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Socio-Economic Burden of Tuberculosis among Hospitalized Patients in Dhaka City, Bangladesh

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Abstract
Tuberculosis (TB) affects the most productive age group people, resulting in economic loss to the individual and their family, particularly in developing countries. This study aimed to assess the economic burden of TB in Hospitalized patients. We conducted a cross-sectional survey among hospitalized TB patients who visited the National Institute of Chest Disease and Hospital, Dhaka, Bangladesh from June 2017 through February 2018. Most TB patients were male (95%) with the age group between 36 and 50 years (42.3%). A majority of the patients (96%) came to the hospital for retreatment of TB. Two-third of the patients went to the hospital from rural areas. The average cost for treating individual TB patients was ~600 US$ (United States dollar). The average productive days lost of a TB patient were 141 days. TB patients from rural areas spent more money than patients living in urban and semi-urban areas. More awareness is needed, particularly in rural people about the current TB burden, nearest TB treatment facilities, and the National Tuberculosis Control Program to minimize economic loss. These study findings also demand the establishment of a specialized TB hospital at the sub-district level.

Keywords: Tuberculosis, Economic burden, Hospitalized patient, Bangladesh

Introduction

In 2017, more than 10 million people were affected and 1.3 million died globally due to tuberculosis (TB) [1]. Tuberculosis (TB), which impacts mostly the poorest of the poor, is an instance of a disease that can add significantly to the poverty trap of the disease [2, 3]. South-East Asian region accounts for 45% of world incidence [1]. Bangladesh is positioned in the top 22 TB countries by numbers of cases, estimated 411 per 100,000 populations in 2011 [4]. Many countries provide free diagnosis and treatment to TB patients. Free TB care has expanded considerably during the last two decades with national attempts and global funding [5]. However, 60% of overall health expenditure is in the private sector of high TB burden countries, and a large proportion of these expenditures are paid out-of-pocket by patients [6]. Many TB patients suffered from very high direct and indirect costs due to TB illness and care-seeking [7]. United Nations (UN) settled Millennium Development Goals (MDGs) for the year 2000 to 2015 explicitly included combating against tuberculosis [8]. Considering catastrophic economic loss, the UN introduced a new goal to end epidemics

of the disease by 2030 in its Sustainable Development Goals (SDGs) [9].

The developing world contributed over 90% of the global prevalence of TB where 75% of the patients were at a productive age [10]. Currently, the recommended regimen for drug-sensitive TB is a 6-month rifampicin-based regimen 2HRZE/4HR [1]. However, long course treatment makes the poor vulnerable to TB [11]. About 100 million people fall under the poverty line each year for economic loss due to TB [12].

In Bangladesh, a study was conducted among 96 patients under the Directly Observed Treatment, Short-course (DOTS) network in two Upazilas (subdistricts) from each of the six districts, which were representative of the national situation in terms of population density, poverty, and rural/urban profile. This study revealed that an economic loss was then 175% (111 US) of the national income. However, travel cost was lower as patients took TB care from local nearest service centers [13]. Though TB treatment is officially free in Bangladesh under DOTS, still catastrophic to poor households because of free DOTS program mostly serves the more vibrant or middle-class population and fails to connect the marginal community where the prevalence of TB is most prominent [11]. Generally, health services access better for higher-income groups in Bangladesh compared to the low-income population [13]. Besides, previous studies in Bangladesh, India, Pakistan, and China noted some barriers for poor peoples to utilize DOTS [14]. Bangladesh has limited data on the socio-economic burden of TB. This study explored the current economic burden of TB affected people. The findings of this study will help policymakers to understand the real impact of TB and to design future interventions, particularly in rural areas.

Materials and methods

Study setting and population

We conducted a hospital-based cross-sectional study to determine the economic burden of TB patients. We enrolled a total of 300 hospitalized TB patients from the National Institute of Chest Disease and Hospital (NIDCH), a hospital specialized for TB located in Dhaka, the capital city of Bangladesh. We selected patients for the enrollment and data collection who were confirmed for pulmonary and extrapulmonary TB by sputum smear, culture, chest-radiograph, cytological, and histopathological examination. Both male and female, over eighteen years of age, were interviewed.

