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"Factors Associated with Delay in Diagnosis and Treatment of Pulmonary Tuberculosis in Bangladesh: Comparison between Urban and Semi-urban Settings"

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Abstract

Early diagnosis and prompt initiation of treatment are essential for an effective tuberculosis (TB) control program in a country like Bangladesh, where TB is a major public health concern. Delay in diagnosis and treatment initiation may aggravate disease conditions and deteriorate clinical outcomes. This study was designed to explore the factors associated with delay in diagnosis and treatment of pulmonary TB. This cross-sectional study was conducted in the DOTS (Directly Observed Treatment Short course) center of BMU and the DOTS Center, Upazila Health Complex, Dohar. A total of 174 patients were enrolled after fulfilling selection criteria. The mean duration of experiencing the first pulmonary symptoms before the first visit to the health facility was 21.39 (±4.50) days. The mean duration from first contact to healthcare providers until TB treatment initiation was 10.78 (±3.042) days. Patients' delay was significantly associated with older age, residence in a semi-urban area, illiteracy, low monthly income, more than four family members, TB category, self-medication and TB stigma. Health system's delay was significantly associated with increased distance to the hospital, not doing a chest x-ray or sputum test on the first visit and multiple health care contacts. Mean patients' delay was 19.91±4.64 days, health system's delay was 9.77±3.43 days and the total delay was 29.81±5.11 days in the urban DOTS center. On the contrary, the mean patients' delay was 22.86±3.85 days, the health system's delay was 11.79 ±2.18 days and the total delay was 34.36±4.60 days in the semi-urban DOTS center. The delay between TB diagnosis and initiation of treatment was significantly higher in the semi-urban DOTS center.

Keywords: Pulmonary tuberculosis; DOTS strategy; DOTS center

Introduction

Tuberculosis (TB) has haunted the human race since time immemorial and continues to do so. In 2019, 10 million people were infected with tuberculosis (TB), with 79 percent of those infected living in the 30 countries with the highest TB burden, and 1.2 million died because of the disease [1]. Bangladesh is one of the 30 countries with the highest TB burden, accounting for 3.6 percent of the global cases. The incidence of tuberculosis in Bangladesh is estimated to be 221 cases per 100,000, with a death rate of 24 cases per 100,000. In Bangladesh, pulmonary tuberculosis accounts for about 80% of all TB cases. Although in recent years, TB control has improved by the implementation of programs such as directly observed treatment short course (DOTS), TB

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remains a significant public health problem in countries like Bangladesh. DOTS strategy is mostly reliant on passive case finding which is heavily influenced by the treatment-seeking behavior of the patients, perceived social stigma, access to health care and delay in diagnosis at the health facilities [2]. Early diagnosis and prompt treatment of TB cases are the keystones of global TB control programs for containing the spread of the disease within the community. According to estimates, an infected person who remains undiagnosed and untreated can infect ten to fifteen people every year [3]. Delayed diagnosis and treatment of pulmonary tuberculosis raise the danger of infection spreading in the community, increases out-of-pocket expenses for patients and decreases the efficacy of TB treatment [4]. In addition, it may avert early mortality associated with more severe complications and severe disease due to delayed presentation. Majority of TB transmission occurs between the onset of cough and initiation of treatment, and patients become more contagious and result in ongoing transmission as the delay increases [5]. Different factors contributing to delay in treatment of TB patients have been assessed across the globe and broadly classified as factors associated to patients, healthcare system or a combination of the two. Unemployment, low income, male gender, limited knowledge about signs and symptoms of TB and the health-seeking behavior of the patients were reported as the factors contributing to the delay in diagnosis whereas long travel time to the first healthcare provider, poor diagnosis with long patient waiting time, and difficulty of disease management in health facilities were associated with prolonged delay in initiation of treatment [6,7]. Delay in TB diagnosis and treatment and its contributing factors vary among societies, type of visited health facilities, geographical locations and category of the disease. In Bangladesh, very few recent studies are available in this regard. Therefore, the main purpose of this study was to identify the factors associated with delay in the diagnosis and treatment of pulmonary tuberculosis patients reported to selected DOTS centers of an urban and a semi-urban area.

