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ORIGINAL ARTICLE

PATTERN AND OUTCOME OF PULMONARY AND EXTRA-PULMONARY TUBERCULOSIS IN CHILDREN: TWO YEARS STUDY OF A TERTIARY CARE HOSPITAL

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Abstract :

Background: *Bangladesh faces a significant tuberculosis burden, ranking among the highest globally. The country has a high incidence of both tuberculosis and drug-resistant tuberculosis, especially in densely populated urban areas and among marginalized populations. The objective of this study was to evaluate the pattern and outcome of pulmonary and extra-pulmonary tuberculosis in children.* ***Methods:*** *This was a descriptive type of study that was conducted in the Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh, from August 2021 to August 2023. A total of 280 diagnosed children of tuberculosis were enrolled purposively. Data were analyzed by using MS Office tools.* ***Results:*** *Among the participants, 51.1% (143) had pulmonary tuberculosis (PTB), while 48.9% (137) had extra-pulmonary tuberculosis (EPTB). Most patients were young girls aged 5-10 years. All presented with fever, followed by cough with sputum (51%), anorexia, and weight loss (51%). A history of TB contact was common. Of the participants, 185 (66%) completed treatment and were cured; 10 (3.6%) completed treatment but weren't cured; 14 (5%) were still undergoing treatment; 25 (8.9%) stopped treatment; 7 (2.5%) defaulted; 6 (2.1%) were lost to follow-up; and 3.8% died. The treatment success rate was 94.9%.* ***Conclusion****: Pulmonary tuberculosis (TB) is prevalent in pediatric patients, commonly presenting with fever and cough. Despite some discontinuing treatment, most are cured with appropriate antiTB drugs. The DOTS strategy is effective, showing no adverse effects from the drugs.*

Keywords: *Tuberculosis, Anti-tubercular therapy, Extrapulmonary TB, TB lymphadenitis, Gene X-pert ultra.*

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Introduction:

Tuberculosis (TB) remains a major global public health problem. According to the World Health Organization (WHO), 10 million people developed TB disease in 2017, including 1 million children under the age of 15 years.[1] Pediatric tuberculosis is currently diagnosed based on a history of contact, clinical symptoms, chest radiography, tuberculin skin testing (TST), and microbiological analysis. However, children with tuberculosis can have vague clinical symptoms and abnormalities on chest X-rays.[1] A precise diagnosis of pediatric tuberculosis is challenging. Sputum for acid-fast bacilli smear positivity occurs in less than 15% of patients, while mycobacterial culture yields range from 30% to 40%.[2,3]

Childhood TB accounts for around 9% of global cases, rising to 15% in low-income countries.[4] Unfortunately, TB control programs primarily focus on identifying

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highly infectious adult cases with sputum smear-positive results, leading to neglect of childhood TB due to diagnostic challenges and overestimation of the effectiveness of the BCG vaccine.[5] Additionally, TB diagnosis is more complicated in resource-poor settings like Bangladesh. Concerns have also arisen regarding TB among HIV-positive children. [6] Various studies from different countries have explored the epidemiology and clinical aspects of childhood TB, with clinical presentations and diagnostic methods influenced by the local TB and HIV situations. Diagnosis of childhood TB can be particularly challenging in resource-limited settings, such as Nepal, which has a high TB burden.[7] Obtaining sputum samples, especially in children under 7 years old, can be difficult, as they may not produce enough or good-quality samples for testing. Diagnosing active TB in children is more complex than in adults due to its less frequent presence of bacteria and differing symptoms.

In the absence of bacteriological confirmation, a triad of (1). close contact with an infectious index patient, (2). a positive tuberculin skin test (TST), and (3). the presence of suggestive abnormalities on a chest radiograph is used to diagnose childhood tuberculosis (TB).[8]

These criteria, however, have limited application in TB-endemic countries because case detection and contact tracing activities are not routine in national TB programs, transmission is not limited to the household, and most individuals become infected and TST-positive during childhood and adolescence.[9,10] As a result, this study was conducted to provide insights into the clinical and epidemiological characteristics of pediatric PTB and EPTB patients and the diagnostic procedures involved. The objective of this study was to investigate the prevalence of pulmonary tuberculosis (PTB) and extrapulmonary tuberculosis (EPTB), assess their clinical profiles and diagnostic methods, and observe the outcomes of anti-tubercular therapy up to 6 months after enrollment.

Methods :

It was a descriptive type of study. This study was conducted in the Department of Pediatrics at the Sir Salimullah Medical College Mitford Hospital (SSMCMH) Dhaka, Bangladesh, from August 2021 to August 2023. Ethical clearance for the study was obtained from the institutional ethical clearance committee of the mentioned hospital. After obtaining informed consent, participants were selected according to the inclusion and exclusion criteria of this study.

