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Clinical Presentation and Associated Risk Factors of Adult Pulmonary Tuberculosis Cases in Dhaka, Bangladesh

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Abstract

Background: Tuberculosis (TB) remains one of the leading causes of death worldwide, particularly in developing countries like Bangladesh. Understanding the demographic distribution, clinical features, and associated risk factors among TB patients is essential for improving case detection and control strategies. **Objective:** This study aimed to assess the sociodemographic characteristics, clinical manifestations, and risk factors among diagnosed cases of pulmonary tuberculosis. **Methods:** A descriptive cross-sectional study was conducted from March 2022 to February 2023 at the Department of Microbiology & Immunology, Bangabandhu Sheikh Mujib Medical University (BSMMU), and the National Tuberculosis Reference Laboratory, Dhaka, Bangladesh. Seventy-four confirmed pulmonary TB patients aged ≥18 years were enrolled based on real-time PCR positivity for Mycobacterium tuberculosis. Data were collected using a predesigned questionnaire and analyzed descriptively. **Results:** The majority of the cases (37.8%) were aged 18–30 years, followed by 31–40 years (32.4%), with a marked male predominance (71.6%). Businessmen (24.3%) and students (20.3%) were the most affected occupational groups. The predominant clinical features included cough lasting more than two weeks (83.8%), respiratory distress (73.0%), and fever persisting for more than two weeks (54.1%). Weight loss, hemoptysis, and anemia were observed in 23.0%, 20.3%, and 14.9% of cases, respectively. Smoking was the most common risk factor (54.1%), followed by chronic respiratory diseases (16.2%) and family history of TB (10.8%). **Conclusion:** Pulmonary tuberculosis predominantly affects young, economically productive males in Bangladesh, with smoking emerging as a major associated risk factor. The high frequency of advanced symptoms at presentation highlights delayed diagnosis and health-seeking behavior. Strengthening early case detection, integrating smoking cessation programs, and enhancing community awareness are crucial to reducing TB transmission and improving outcomes.

Keywords: Tuberculosis, Bangladesh, Clinical features, Risk factors, Smoking, Demographic profile.

Introduction

Tuberculosis (TB) remains among the top ten causes of death worldwide, and it is the leading cause of infectious diseases.[1] Each year, approximately nine million people develop active tuberculosis. Of them, nearly two million lose their lives to the disease.[2] More than 75% of these affected individuals fall within the economically productive age group. Furthermore, almost 90% of both TB cases and deaths occur in underdeveloped nations.[2] The most susceptible site of MTB (Mycobacterium tuberculosis) infection is the lung.[3]

Bangladesh is one of eight countries that collectively account for almost two-thirds of the global total TB cases.[4] Tuberculosis can be caused by a family history of being infected with TB. If one family member is exposed to TB disease, other family members will likely be infected. TB transmission within the family occurs due to frequent direct contact with TB sufferers who live in the same house.[5] Since ancient times, tuberculosis has been a major public health concern with a significant socioeconomic impact. Overcrowding, intimacy, length of contact, and the infectiousness of the TB patients all raise the risk of TB transmission.[6]

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The distribution of these socioeconomic variables is reflected in the epidemiology of tuberculosis, which clearly influences every stage of TB pathogenesis.[7] Identifying the population at risk of TB is essential and may help in developing appropriate case-finding strategies.[8]

In addition, a description of the clinical characteristics of diagnosed pulmonary TB provides a contemporary depiction that could be beneficial to healthcare professionals, public health authorities, and organizations in detecting active TB.[9] Such as some studies showed that Elderly TB patients presented more frequent respiratory symptoms.[10] Evaluation of clinical characteristics will also provide insight regarding which groups might show unusual symptoms associated with the illness. Several studies have demonstrated that both patient-related and health system-related delays are influenced by diverse socioeconomic and clinical factors.[11-13] For instance, smear-negative pulmonary TB cases with atypical symptoms—particularly in older adults—are frequently mismanaged with fluoroquinolones, leading to delayed diagnosis and initiation of appropriate therapy.[14] Such delays in timely detection and treatment can significantly increase the risk of adverse clinical outcomes.[15] Furthermore, the epidemiology of pulmonary tuberculosis has evolved, raising questions about whether the clinical traits noted previously still hold today.[9]

Among the pulmonary TB detection methods, the real-time PCR demonstrates higher sensitivity and offers specificity and positive predictive value comparable to LED fluorescent microscopy and Ziehl-Neelsen (ZN) staining.[16] Currently, limited data exist regarding the clinical characteristics and associated risk factors diagnosed with pulmonary TB who were tested with real-time PCR. With this background, this study was designed to assess the sociodemographic factors and clinical characteristics of diagnosed cases of pulmonary tuberculosis.

Materials and methods

Study Type: This was a descriptive cross-sectional study.

Study Place and Period: The study was carried out at the Department of Microbiology & Immunology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, and the National Tuberculosis Reference Laboratory, Mohakhali, Dhaka, Bangladesh.

