients to the government facilities for diagnosis.

Almost all (92%) patients at government facilities were initiated on TB treatment within a day or two after receiving the TB diagnosis, within three-four days by private providers, and within a day or two by pharmacists/village doctors, again due to referrals.

Discussion

Table 3 compares findings from this study with previous studies on TB delays in Bangladesh. In general, comparing findings is complicated by use of different definitions of delay, measurement of either absolute days of delay or variation from a number of days deemed reasonable, and reporting of either the mean or the median [3]. This study found a longer mean patient delay than previous studies, shorter diagnostic delays (with the exception of a study on diagnostic delay for extra-pulmonary TB), and similar treatment delays. In terms of median delays, this study found shorter patient and diagnostic delays and similar treatment delays (with the exception of the study on MDR-TB).

	Symptom onset to first provider visit (Patient delay)	First contact to visit to diagnostic center (Provider delay)	Test to receiving diagnosis (Diagnostic delay)	Diagnosis to treatment initiation (Treatment delay)
Mean Delay				
This study	57 days	18 days		2.2 days
Huq., <i>et al.</i> [12]	NA	68 days (71 days for qualified providers, 67 days for non-qualified)		
Sarkar., <i>et al.</i> [11] (Extra-pulmonary TB)	NA	13 weeks urban 28 weeks rural	NA	
Hossain., <i>et al.</i> [9]	31 days	NA		
Karim., <i>et al.</i> [14]	52 days women	61 days women		2 days women
	49 days men	58 days men		2 days men
Median Delay				
This study	30 days	3 days		1 day
Rifat., <i>et al.</i> (MDR-TB) [10]	NA	4 weeks	5 days	10 days
Gosoni., <i>et al.</i> [5]	60 days			NA
Karim., <i>et al.</i> [14]	50 days women	60 days women		1 day women
	42 days men	52 days men		1 day men

Table 3: Comparison of the amount of TB delay in Bangladesh studies.

Individual level causes of delay that were investigated included knowledge of TB and recognition of symptoms, sex, stigma and discrimination, and access to care. The study found that while most patients knew about TB and that prolonged cough was a symptom of TB, most did not seek care because they did not recognize the severity of their symptoms. Several studies have shown that more than half of TB patients had fever, weakness, or shortness of breath and that patients often attributed those symptoms to other diseases, such as malaria or viral infections [3,15,16]. Even when patients are aware of their symptoms they didn't perceive them as severe to seek medical attention [17,18]. This finding suggests that interventions to improve symptom recognition and encourage health seeking behavior need to be further expanded.

This study did not find a difference in the amount of delay between women and men, similar to some other studies in Bangladesh [6,8], but in contrast to others [12,19]. A systematic review of 58 studies found studies with diverging conclusions on the link between being female and TB delay [3] and a meta-analysis of 44 studies found that although more studies report higher delays for women, sex is not an independent determinant of patient delay [20]. Because gender is a very context-specific construct and norms vary greatly from one community to the next, it may be impossible to draw any global conclusions.

A quarter of patients in this study had experienced some discrimination, which has in many studies been found to contribute to TB delay. A systematic review of TB-related stigma found that stigma was a significant cause for diagnostic delay in 33% of studies conducted in Asia/Pacific Islands and 28% of studies in Africa/Middle East [21]. Since stigma is a deeply rooted social problem, community and workplace programs are needed to shift social norms around TB and people infected with TB.

Men in this study were concerned about losing their employment, as has also been found in other countries [3]. Women were worried about the impact on their marriageability and childbearing. The finding that men were thought to experience more discrimination was surprising, particularly given the women's concerns about how TB would impact their marriage prospects. This may have been the result of interviewing women in the presence of their husbands, which was culturally appropriate but may have discouraged women from talking about the difficulties they face. Other studies in Bangladesh [12,14,22,23] and elsewhere have found women to experience more TB-related stigma than men [3,5,24-29].