Study design

Patients were selected using a convenient sampling method from June 2017 to February 2018. Interviews were conducted by using a pre-designed and semi-structured questionnaire to collect data on the socio-economic condition, previous medical history for treating TB before admitted to the hospital, basal metabolic index data, direct and indirect costs for treating TB, and individual behavioral factors like smoking. Expenditure incurred during illness, the effects of disease on routine activities, and employment status were also included. The questionnaire was developed based on the information collected from various research articles, newspapers, books, media, internet, and peer group discussions.

Data analysis

We performed a descriptive analysis to summarize the demographics of TB patients, the cost for TB treatment, and other factors. Costs were categorized into two types: direct cost and indirect cost. Money spends on laboratory investigations, medicines, and hospitalization are classified as medical expenses, travel is considered a non-medical expenditure. Both medical and non-medical expenditure was considered as direct costs. Indirect costs were the loss of wages due to illness, decreased earning ability due to illness, or long-term disability. Total costs were covered by expenditure incurred under direct and indirect costs. All statistical analyses were done using STATA 10.0 (www.stata.com/stata10/).

Ethical approval

The study protocol was reviewed and approved by the Departmental Ethical Committee of Patuakhali Science and Technology University (Approval Number: 01/02/2017:06). The institutional ethical clearance was obtained before the study, documented as NIDCH/ACA/2017. The right of a participant to withdraw from the study at any time, without any precondition was maintained. Informed written consent

was obtained from all individual participants included in the study.

Results

A total of 300 laboratory-confirmed TB patients were interviewed over the study period. The majority (94.7%) of the TB patients were male, with the age group of 36-50 years (127, 42%). Sixty-eight percent (203) of the patients resided in the rural area. Among the patients, 33% (98) had primary education, and 28% (84) were illiterate. Forty-three percents of the patients were self-employed, and 41% were involved in jobs, either government or private. Sixty-one percent of patients had healthy BMI, and 37% were underweight. The family income of the TB patient's varied, with 63% earned 10000-30000 BDT per month. The majority (70%) of the patients were the main earning persons of his/her family. More than three-fourths (77%) of TB patients was a smoker. Forbearing the cost of illness, 29% (88) of the patients took a loan, and 2% (7) sold their assets. Fifty-three percent of the patients were lived in an extended family, and 36% had more than seven family members. Only 20% (60) of the patients took BCG (Bacillus Calmette–Guérin) vaccine, and 18.7% (56) of patients didn't know whether they take the vaccine or not. More information about the demographic characteristics of TB patients is given in Table 1.

Table 1: Demographic and socio-economic characteristics of TB patients, NIDCH, Dhaka, Bangladesh 2017-2018 (n=300).

	n (%)	95% CI (%)
Age		
18-25	16 (5)	3-8
26-35	65 (22)	17-26
36-50	127 (42)	36-48
50-65	67 (22)	17-27
>65	25 (8)	5-12
Place of residence		
Rural	203 (68)	62-72
Semi-urban	34 (11)	8-15
Urban	63 (21)	16-26
Gender		
Male	284 (95)	91-96
Marital status		
Married	267 (89)	84-92
Not married	33 (11)	7-15
Education		
Illiterate	84 (28)	23-33
Primary	98 (33)	27-38
Secondary	60 (20)	15-24
Higher secondary and above	58 (19)	15-24
Occupation		
Government or private job	124 (41)	35-47
Self-employed	130 (43)	37-49
Student	36 (12)	8-16
Not working	10 (3)	1-6
Family Type		
Nuclear	140 (47)	41-52
Joint	160 (53)	47-58
Family Size		
≤4 members	89 (30)	24-35
≥5 members	211 (70)	64-75