Study Population: Data from 74 cases, both male & female, aged 18 years and above, having pulmonary TB infection confirmed by Real-time PCR on sputum samples, were enrolled in this study from March 2022 to February 2023. Cases were selected purposively from the DOTS (Directly observed treatment, short-course) corner of BSMMU, National Institute of Disease of the Chest and Hospital (NIDCH), Mohakhali, Dhaka, 250 Bedded TB Hospital, Shyamoli, Dhaka. Patients having a history of taking anti-TB drugs or patients of pulmonary TB with associated connective tissue disorders are excluded from the study.

Real-time PCR: Pulmonary tuberculosis caused by Mycobacterium tuberculosis complex (MTBC) and infections due to non-tuberculous mycobacteria (NTM) were detected using the GENMARK M. tuberculosis Complex + Non-Tuberculous Mycobacteria Real-Time PCR Detection Kit (www.genmark.com.tr) according to the manufacturer's instructions. This assay is based on two main steps: nucleic acid extraction from clinical specimens, followed by real-time PCR amplification using specific primers and probes. The multiplex real-time PCR assay simultaneously targets M. tuberculosis (MTB), NTM, and an Internal Control (IC), enabling amplification and detection of nucleic acids in a single reaction. The targeted genes include IS6110 specific for MTB and 16S rRNA, a conserved region allowing pan-Mycobacterium detection. This methodology enables accurate differentiation between MTBC and NTM in respiratory samples.

Data collection: Relevant data obtained directly from the participants and results obtained from laboratory methods were recorded in a predesigned data record sheet. Informed written consent was taken from each patient before his/ her entry into the study. After collection, the data were checked for inadequacy, irrelevancy, and inconsistency. Irrelevant and inconsistent data were discarded.

Ethical consideration: The study protocol was approved by the Institutional Review Board (IRB) of BSMMU (No.BSMMU/2022/6769) on 07/07/2022. Informed written consent was taken from each participant.

Results

A total of 74 diagnosed tuberculosis (TB) cases were included in the study. The demographic distribution of the participants is presented in Table 01. The majority of the cases (37.8%) were within the 18–30 years age group, followed by 32.4% in the 31–40 years age group.

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Only 5.4% of the patients were above 60 years of age. The disease showed a marked male predominance (71.6%) compared to females (28.4%). With regard to occupation, businessmen (24.3%) and students (20.3%) constituted the largest proportions, followed by service holders (17.6%) and housewives (13.5%).

The clinical features of the study population are shown in Table 02. The most frequent presenting symptom was cough lasting more than two weeks (83.8%), followed by fever persisting for more than two weeks (54.1%). Respiratory distress was present in 73.0% of patients, whereas hemoptysis was noted in 20.3%. Weight loss and anaemia were recorded in 23.0% and 14.9% of the cases, respectively. Only a small proportion of patients presented with cough or fever of shorter duration (<2 weeks).

The distribution of risk factors among the TB cases is summarized in Table 03. The most common associated risk factor was smoking, observed in 54.1% of patients. A smaller proportion had a history of asthma or chronic obstructive pulmonary disease (16.2%), while family history of tuberculosis was present in 10.8% of cases.

Table 01: Demographic characteristics of diagnosed tuberculosis (TB) cases (n = 74)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	18–30	28	37.8
	31–40	24	32.4
	41–50	6	8.1
	51–60	12	16.2
Gender	> 60	4	5.4
	Male	53	71.6
Occupation	Female	21	28.4
	Housewife	10	13.5
	Garments worker	4	5.4
	Businessman	18	24.3
	Farmer	6	8.1
	Service holder	13	17.6
	Student	15	20.3
	Other	8	10.8
Total	—	74	100.0

Values are presented as frequency (n) and percentage (%).

Table 02: Clinical features of diagnosed tuberculosis (TB) cases (n = 74)

Clinical Feature	Category	Frequency (n)	Percentage (%)
Cough	< 2 weeks	12	16.2
	> 2 weeks	62	83.8
Fever	Negative	5	6.8
	< 2 weeks	24	32.4
	> 2 weeks	40	54.1
	Evening rise	5	6.8
Weight loss	Negative	57	77.0
	Positive	17	23.0
Anaemia	Negative	63	85.1
	Positive	11	14.9
Hemoptysis	Negative	59	79.7
	Positive	15	20.3
Respiratory distress	Negative	20	27.0
	Positive	54	73.0
Total	—	74	100.0

Values are presented as frequency (n) and percentage (%).

Table 03: Risk factors among diagnosed tuberculosis (TB) cases (n = 74)

Clinical Feature	Category	Frequency (n)	Percentage (%)
Asthma / COPD	Negative	62	83.8
	Positive	12	16.2
Family history of TB	Negative	66	89.2
	Positive	8	10.8
Smoking	Negative	34	45.9
	Positive	40	54.1
Total	—	74	100.0

Values are presented as frequency (n) and percentage (%).

