

Research Article

An Epidemiological Study of Sputum Positive TB Patients & Burden of Tuberculosis amongst Their Contacts in Northern Region of Bangladesh

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Abstract

Background: Tuberculosis (TB) is one of the major prevalent diseases in global, which is caused by *Mycobacterium tuberculosis* and among all the diseases it exists in harmful condition. The magnitude of TB in Bangladesh is enormous as is evident by the number of cases being reported about 3.6% of the global totally. Among the 30 high TB-burden countries, Bangladesh is one of them. It accounts for 3.6% of the global totally. The estimated incidence of TB per 100,000 is 221 in Bangladesh, with a mortality rate of 24 per 1,00,000 population. About 64,000 people die solely due to TB in Bangladesh per year on average. Approximately 80% of all TB cases in Bangladesh are pulmonary TB.

Materials and methods: It was a cross sectional study conducted among all the Sputum Positive cases of Tuberculosis and their household contacts in the northern part of Bangladesh that were registered with DOT center for the first and second quarters of the year 2021.

Results: A total of 500 sputum positive cases of Tuberculosis and 250 household contacts were included in the study. Nearly 70% of the index cases reported having cough for more than two weeks along with fever in the beginning of their illness. On assessment of the past medical history of the contacts, it was observed that 20 (8.4%) had a history of TB in past. Almost a quarter of the contacts spent all their time in the same room as the index cases, another quarter spent only night-time in the same room while about 50 (20%) spend only daytime in the same room as index cases. Among the contacts, 9 were referred for sputum microscopy and gene expert out of whom 2 were found to be positive and 4 were negative. The remaining 3 didn't get themselves tested.

Conclusions: With the burden of TB being highest in Bangladesh and having a goal to end TB by 2025 according to WHO, a more active approach to diagnose TB among contacts is the need of the hour which can led to early treatment and cut down transmission among the contacts.

Keywords: Tuberculosis; Epidemiology; WHO; Sputum microscopy; COVID-19; HIV

Introduction

Tuberculosis (TB), one of the important re-emerging infectious diseases, is a clinical disease caused by infection with *Mycobacterium tuberculosis* and is characterized pathologically by the formation of granulomas. TB is a major public health problem all over the world including Bangladesh as it reports the highest burden of TB (both Drug sensitive and Drug resistant TB) globally.

Globally, TB incidence is falling at about 2% per year and between 2015 and 2020 the cumulative reduction was 11%. This was over

half-way to the End TB Strategy milestone of 20% reduction between 2015 and 2020. A total of 1.5 million people died from TB in 2020 (including 214 000 people with HIV). Worldwide, TB is the 13th leading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS) [1]. In 2020, an estimated 10 million people fell ill with Tuberculosis (TB) worldwide, 5.6 million men, 3.3 million women and 1.1 million children. TB is present in all countries and age groups. An estimated 66 million lives were saved through TB diagnosis and treatment between 2000 and 2020. Globally, close to one in two TB-affected households face costs higher than 20% of their household income, according to latest national TB patient cost survey data. The world did not reach the milestone of 0% TB patients and their households facing catastrophic costs as a result of TB disease by 2020. Among the 30 high TB-burden countries, Bangladesh is one of them. It accounts for 3.6% of the global totally. The estimated incidence of TB per 100,000 is 221 in Bangladesh, with a mortality rate of 24 per 1,00,000 population [1]. About 64,000 people die solely due to TB in Bangladesh per year on average. Approximately 80% of all TB cases in Bangladesh are pulmonary TB [2].

TB is transmitted from person to person *via* droplet infection. It is a known fact that one single active case of TB can infect about 10 to 15 persons in a year. Therefore, the longer a case goes undetected, the greater number of people they may infect. Countries that have a high

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burden of TB report high prevalence of TB in contacts, particularly household members. Effective investigation and screening of such close contacts of TB cases will lead to early identification of a significant number of cases who can then be put on treatment. Early identification ensures a better chance at cure and also helps to reduce the transmission. Many high-income countries already have screening programmes for detection of TB in close contacts, however such a mechanism is often seen missing in the countries with highest TB burden. Given the burden of disease in the northern region of Bangladesh, it is important to assess the burden of disease in the close contacts of an active TB case.

Aims and objectives

The objective of this study was to assess the epidemiology of Sputum positive TB patients & the burden of Tuberculosis infection amongst their close contacts in the respective study area.