Family Income/month (Bangladesh Taka)		
<10000	40 (13)	9-17
10000-30000	188 (63)	57-67
31000-50000	50 (17)	12-21
>50000	22 (7)	4-10
Households having electricity		
Yes	284 (95)	91-96
No	16 (5)	3-8
Health insurance		
Yes	3 (1)	1-3
No	297 (99)	96-99
Family member having TB		
Yes	46 (15)	11-19
No	254 (85)	80-88
History of BCG vaccine intake		
Yes	60 (20)	15-24
No	184 (61)	55-66
Don't know	56 (19)	14-23

Table 2 shows the patterns of TB and health-seeking characteristics of the patients. The majority of patients (82%) were suffered from pulmonary tuberculosis, and 18% (54) had extrapulmonary diseases. Fifteen percent of the patients reported that they had at least one family member having a history of TB infection. More than forty percent (40.7%) of the patients have frequently (4-6 times) visited doctors for TB care, and 42.3% have had 4-6 tests for diagnosis.

Table 2: Clinical characteristics and health-seeking behavior of the TB patients, NIDCH, Dhaka, Bangladesh 2017-2018 (n=300).

Characteristics	n (%)	95% CI (%)
Type of TB		
Pulmonary	246 (82)	77-85
Extra-pulmonary	54 (18)	14-22
Occurrence of TB		
New TB	12 (4)	2-6
Previously treated TB	288 (96)	93-97
Treatment received		
Government hospital	105 (35)	29-40
Both government and non-government hospital	195 (65)	59-70
Number of visits to the hospital		
Once	12 (4)	2-6
2-5 times	202 (67)	61-72
≥ Six times	86 (29)	23-34

The average direct cost per TB patient was 23,406 BDT, and the indirect cost was 26,985 BDT, while the average overall cost per TB patient was 50,390 BDT, which was equivalent to ~600 USD (Table 3). The average productive days lost of a TB patient was 141 days. TB patients from rural areas spent more money (56,475 BDT) than patients living in urban (40,582 BDT) and the semi-urban regions (32,232 BDT). Around 30% of patients had to take a loan of varying amounts for the treatment of TB. Almost all patients (99%)

reported that they have no insurance coverage for treatment.

Table 3: Average cost for treatment of TB patient.

Cost category	Mean ± Standard deviation
The average cost for laboratory test (BDT)	7200 ± 25183
The average cost for medicines (BDT)	8745 ± 33835
The average cost for hospital stay (BDT)	1604 ± 4585
The average cost for travel to visit hospitals and diagnostic centers (BDT)	5856 ± 7335
Average economic loss due to loss of productive hours (BDT)	26985 ± 88633
Average cumulative cost for treatment of TB patient (BDT)	50390 ± 111571

Discussion

Although public health services for tuberculosis are free worldwide, a substantial part of the costs still falls on the patients and their families [15]. This study demonstrates the economic burden of TB among hospitalized patients. We found high direct losses for TB care and indirect economic losses due to productive day loss. The mean indirect cost was higher than the direct cost. The mean productive days' wastage of a TB patient was 141 days. Patients of rural areas lose more cash and working time than urban.

In this study, the mean total cost for treating TB was approximately fifty thousand BDT (~600 USD). In India, treatment cost was 171 USD for a newly smear-positive patient [16]. Patients of Uganda spend 584 USD for the first two months of hospitalization and 4–10 months of follow-up outpatient treatment [17]. It was much lower (336.4 USD) in Brazil [15]. In Nigeria, the median of the total cost was USD 528 [18]. For the hospitalized patient in a public hospital, it was 264 USD in South Africa [19].

The previous investigation uncovered that income loss makes up the most significant monetary weight for TB patients [7]. In this research, we found that indirect cost was higher than the direct cost. Similar findings have been documented in India and South Africa, where indirect costs cost was more than half of the total episode costs [16, 20]. A community-based study among new smear-positive pulmonary tuberculosis (PTB) patients in China showed that the direct costs were 203.19 USD and the indirect cost was 728.33 USD [21]. However, a previous study in Bangladesh demonstrated that direct cost was a little higher than the indirect cost [7].