Materials and Methods

At the beginning of the study, one urban (DOTS Center, Bangladesh Medical University) and one semi-urban (DOTS Center, Upzilla Health Complex, Dohar) DOTS Center were selected. Adult patients (18 years or older) diagnosed with pulmonary TB according to the national TB guideline and first attending the respective DOTS center not more than one month ago were included in the study population by systematic randomized sampling. TB patients who were unable to communicate (critically ill, mute, patients with psychiatric disorders, dementia, hearing impairment), TB patients who had relapsed or treatment failed, or who were diagnosed with MDR-TB and/or XDR-TB, as well as patients with extra-pulmonary tuberculosis, were excluded. After getting informed consent, the participants were interviewed using a structured questionnaire containing all the variables of interest to collect information regarding socio-demographic status, clinical characteristics, healthcare seeking behavior and knowledge about TB. The questionnaire was adopted from the WHO multi-country tuberculosis treatment delay survey with some relevant modifications [8]. Dates of the first appearance of TB symptoms, the first visit to a healthcare provider and the initiation of TB treatment were extracted from the records. The time interval between the date of the onset of TB symptoms and the first presentation to a professional health provider was regarded as patients' delay whereas the time interval between the date of the first visit to a professional health provider and the initiation of treatment was considered the health system's delay. Cough, fever and hemoptysis were considered as the main symptoms as well as constitutional symptoms (night sweats, weight loss and loss of appetite) were also considered where applicable. Prior approval was obtained from the Institutional Review Board (IRB) of BMU. Data were processed and analyzed using computer software SPSS (Statistical Package for Social Sciences) 23 version. Qualitative data was described in frequency and percentage. Quantitative data was described using mean and standard deviation. One way ANOVA with post HOC analysis by the Bonferroni method was done. Significance was considered at $P < 0.05$.

Results

A total number of 174 patients were included from both DOTS centers in this study. The socio-demographic profile of the participants is summarized in Table-I. Majority of the respondents (28.2%) were aged more than 50 years. Mean age of the respondents was 42.30±14.12 years. Among the participants 54.6% were female and 45.4% were male while 52.3% were from semi-urban area and 47.7% were from urban area. Regarding level of education, 15.5% respondents were illiterate, 25.9% had Primary education. Sociodemographic profile of the respondents reveals majority (37.4%) of them were housewife and 16.1% were unemployed. Almost half (49.4%) of the respondents had monthly family income between 10001 to 15000 taka and 40.2% had family income above 15000 takas. Most of the participants (64.9%) belong to a family of more than four members. In terms of distance to the nearest health facility, 54.6% of respondents needed more than 30 minutes to reach the health care center. Majority of the patients (69%) had smear positive pulmonary TB. Fever (81%) was the main presenting complaints while 66.7% experienced night sweats, 62.1% had chest pain, 61.5% had cough and 36.2% complained of hemoptysis. Personal history revealed that 31% had habit of smoking and 10.9% had known exposure to TB patients. Regarding health care seeking behavior of the participants, 21.8% had practiced self-medication, 14.9% had used non-prescribed medicine.

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Moreover, 57.5% had more than 3 visits to health care centers. Among all the respondents, 36.2% felt stigmatized due to TB, 28.2% had a history of delayed referral to DOTS center and 29.3% was not instructed do chest X-ray or sputum test in 1st visit. Overall, 56.9% had poor knowledge of TB. In terms of knowledge about TB, 89.7% respondents knew the kind of disease they have, 19.5% knew that tuberculosis is not hereditary, 93.1% knew that tuberculosis is contagious, 96.6% knew that tuberculosis is curable, but only 12.1% knew the transmission prevention method. Among all the participants, mean patients' delay was 21.39±4.50 days, health system's delay was 10.78 ± 3.042 days and total delay was 32.09±5.36 days. Patients' delay was significantly associated with age, Residence, marital status, education, monthly income, family member, distance to hospital, TB category, practice of self-medication, TB stigma and number of health care contact. Health system's delay was significantly associated with Distance to hospital, not doing chest x-ray or sputum test in first visit and number of health care contacts. Delay in diagnosis and treatment of TB was significantly found higher in Semi-Urban DOTS center.