All children clinically suspected and newly diagnosed cases of tuberculosis and Children within the age of 12 years were included and the Children who do not fulfill the diagnostic criteria of TB were excluded in this study. A total of 280 children diagnosed with tuberculosis were enrolled, including both outpatients and inpatients.

A total of 280 diagnosed TB patients aged up to 12 years met the inclusion and exclusion criteria for this study. They were informed about the study's purpose and benefits. All consecutive children attending the outpatient department of SSMCMH with clinical symptoms suggestive of tuberculosis were investigated to confirm TB disease. After obtaining written informed consent, demographic data, detailed clinical history, family contact history, and physical examination results for each child were recorded. Complete blood count, Mantoux test, and chest X-ray were performed for all the children. Additional tests such as fine needle aspiration cytology (FNAC), ultrasound (USG) of the whole abdomen, chest and spine X-rays, lumbar puncture (LP), CT scan, MRI, and other necessary investigations were conducted based on diagnostic needs. Sputum and stool samples were tested for gene X-pert and gene X-pert Ultra as required. In some cases, gastric lavage was performed for acid-fast bacilli (AFB) staining and gene X-pert testing. Children attending the outpatient (OPD) and inpatient departments were evaluated and enrolled in the study. Of the 280 cases, 209 children came for follow-up at regular intervals: after one month, at two months, and just before the completion of six months of Anti-TB (ATB) treatment. Reminders were sent to the parents via mobile phone to ensure follow-up. All cases received Anti-TB treatment at the DOT Center in the hospital or another feasible treatment source. The information was entered into SPSS 23 for analysis.

Results:

Table 1 presents the sociodemographic statistics observed in our study. Out of 280 patients, the largest proportion (44.29%) were in the age range of 5 to 10 years. There were 86 patients (30.71%) older than 10 years, while 70 patients (25%) were younger than 5 years. Females comprised 153 cases (54.64%), and males comprised 127 cases (45.36%). Regarding socioeconomic status, 134 patients (47.86%) were from the middle class, 106 patients (37.86%) were from the low-income category, and 40 patients (14.28%) were from the upper class.

Table I

Socio-demographic data (n=280)

Variables	Frequency	Percentage
Age (Year)		
<5	70	25%
5-10	124	44.29%
11-12	86 Sex	30.71%
Male	127	45.36%
Female	153	54.64%
	Socio economic status	
Low	106	37.86%
Middle	134	47.86%
High	40	4.28%

Table II shows that all 280 individuals exhibited fever (100%). Among these, 143 (51.07%) experienced both cough with sputum and anorexia, which was subsequently accompanied by weight loss. Additionally, 30 cases (10.71%) presented with ascites, 21 (7.5%) experienced back discomfort, 8 (2.86%) reported shortness of breath, 3 (1.07%) exhibited confusion, and only 2 (0.71%) had headaches.

Table II

Presenting symptoms (n=280)

Presenting symptoms	n	%
Cough with sputum	143	51.07%
Anorexia and weight loss	143	51.07%
Fever	280	100%
Shortness of breath	8	2.86%
Back pain	21	7.50%
Headache	2	0.71%
Disorientation	3	1.07%
Ascites	30	10.71%

Figure 1 shows that the majority of our cases, specifically 143 (51.07%), were diagnosed with pulmonary TB, while the remaining 137 (48.93%) had extrapulmonary TB.

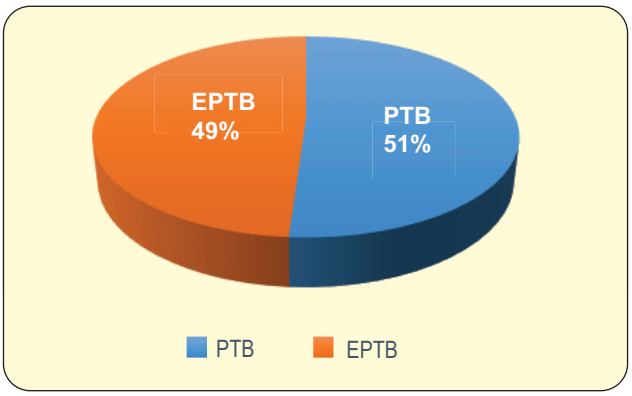

Fig.-1: Types of Tuberculosis(n=280)

Table III lists the various types of extrapulmonary tuberculosis. The majority of cases (44.52%) presented with TB lymphadenitis. This was followed by abdominal TB in 30 cases (21.90%), Pott's disease in 20 instances (14.60%), miliary TB in 17 cases (12.41%), tubercular pleural effusion in 8 cases (5.84%), and just 1 case (0.73%) of TB meningitis.