Discussion

Tuberculosis (TB) remains a major public health concern worldwide, particularly in low- and middle-income countries where social, economic, and health-system challenges continue to hinder effective control. Despite global efforts through the WHO's End TB Strategy, TB persists as one of the top infectious causes of morbidity and mortality, with an estimated 10 million new cases and 1.3 million deaths reported globally in 2023. The disease burden is highest in developing nations of Asia and Africa, where delayed diagnosis, poor treatment adherence, and underlying

risk factors such as malnutrition, smoking, and co-morbidities contribute to ongoing transmission.[17]

Understanding the demographic characteristics, clinical presentation, and associated risk factors among diagnosed TB patients provides essential insights for improving case detection, early management, and prevention strategies. The present study was conducted to describe the demographic distribution, common presenting symptoms, and risk determinants among patients diagnosed with tuberculosis, and to compare these findings with those reported in similar studies.

This study analyzed 74 diagnosed tuberculosis (TB) patients to describe their demographic and clinical profiles in a rural Bangladeshi setting. The findings revealed that the majority of patients were young adults aged 18–30 years (37.8%), followed by those aged 31–40 years (32.4%). Only 5.4% were above 60 years, indicating that TB predominantly affects the economically productive age group. This pattern aligns with previous findings in Bangladesh, where TB was most common among adults aged 15–35 years due to higher social exposure and occupational mobility.[18]

A marked male predominance (71.6%) was observed, consistent with several regional and global studies. A study in Tangail reported 71.88% male TB cases, while a study from Dhaka using mixed methods noted 69.9% male among pulmonary TB patients.[19,20] This gender disparity may be attributed to increased exposure, smoking habits, and differences in healthcare-seeking behavior among men in low-resource settings

Occupationally, businessmen (24.3%) and students (20.3%) were the most affected groups, followed by service holders (17.6%) and housewives (13.5%). This reflects the vulnerability of mobile, socially active, and urban-exposed individuals. Similar findings are concentrated among economically active and mobile populations, and occupation is a significant predictor of risk and access, according to national and facility surveys on socioeconomic status in TB.[21]

Cough lasting more than two weeks was the most frequent symptom (83.8%), followed by fever persisting for over two weeks (54.1%) and respiratory distress (73.0%). Hemoptysis, weight loss, and anemia were present in 20.3%, 23.0%, and 14.9% of patients, respectively. These findings correspond well with the classical presentation of pulmonary TB as outlined by the National Tuberculosis Control Program.[22]

Comparable results were observed, where cough >2 weeks: 83.3% and fever: 84.0% were the leading symptoms among TB patients in Dhaka.[19] Similarly, a Nepalese study reported cough ~72% and fever ~61% in TB patients in a Nepal hospital series.[23] The relatively high frequency of respiratory distress in our study (73%) suggests delayed health-seeking or advanced pulmonary involvement at the time of diagnosis.

The presence of systemic features such as weight loss (23%) and anemia (14.9%) indicate ongoing catabolic processes and chronic disease burden. Although these figures are slightly lower than the 27.56% reported by the previous Bangladeshi hospital-based study.[24] The difference may reflect earlier diagnosis or regional nutritional differences.

Smoking emerged as the most common risk factor, observed in 54.1% of patients. Chronic respiratory diseases such as asthma or COPD were reported in 16.2%, and a family history of TB was noted in 10.8%. According to a cross-sectional study conducted in Bangladesh and Pakistan in 2017–2018, the prevalence of smoking among TB patients in both countries was approximately 22.5%, which was much higher than in the general population.[25] Smoking impairs local pulmonary defense mechanisms and increases susceptibility to *Mycobacterium tuberculosis* infection.

A smaller fraction of patients reported asthma or COPD, which are recognized risk conditions due to reduced pulmonary immunity. The presence of family history suggests ongoing community or household transmission. These results echo those of reported smoking in 68.9% of patients and family history of TB in 41.8% of TB patients.[26]

The concentration of TB cases among young, working-age males underscores the ongoing risk of community transmission and productivity loss. The prominence of smoking as a risk factor suggests that TB control strategies in Bangladesh should integrate smoking cessation campaigns into routine TB services.

Limitations of the study

The present study was limited by its relatively small sample size (n = 74) and cross-sectional design, which restricts causal interpretation. The findings represent a facility-based population and may not reflect community prevalence. In addition, socioeconomic and nutritional variables were not extensively assessed, which might have provided more insight into vulnerability patterns.

Conclusion

Tuberculosis continues to pose a significant public health challenge in Bangladesh, disproportionately affecting young, economically productive males. The present study highlights that delayed healthcare-

seeking behavior, classic respiratory symptoms such as prolonged cough and respiratory distress, along with modifiable risk factors—particularly smoking—play a central role in disease transmission and progression. The association of TB with common co-morbidities suggests the need for a more integrated approach to prevention and early case detection.

Strengthening awareness, improving accessibility to diagnostic services, and promoting health-seeking behavior are essential for reducing diagnostic delay. Additionally, targeted interventions such as smoking cessation support and household screening for high-risk families should be incorporated into routine TB control programs. Addressing these risk factors and demographic vulnerabilities can significantly enhance the effectiveness of national TB strategies and contribute to achieving the goals of the End TB initiative in Bangladesh.

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