Table 1

Sociodemographic Characteristics of the Respondents (n=174)	
Variables	**Findings**
Age (years)	42.30±14.12
Age group (years)	
18-20	14 (8)
21-30	28 (16.1)
31-40	43 (24.7)
41-50	40 (23)
>50	49 (28.2)
Gender	
Female	95 (54.6)
Male	79 (45.4)
Residence	
Urban	83 (47.7)
Semi-urban	91 (52.3)
Marital Status	
Married	127 (73)
Unmarried	35 (20.1)
Divorced/Widowed	12(6.9)
Education	
Illiterate	27 (15.5)
Primary education	45 (25.9)
Secondary Education	41 (23.6)
SSC	34 (19.5)
HSC	14(8)
Graduation and above	13 (7.5)
Occupation	
Housewife	34(5.1)
Unemployed	17(2.6)
Day laborer	2(0.3)
Student	81(12.2)
Service holder	72(10.9)
Businessman	2(0.3)
Farmer	2(0.3)
Family members	
1 to 4	61 (35.1)
>4	113 (64.9)
Monthly income (Tk.)	
<5000	0 (0)
5001 - 10,000	18 (10.34)
10,001 - 15,000	86 (49.43)
>15,000 taka	70 (40.23)
Continuous data is expressed as mean±SD and frequency data is expressed as counts (percentage)	

Table 2

Clinical characteristics of the TB patients (n=174)		
Clinical features	**Frequency**	**Percentage (%)**
TB category		
Smear positive	120	69
Smear Negative	54	31
Type of symptoms		
Fever	141	81
Cough	116	66.7
Hemoptysis	108	62.1
Weight loss	107	61.5
Night sweats	63	36.2
Known exposure to TB patient		
Yes	19	10.9
No	155	89.1
Smoking Habit		
Yes	54	31
No	120	69

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Table 3

Healthcare seeking behavior of the Respondents (n=174)		
Healthcare seeking behavior	Frequency	Percentage (%)
Practiced self-medication	38	21.8
Use of non-prescribed medication	26	14.9
Health care contacts		
3 or less	74	42.5
More than 3	100	57.5
TB stigma		
Yes	63	36.2
No	111	63.8
Delayed referral to DOTS center		
Yes	49	28.2
No	125	71.8
Chest X-ray or Sputum test done after 1st visit		
Yes	51	29.3
No	123	70.7
Knowledge on TB		
Good	99	43.1
Poor	75	56.9

Table 4

Comprehensive knowledge about tuberculosis among TB patients (n=174)		
Knowledge items	Frequency (n)	Percentage (%)
Nature of the disease	156	89.7
Tuberculosis is not hereditary	34	19.5
Tuberculosis is contagious	162	93.1
Tuberculosis is curable	168	96.6
Transmission prevention methods	21	12.1

Table 5

Delay of TB diagnosis and initiation of treatment among TB patients (n=174)	
Delay of TB diagnosis and initiation of treatment	Mean±SD
Patients' Delay (days)	21.39±4.50
Health system's Delay (days)	10.78±3.042
Total Delay (days)	32.09±5.36

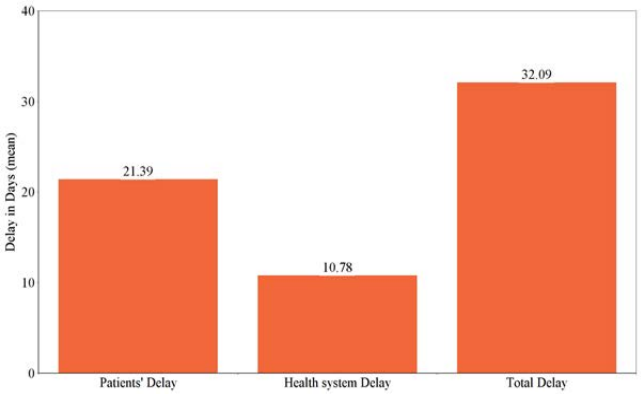

Figure 1: Delay of TB diagnosis and initiation of treatment among TB patients (n=174).