Table-III

Types of EPTB in our study cases (n=137)

Types of EPTB	Frequency	Percentage%
TB lymphadenitis	61	44.52%
TB meningitis	1	0.73%
TPE	8	5.84%
Pott's disease	20	14.60%
Abdominal TB	30	21.90%
Miliary TB	17	12.41%

TPE: Tubercular pleural effusion

Figure 2 shows that out of the total 280 cases, 267 (66.43%) had a confirmed history of contact with TB, while 33.57% had no confirmed history of contact with TB.

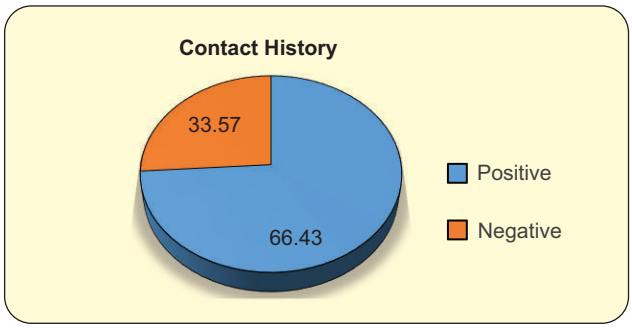

Fig.-2: *History of TB contact in our study cases (n=280)*

Figure 3 displays the initial clinical diagnosis of 156 patients (55.71%) and the bacteriological detection of TB in 124 patients (44.29%).

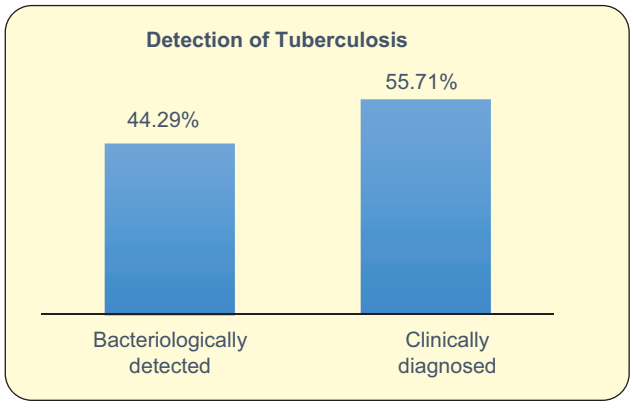

Fig.-3: *Initial detection of Tuberculosis in our study cases(n=280)*

Table III presents a comprehensive account of multiple investigations. A significant proportion of patients (23.57%) tested positive for the sputum GeneXpert test, while a slightly lower percentage (19.6%) had positive results for the MT test. Positive findings were also observed in the FNAC of different specimens, such as lymph nodes, in 20% of cases. Chest X-rays showed features suggestive of tuberculosis in another 20% of cases. A smaller percentage (12.14%) tested positive for the GeneXpert Ultra test. Positive findings in pleural fluid studies were observed in 2.86% of cases, while only 0.36% had positive findings in their CSF study.

Table IV

Different investigations in our study total percentages cases(n=280)

Variables	n	%
CBC with ESR	4	1.43%
Sputum for Gene X-pert	66	23.57%
MT	55	19.60%
Chest X-Ray P/A view	56	20%
FNAC & LN biopsy	56	20%
Gene x-pert Ultra	34	12.14%
CSF study	1	0.36%
Pleural fluid study	8	2.86%

Table V reflects the treatment outcomes of 280 TB patients. Out of these, 143 (51.1%) had pulmonary tuberculosis (PTB) and 137 (48.9%) had extrapulmonary tuberculosis (EPTB). Overall, 258 (92.1%) underwent treatment—133 (51.6%) with PTB and 127 (48.4%) with EPTB. Among these, 69.2% (99) of the PTB patients and 62.8% (86) of EPTB patients recovered after completing the treatment, representing an overall recovery rate of 66% (185). In terms of treatment results, 66% (185) of patients finished the course and were cured: 69.2% (99) of PTB and 62.8% (86) of EPTB. Meanwhile, 3.6% (10) of the total cases—3.5% (5) of PTB and 3.6% (5) of EPTB—completed the course but were not cured. A total of 7.9% (22) of patients did not receive any treatment: 7% (10) of PTB and 8.8% (12) of EPTB. Treatment was continued in 5% (14) of cases—0.7% (1) of PTB and 9.5% (13) of EPTB. Moreover, 8.9% (25) of patients discontinued treatment: 10.5% (15) of PTB and 7.3% (10) of EPTB. Notably, 2.5% (7) defaulted on their treatment—2.8% (4) of PTB and 2.2% (3) of EPTB. Additionally, 2.1% (6) were lost to follow-up—2.1% (3) of PTB and 2.2% (3) of EPTB. Unfortunately, 3.8% of patients passed away during the follow-up: 4.2% (6) of PTB and 3.6% (5) of EPTB. Among the TB patients who completed their treatment, the overall success rate was 94.9%—95.1% (99) for PTB and 94.5% (86) for EPTB.