Materials and Method

It was a cross sectional study conducted among the Sputum Positive cases of Tuberculosis and their household contacts in northern part of Bangladesh. The study covered the Sputum Positive cases of Tuberculosis and their close contacts (those sharing same household) that were registered with DOT center for the first and second quarters of the year 2021. After obtaining the Institutional Ethics Committee clearance and permission from Pabna University of Science and Technology, the subjects fulfilling the inclusion criteria were first explained about the study in details and written informed consent of the subjects were taken. The study duration was for one year and a pre-designed questionnaire was used to collect information. Questionnaires were used for two parts: one for the sputum positive patient and another for the contacts. The questionnaire for the patient included information regarding their socio-demographic characteristics, details of household contacts, environmental sanitation, diagnostic and follow up investigations and treatment history. The second part of questionnaire for contacts collected information on whether they had experienced any symptoms of TB and their medical history. If the contact was found to have any symptom of TB, they were referred to the nearest DOT/govt facilities which designated microscopy center to get their sputum tested, gene expert and a chest x-ray was also done. The test results and whether or not treatment was started was also noted in the questionnaire. In case of pediatric contact, a history of Isoniazid prophylaxis was also taken.

In children up to 14 years of age, all eligible individuals were subjected to chest x-ray and the individual's showing signs and symptoms were further subjected to microbiological examination. For microbial confirmation, at least one positive sputum smears out of two was taken as a case with a confirmation by gene expert. Chest X-rays (PA view) were read by at least two experienced, independent, and blinded readers. In case of discordant findings, the reading by a third expert reader was used.

All contacts regardless of their symptoms were given information on what to do if they developed any symptom.

After checking the questionnaire for completeness, the data was entered into a Microsoft Excel spread sheet and was analyzed using SPSS version 20. Data was categorized and is presented in proportions.

Results

A total of 500 sputum positive cases of Tuberculosis and 250 household contacts were included in the study. Among the cases 240

(48%) were females while 52 (260%) were males, with 34.5% of them in the age group of 14 to 45 years and 38.5% were 45 to 60 years of age (Figure 1).

Nearly 70% of the cases reported having cough for more than two weeks along with fever in the beginning of their illness, while about 10% reported having only fever and 30% reported having fever with other symptoms of Tuberculosis. A known history of contact was present in 30% of the cases. Among the cases, 38.3% reported were smokers, and 7.3% used smokeless tobacco while 1.6% took only alcohol. On assessment of housing parameters, it was found that nearly 6% of cases lived in a clay (kaccha) house while 55% had mixed housing. About a quarter of the houses did not have a separate kitchen and indoor air pollution was present in nearly 31% of the houses. More than half (52.7%) had overcrowding in the house as well as have an experienced for lack of proper ventilation. The initial approach to diagnosis had been x-ray examination and sputum in most of the cases (63.6%) in respectively.

Out of the total 250 contacts included in the study, 48.5% were male and 51.5% were female. Most (57.9%) of the contacts belonged to the age group of 16 to 45 years followed by 19.6% in the age group 45 to 65 years. Pediatric contacts amounted to 5.2% in 0 to 5 years age, 7.8% between 6 to 10 years and 9.5% in age group 11 to 15 years (Table 1).

On assessment of the past medical history of the contacts, it was observed that 20 (8.4%) had a history of TB in past. All of them had been tested for HIV and nobody came out positive. Diabetes was reported by 87 (34.8%) contacts and 120 (48%) reported having hypertension. Almost a quarter of the contacts spent all their time in the same room as the index cases, another quarter spent only night time in the same room while about 50 (20%) spend only daytime in the same room as index cases. Twenty-two contacts shared the bed with the cases and 76 (30.4%) slept in the same room but did not share a bed. Most of the contacts 232 (92%) had been living in the same house as the index cases for more than five years (Table 2).

Among the contacts, 9 qualified for referral after screening and were referred for sputum microscopy and gene expert out of which 2 were found to be positive and 4 were negative but the remaining 3 didn't get themselves tested. Among the pediatric contacts, none was referred as none was found to be chest symptomatic after screening all of them. Among them, 6 had started Isoniazid Preventive Therapy (IPT), 4 had completed and 3 were yet to start IPT.