Research in the Philippines stated that the mean test cost for TB patients was between 12.66 USD and 32.55 USD [22]. Our study found that the money spends on the TB test was 7200 BDT (85 USD). A study in Bangladesh showed that the patient spends 4 USD for the test within two months of the study period [14]. A review study in Africa stated that diagnostic test costs other than sputum smears ranged from USD 7 for chest radiographs to USD 10 for examination, laboratory, and X-ray fees [23]. In China, the average costs for tests were 27.60 USD [21].

In this study, we found that the mean drug cost for TB was 8745.17 BD TK (105.36 USD). A study in Brazil reveals that the medication cost of TB ranged from 15 to 548 USD, and in China, it was 125.8 USD [15, 21]. Our study showed that the mean travel cost was almost 6,000 BDT (72.29 USD/ 83 per USD). Travel cost was practically similar 0.17- 70 USD in Sub-Saharan Africa and higher (2851USD) in Iran [23, 24].

We found that about thirty percent of the patients took a loan, and the mean amount of the loan was 6720 BD T (80.96 USD). A previous study in Bangladesh showed that 14% of patients took a loan for TB care [25]. Findings were almost similar for the average loan (81.8 USD) in India [26]. The mean days' loss of care-seeking was 141 days in our study. In Benin, the median indirect days lost was 131 [27]. In India, the mean number of workdays lost was 83 [16].

Patients from Saharan Africa sells assets and borrowing to overcome the burden of the disease [23]. We found that only 2.3% of the patients sold their assets for their treatment purposes. A previous study in Bangladesh showed higher numbers (38 %) sold their assets to cope with TB [25]. A study conducted in both public and private hospitals in India reported that 11% of poor patients sold items to finance their care for TB [28].

This research revealed that most of the patients were male. This result is consistent with the statistics

of WHO (2014) [29]. In the developing world, 75% of TB cases were affected during their productive life [11]. Our study revealed that more than 70% of the patients were the head of their family and the only income-generating person. So, the burden of TB pushes the patients and household into a socio-economic crisis. Special support to a patient who is the family head, or in this age group might reduce the burden of TB.

We found that 70.3% of the family's head were patient himself. Previous findings showed a strong association between poverty and TB [24]. We found 76% respondent's family incomes were <=30000 BDT (<= 361.44 USD). Previous research among new smear-positive pulmonary tuberculosis (PTB) cases revealed that poverty is strongly associated with TB incidence [21]. The family with low income can't maintain hygienic conditions, so the prevalence of TB is higher.

We found a higher proportion of patients with pulmonary TB. Another similar investigation in Bangladesh found 50.9% were pulmonary TB, and 43.7% were an extrapulmonary form of TB [30]. In Yemen, the proportions were 41% and 26%, respectively in private hospitals and clinics [31].

The study had some limitations. Firstly, recall bias is a particular concern in patient cost surveys. We attempted to limit the negative effect of recall bias by linking questions about costs incurred to 'memorable' events such as starting treatment or the start of symptoms. Secondly, it was not possible to collect accurate household income data and compare the direct costs incurred against individual annual income. Some respondents may give overestimated cost for TB care. This study didn't include the patient's caregivers, which may further burden the patient's family.

Conclusion

This study demonstrates that the economic burden of seeking TB care has often been very high for patients for rural patients. Income loss is a dominating reason for the high costs. We should make people aware of the National free TB control program, especially in rural areas. The establishment of the TB hospital with proper diagnostic facilities may reduce the economic burden of TB over the poor. Further study can be conducted to identify the factors associated with repeated treatment.

Conflicts of Interest

The authors declared no conflict of interest.

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Not required.

Authors' Contributions

MK, MSIK, and SC developed concept and design study protocol. MK, SG, MAT, MRB, MSI collected data. MK, MSIK, MK, SG, MAT, MRB, MSI, and SC performed data analysis and drafted manuscript. All authors read and approved the final manuscript.

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