Table V

Treatment outcomes of pulmonary TB and extra-pulmonary

TB cases Outcomes	Types of TB		
	Pulmonary (143) % (n)	Extra-pulmonary (137) % (n)	TB patients (280) % (n)
Treatment completed & cured	69.2% (99)	62.8% (86)	66% (185)
Treatment completed but failed	3.5% (5)	3.6% (5)	3.6% (10)
Treatment ongoing	0.7% (1)	9.5% (13)	5% (14)
Switch off	10.5% (15)	7.3% (10)	8.9% (25)
Defaulted	2.8% (4)	2.2% (3)	2.5% (7)
Lost to follow-up	2.1% (3)	2.2% (3)	2.1% (6)
Death	4.2% (6)	3.6% (5)	3.9% (11)
Treatment not received	7% (10)	8.8% (12)	7.9% (22)

Discussion:

Among our total participants, the highest percentage (44.29%) belonged to the age group of 5 to 10 years. In contrast, R Ksoo et al. found that most patients [11] were under 5 years of age, and Wang et al. reported the mean age of their patients as 9.11 ± 4.39 years.[12] Environmental differences or geographic location may account for these variations in findings. We found a nearly equal ratio of male to female participants, with a slightly higher number of females. However, other studies[12,13] have observed a dominance of male participants. Among our total participants, the largest proportion were from the middle-class category, with low-income cases accounting for nearly one-third. A separate study[14] revealed that a significant proportion of participants belonged to a low socioeconomic background. In our study, all participants experienced fever. Besides fever 'cough with sputum and anorexia with weight loss was also prevalent among the majority of the cases. Nearly similar frequencies of symptoms were observed in some other previous studies[12,13]. Among our total TB, the majority were diagnosed based on clinical evaluation, while 44% were identified through bacteriological testing. Our study revealed that most of our cases were diagnosed with pulmonary TB. However, extrapulmonary TB was the most common finding in other studies[15,16], even when their study

populations included children under 15 years old. Our study found that TB lymphadenitis was the most common presentation, followed by abdominal TB. In another Indian study[17], TB lymphadenitis was also found to be the prevalent form of extrapulmonary tuberculosis, which aligns with our research findings. Nearly one-fourth of our participants had cervical lymphadenopathy, while 8.76% had both abdomen and axillary lymphadenopathy. A recent study reported that peripheral tuberculous lymphadenitis can occur in the context of a primary infection, typically seen in young children and immunocompromised patients[18].It may also indicate the reactivation of a prior primary infection. Among our participants, 66% completed treatment and were cured; 3.6% completed treatment but weren't cured; and 3.8% died; the treatment success rate was 94.9%. In another study[19], out of 56 children whose treatment outcomes were recorded, 69.6% completed treatment, 28.5% were cured, and 1.7% experienced treatment failure. However, similar to our findings, Siamisang et al. reported a treatment success rate of 93.1% [20] in Botswana from 2008 to 2019. In Ethiopia, Weldegebreal et al. found a treatment success rate of 88.6% [21] from September 1, 2017, to January 30, 2018.

Conclusion:

Pulmonary tuberculosis (TB) is prevalent in pediatric patients, typically presenting with symptoms such as fever and cough. Although some patients may discontinue treatment prematurely, the majority achieve a cure with appropriate anti-TB drugs. The Directly Observed Treatment, Short-course (DOTS) strategy has proven effective, ensuring adherence and successful outcomes, without significant adverse effects from the medications.

Limitations of the study:

This study was conducted in a single center. One major limitation of the study was the smaller sample size, the number of children treated with conventional anti TB drugs was to allow for definitive conclusion about efficacy.

Data Availability:

The datasets analysed during the current study are not publicly available due to the continuation of analyses but are available from the corresponding author on reasonable request.

Conflict of Interest:

The authors stated that there is no conflict of interest in this study

Funding:

This research received no external funding.

Ethical consideration:

The study was approved by the Ethical Review Committee of Sir Salimullah Medical College Mitford Hospital, Dhaka, Bangladesh. Informed consent was obtained from each participant or caregivers of the patients.