Discussion

The present study identified 500 index cases of Sputum Positive TB & 250 household contacts. Along with sharing the same living space, the burden of care for the sick often falls on the household members. This means prolonged periods of close contact, putting the contacts at potential risk for developing Tuberculosis themselves. In the present study there more male cases as compared to females with most of them in the age between 15 to 45 years. The findings are similar to studies conducted in other parts of the country except a higher proportion of cases in the age group below 14 years (5.5%). This difference may be due to the higher burden of TB in the northern part of Bangladesh as compared to other parts of the country [3-7]. Overcrowding is a known risk factor for spread of respiratory illnesses especially tuberculosis and the present study report that almost half of the cases live in overcrowded houses [8]. Similar findings are reported by Singh et al. [6] Known history of contact with tuberculosis was

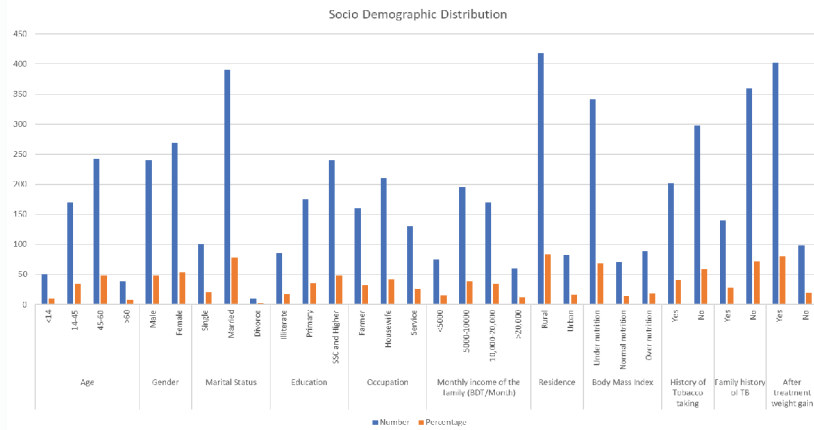


Figure 1: Socio-demographic characteristics of smear positive PTB patients in two districts, (n=500).

Table 1: TB Symptoms screening among the Household contacts.

| Symptoms of TB | Number (%) |
|---|------------|
| Cough | 3 (1.53%) |
| If yes, <2 weeks | 1 (0.51%) |
| >2 weeks | 2 (1.02%) |
| Blood stained | 0 |
| Fever | 2 (1.02%) |
| Noticeable loss of weight (>3 kg in a month) | 0 |
| Sweating at night for 3 or more weeks in the last 4 weeks | 0 |
| Swelling and/or lumps on your neck, arm pits, or groin | 0 |

Table 2: Distribution of contacts according to social variables.

| Variables | Number (250) | P Value |
|----------------|--------------|-----------|
| Smoking Status | | |
| Smoker | 114 | P ≤ 0.001 |
| Non-smoker | 136 | |
| Overcrowding | | |
| Present | 210 | P ≤ 0.001 |
| Absent | 40 | |
| Literacy | | |
| Literate | 120 | P ≤ 0.001 |
| Illiterate | 30 | |

present in 8.4% of the cases in the present study meaning that the index cases themselves had been contacts of cases of TB. On screening the contacts for symptoms, the commonest was found to be cough followed by fever, other studies also report similar findings with cough and fever being reported more than other symptoms like night sweats, weight loss or any swelling [6]. Among contacts in this study, 8.4% had TB in the past which is higher than that reported by Singh et al. [6] (0.8%), Nair et al. [7] (3.1%) and Lee et al. [9] (2%) which could be due to the higher burden of TB in the respective study area. Diabetes was reported in 34.8% of the contacts, which concomitant with Lee et al. [9] (1.1%), putting these contacts at a higher risk of developing TB as Diabetes Mellitus triples a person's risk for developing TB [10].

Sevaraju et al. [11] conducted a multi-centric cohort study and identified that contacts with age between 6 to 15 years, who are males and have long exposure to index patient per day had higher risk for TB incidence. Similar report is given by Singh et al. [6] those male contacts had higher risk for developing TB. The current study reports that 92% of the contacts have been living in the same house as cases for 5 years, almost half are males and 57.9% belong to age group 15 to 45 years, putting them at a considerable risk for developing TB.

This study could identify 1 (0.5%) contact having sputum smear

positive tuberculosis, which is comparable to that reported by Thanh et al. [12] (0.4%) and less as compared to other studies like Singh et al. [6] (6.8%), Nair et al. [7] (4.2%), Gupta et al. [13] (1.15%) and Fox et al. [14] (3%). The difference can be attributed to the difference in the process of identifying and screening the household contacts. Some studies have employed more vigorous methods like offering screening to all contacts, use of a prospective study design was also seen with multiple follow up as in Singh et al. [6] and Gupta et al. [13] while Thanh et al. [12] relied on a self-referral mechanism according to the symptoms of the contacts.

Conclusion

With the burden of TB being high in Bangladesh and having a goal to end TB by 2025 according to WHO, a more active approach to diagnose TB among contacts is the need of the hour which can lead to early diagnosis & treatment and therefore cut down transmission.

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