Approximately half (48%) of patients first visited a UHC to obtain care for their symptoms, 39% visited a private facility, and 8% visited a pharmacist/village doctor. The strong preference for private providers was surprising given transportation costs and service fees involved. Other factors, such as office hours, greater trust in private providers, or a perception of better-quality services at non-government facilities may be playing a role. The strong preference for private facilities is similar to other studies in Bangladesh [10,11], although other studies have found an even stronger preference for unqualified providers such as pharmacists, licentiate of medical faculty (LMF), village doctors, medical assistants, sub-assistant community medical officers (SACMOs) [9,12].

Despite the preference for private providers, patients delay visiting them to seek care for symptoms, possibly due to the cost involved. This study confirmed that patients who first visited a private provider have longer patient delays than patients who initially contact UHC provider or visit an unqualified provider such as a pharmacist or village doctor [6,8,10,12]. A meta-analysis of 40 studies had similar findings with patients initially seeking care from an informal provider having higher odds of patient delay [20].

Health system factors that contribute to delays include lack of provider capacity, non-compliance with diagnostic standards, and unavailability of drugs. These factors have received limited attention in previous studies about TB delay in Bangladesh. In this study, almost half of patients were initially diagnosed with illnesses other than TB, and almost half did not receive their TB diagnosis until their fourth visit. Repeated consultations at the same level, undergoing repeated courses of nonspecific antibiotics, and failure to perform sputum microscopy, have been identified among the factors identified contribute to low rates of TB diagnosis, increasing health system delays [3,15,26,30].

Health system delays were longer for patients who were initially seen by private providers. In this study, fewer private providers had training in TB service delivery, experience treating TB, and they were less likely to use sputum smear microscopy. Of the three types of providers, private providers were the least likely to provide counseling on TB. It is likely that private providers treat symptomatic patients with one or more cycles of general antibiotics, referring them to a UHC only after a patient's failure to respond to one or more cycles of antibiotic therapy. Longer health system delays for patients initially seen in the private sector have also been found in other countries [2,3,31,32].

Scaling-up public-private mix programs that include both formal and informal health providers would maximize access of TB suspects to high-quality TB diagnosis and treatment services. TB management guidelines for informal health care providers, including an algorithm for identifying TB suspects and referring patients, would also be beneficial.

The study was limited by the small sample size and purposeful selection of the regions/districts. As a result, the sample may not have represented the causes of TB delays throughout the country. In addition, the study did not collect data on some factors that have been frequently identified as contributing to delay such as age, education, literacy and poverty [2,3,8,12,15]. A comprehensive understanding of patient characteristics that are likely to delay their care-seeking for TB would help target case-finding.

Secondly, it would also have been interesting to examine correlations between gender and health system factors such as access to health care or number of visits before obtaining a TB diagnosis. Gender norms influence not only whether women can seek care, but also the quality of care they receive.

Since exit interviews were held in health facilities, interviewed patients may have felt observed, which may have affected their responses. Women were interviewed in the presence of their husband/companion due to cultural/social norms, and they may not have responded freely to all questions (especially those regarding stigma and gender issues).

Finally, TB providers in government facilities in Bangladesh usually have a morning public practice and an afternoon private practice, so there may have been overlap among the two groups of providers.

Conclusion

A recently published study highlighting data from modelling approach shows that most important TB cascade losses are from the proportion of patient visiting the private health care providers as well as missed diagnosis in health care settings [33]. Identifying both system including provider- and patient-level factors that influence TB delay are important for targeting case-finding and quickly diagnosing cases. In particular, the capacity of private providers, who serve as the initial health system contact for a significant proportion of the population, to rapidly and accurately diagnose TB needs to be strengthened.

Ethics Approval and Consent to Participate

The study was approved by the National Research Ethics Committee and by the University Research Co. LLC Institutional Review Board. Informed consent was obtained from each participant before the interview and confidentiality was assured.

Consent for Publication

Not applicable.

Availability of Data and Materials

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

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

NK, along with other TB CARE II project staff, conceived and designed the study, FZ, PD along with local staff collected and analyzed the data. The manuscript was prepared by AO, PD, HJA, SH, KC, NK based on the review of data as well as project reports and review of literature. All authors approved the final version of the manuscript.

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Disclaimer

The views expressed herein are those of the authors and do not necessarily reflect the views of their affiliated organizations or USAID.

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