Author Contributions:

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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References:

1. Rossoni AM, Lovero KL, Tahan TT, et al. Evaluation of pulmonary tuberculosis diagnostic tests in children and adolescents at a pediatric reference center. Pulmonology. 2022 Mar 1;28(2):83-9.
2. Cruz AT, Starke JR. Clinical manifestations of tuberculosis in children. Pediatric respiratory reviews. 2007 Jun 1;8(2):107-17.
3. Eamranond P, Jaramillo E. Tuberculosis in children: reassessing the need for improved diagnosis in global control strategies. The International Journal of Tuberculosis and Lung Disease. 2001 Jul 1;5(7):594-603.
4. Dolin, P.J., Raviglione, M.C. and Kochi, A. Global Tuberculosis Incidence and Mortality during 1990-2000. Bulletin of the World Health Organization,1994; 72, 213-220.
5. Nelson, L.J. and Wells, C.D. Global Epidemiology of Childhood Tuberculosis [Childhood TB]. The International Journal of Tuberculosis and Lung Disease, 8,2004: 636647.
6. Donald, P.R. Childhood Tuberculosis: Out of Control? Current Opinion in Pulmonary Medicine, 2002; 8, 178-182.
7. Lin, Y.S., Huang, et al. Clinical Characteristics of Tuberculosis in Children in the North of Taiwan. Journal of Microbiology, Immunology and Infection,2005; 38, 41- 46.
8. Swaminathan S, Rekha B. Pediatric tuberculosis: global overview and challenges. Clinical infectious diseases. May 15, 2010;50(Supplement_3): S184-94.

9. Marais BJ, Gie RP, Schaaf HS, et al. Childhood pulmonary tuberculosis: old wisdom and new challenges. American journal of respiratory and critical care medicine. 2006;173(10):1078-90.

10. Marais BJ, Pai M. Recent advances in the diagnosis of childhood tuberculosis. Archives of disease in childhood. 2007 May;92(5):446.

11. Ksoo R, Barman H, De M, et al. Clinical Profile of Pediatric Tuberculosis in a Tertiary Hospital in Northeast India: A Retrospective Analysis. Cureus ;2023; 15(5): e38660. DOI 10.7759/cureus.38660.

12. Wang D-M, Wang C, An Q, et al., Clinical characteristic, common sites, and geographical distribution of pediatric tuberculosis patients in Southwest China. Front. Pediatr. ;2024; 12:1327648. doi: 10.3389/fped.2024.1327648.

13. Alex-Hart, B. and Paul, N. Pattern and Outcome of Childhood Tuberculosis Seen at the University of Port Harcourt Teaching Hospital, Nigeria. Journal of Tuberculosis Research, 2019;7, 170-183. doi: 10.4236/jtr.2019.73017.

14. Sharma S, Sarin R, Sahu G, et al., Demographic profile, clinical and microbiological predictors of mortality amongst admitted pediatric TB patients in a tertiary referral tuberculosis hospital. Indian Journal of Tuberculosis. 2020;1;67(3):312-9.

15. Dendup T, Dorji T, Edgnton ME, et al.: Childhood tuberculosis in Bhutan: profile and treatment outcomes. Public Health Action. 2013, 3:11-14. 10.5588/pha.12.0091.

16. Dhoble S, Akre C, Kubde S: Assessment of the socio-demographic profile and treatment outcome of pediatric tuberculosis patients. Natl J Community Med. 2017, 8:338-42.

17. Hatwal D, Chaudhari S, Joshi AK, et al., Patterns of extrapulmonary tuberculosis in children: a hospital-based study. Indian Journal of Community Health. 2012;31;25(1):22-7.

18. Neyro SE, Squassi IR, Medín M, Caratozzolo A, et al. Peripheral tuberculous lymphadenitis in pediatrics: 16 years of experience in a tertiary care pediatric hospital of Buenos Aires, Argentina. Arch Argent Pediatr 2018;116(6):430-436.

19. Pýnar ET, Altunsu AT. Epidemiologic features and treatment outcomes of pediatric pulmonary tuberculosis cases. Cukurova Medical Journal. 2020 Oct;45(4):1698-706.

20. Siamisang K, Rankgoane-Pono G, Madisa TM, et al., Pediatric tuberculosis outcomes and factors associated with unfavorable treatment outcomes in Botswana, 2008-2019: a retrospective analysis. BMC Public Health. 2022;4;22(1):2020.

21. Weldegebreal F, Teklemariam Z, Mitiku H, et al., Treatment outcome of pediatric tuberculosis in eastern Ethiopia. Front Pediatr. 2022; 10:966237.