Table 6

Factors associated with patients' delay for treatment among pulmonary TB patients (n=174)		
Factors	Patients delay	P value
Age (n)		**<0.01
18 to 20 years	17.93±0.99	
21 to 30 years	19.50±4.26	
31 to 40 years	21.09±4.35	
41 to 50 years	22.65±4.83	
More than 50 years	22.79±4.15	
Sex (n)		*0.706
Male	21.28±4.60	
Female	21.53±4.39	
Marital status (n)		**<0.01
Unmarried	25.67±0.49	
Married	21.52±4.60	
Divorced/Widow	19.60±3.67	
Residence		*0.05
Urban	21.33±4.46	
Semi-urban	22.45±4.56	
Education (n)		**<0.01
Illiterate	24.58±2.78	
Primary education	23±3.78	
Secondary Education	22±3.37	
SSC	17.93±0.99	
HSC	21.24±4.08	
Graduation and above	17.41±4.61	

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Family income		
5001 to 10,000 taka	24.17±4.37	**0.01
10,001 to 15,000 taka	22.20±3.80	
>15000 taka	19.76±4.72	
Family member (n)		
1 to 4	19.56±4.02	*0.01
>4	22.42±4.40	
TB category		
Smear positive	20.85±4.68	*0.02
Smear Negative	22.57±3.84	
Practiced self-medication		
Yes	23.81±3.71	*<0.01
No	20.71±4.47	
TB stigma	22.28±4.42	
Yes	20.88±4.48	*0.04
no		

*P value was determined by independent sample t test.
**P value was determined by post-Hoc analysis by Bonferroni method.

Table 7

Factors associated with Health system's delay for treatment among pulmonary TB patients (n=174)		
Factors	Health System delay	P value
Distance to Hospital (n)		
<30 minutes	10.19±3.14	*0.01
>30 minutes	11.49±2.76	
TB category		
Smear positive	10.98±3.31	*0.193
Smear Negative	10.33±2.29	
Delayed referral to DOTS center		
Yes	10.81±2.88	*0.92
No	10.76±3.11	
Chest x-ray or sputum test given in 1st visit		
Yes	10.46±2.88	*0.03
No	11.54±3.30	
Health care contacts (n)		
3 or less	10.45±3.64	*<0.01
More than 3	11.03±2.50	

*P value was determined by independent sample t test.

Table 8

Delay of diagnosis of pulmonary TB and initiation of treatment in Urban and Semi-urban DOTS center (n=174)			
Delay of TB diagnosis and initiation of treatment	Urban DOTS center (n=87) Mean±SD	Semi-urban DOTS center (n=87) Mean±SD	P value
Patient's Delay	19.91±4.64	22.86±3.85	*<0.01
Health system's Delay	9.77±3.43	11.79±2.18	*0.01
Total Delay	29.81±5.11	34.36±4.60	*<0.01

Discussion

The mean age of the participants was 42.30±14.12 years and most of the respondents (28.2%) were aged > 50. Previous studies conducted in Ghana, Southern and Northern Ethiopia also found almost similar findings [4,5,7]. These observations are rational as elderly people are more likely to get sick and their immune systems weaken with increasing age. This population typically has concurrent systemic illnesses, which put them at risk for complications, disease transmission, and treatment difficulty owing to side effects. Furthermore, the inconveniences of visiting DOTS centers owing to illness and the need for an accompanying person may cause treatment to be delayed. Female predominance was observed with 56.4% female and 45.4% male among the study population. A previous study conducted in Bangladesh also observed female predominance where 60.9% participants were female [9]. Similar sex distribution was also observed in a study conducted in Ethiopia [10]. Males are more prone to develop tuberculosis in developing countries, which could be attributed to a variety of socioeconomic factors such as being the sole earner, having a larger probability of working in the informal sectors, and having less knowledge of the disease [11]. Female predominance in this study may be influenced by the demographic profile of the semi-urban area, where the female population is larger than the male population and a large portion of the male population is working overseas. Moreover, as men are busy with a variety of jobs both in urban and semi-urban areas, this may prolong the time it takes to report to the DOTS center and subsequently diagnose and initiate treatment. The current study also

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revealed that 89.7% of respondents knew the kind of disease they had, 19.5% knew that tuberculosis was not hereditary, 93.1% knew that tuberculosis was contagious and 96.6% knew that tuberculosis was curable, but only 12.1% knew how to prevent the transmission of TB. In a previous study conducted in Ethiopia, it was indicated that most (99%) of the respondents knew about the disease they had at the time of the interview. Only 36.5% knew that tuberculosis was not hereditary, while only 10.1% were aware that tuberculosis had a vaccine, but more than half (54.1%) knew how to prevent transmission of TB [10]. In this study, the mean patients' delay was 21.39±4.50 days, health system's delay was 10.78±3.042 days, and total delay was 32.09±5.36 days. In a study conducted in Ethiopia, it was revealed that the mean patient delay was 33.9±14 days and mean total days of delay for TB diagnosis and initiation of treatment was 41.6±16.6 days [10]. Another study found that mean patients' delay was 26±26.9 days and mean health system's delay was 19±22.9 days in their study conducted in Ethiopia [12]. According to a systematic review of literature from India, total delay ranged from 25 to 185 days, patient delay ranged from 4.9 to 162 days, and health system delay ranged from 2 to 87 days for the diagnosis of tuberculosis [13]. This study revealed that patients' delays were significantly associated with older age, living in a semi-urban area, having a low monthly income, more than four family members and low level of education. Smear-negative TB category, practicing self-medication and perceived TB stigma also significantly increased the patient's delay. In a study conducted in northern central Ethiopia, it was revealed that patients' delay was significantly associated with rural residence, older age (≥55 years), having more than three family members in the household, practicing self-medication and smear-negative status [4]. In the same study, 14.7% of the patients reported using different forms of home-prepared self-medication, and 8.9% used different non-prescribed medications before visiting a formal health care provider. Low monthly income was found to be significantly associated with the patients' delay in a study conducted in southern Ethiopia [5]. Negative sputum smear was found to be one of the main factors linked with diagnostic delay (> 6 days) in a study conducted in Brazil [3].

On the contrary, the health system's delay was significantly associated with increased distance to the hospital, not doing a chest x-ray or sputum test on the first visit, and multiple health care contacts. In another study, health system's delay was significantly associated with greater walking time (> 30 min) to reach a health facility, lack of diagnostic tests, and multiple healthcare contacts. The prolonged health system delay may also reflect insufficient knowledge of the signs and symptoms of TB among the different types of health service providers. This could be substantiated by the fact that most patients with symptoms of tuberculosis were not examined correctly for tuberculosis or referred to diagnostic facilities upon their first visits; rather, most of them were given treatment for diseases other than tuberculosis. Another reason might be the inadequacy of the clinical services diagnosed TB among symptomatic individuals in most of the semi-urban centers. This study also revealed that the delay of TB diagnosis and initiation of treatment was significantly higher in the semi-urban DOTS center than in the urban DOTS center. The longer treatment delay in the semi-urban DOTS center might be due to the lack of experienced staff in identifying suspected cases. Moreover, increased workload in semi-urban centers due to a heavy rush of patients may also contribute to this delay.

Conclusion

Effective strategies should be designed to eliminate the factors responsible for delay in diagnosis and treatment of pulmonary TB. Mass education and awareness programs regarding the importance of early detection and treatment of the disease should be implemented to reduce patients' delays. Use of self-medication should be discouraged, and the sale of non-prescribed antibiotics should be minimized by strict implementation of the law. Healthcare workers should be trained to diagnose and advise treatment at the earliest opportunity. Access to health care centers should be increased to reduce the health system's delays.

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Conflict of interest

The authors declared that there is no conflict of interest.

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