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Review Article

Extrapulmonary Tuberculosis in Bangladesh: A Comprehensive Review

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Abstract

Extrapulmonary tuberculosis (EPTB) represents a major but under-recognized element of the tuberculosis (TB) burden in Bangladesh. Although pulmonary TB (PTB) remains the dominant form of the disease, EPTB accounts for a notable proportion of national TB cases, ranging from 15–30% based on hospital and community-level studies. EPTB manifests in variegated anatomical sites—including lymph nodes, pleura, abdomen, bones, urogenital tract, and the central nervous system—often presenting with nonspecific symptoms that overlap with malignancy, autoimmune disorders, or bacterial infections. These diagnostic challenges combined with the paucibacillary nature of EPTB, complicate clinical evaluation and contribute to delays in management. Recent improvements in molecular diagnostics such as Gene Xpert MTB/RIF have enhanced case detection; however, access remains uneven across Bangladesh, especially in rural and district-level facilities.

This review synthesizes the current evidence on extrapulmonary tuberculosis (EPTB) in Bangladesh, covering epidemiology, risk factors, pathogenesis, clinical presentation, diagnosis, treatment, and systemic challenges. It highlights local research published in BanglaJOL, National TB Program (NTP) data, tertiary hospital studies, and WHO guidance adapted to the Bangladeshi context. Although less common than pulmonary MDR-TB, drug-resistant EPTB presents significant clinical and public health challenges. Reducing EPTB-related morbidity and long-term complications requires multisectoral strategies, which includes enhanced laboratory capacity, standardized diagnostic protocols, decentralized molecular testing, and targeted clinician training. This review seeks to assist clinicians, researchers, and policymakers by consolidating current knowledge and identifying key gaps and priorities for future action.

Keyword: Extrapulmonary tuberculosis; Bangladesh, Gene Xpert, Lymph node TB, Drug Resistance, Tuberculosis Epidemiology.

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1. Introduction

Tuberculosis (TB) remains among the leading infectious diseases affecting Bangladesh. According to the National Tuberculosis Control Program (NTP), over 360,000 people develop TB annually, and the country ranks among the top 30 high TB-burden nations globally.[1] While pulmonary tuberculosis (PTB) accounts for most transmission and therefore receives the bulk of programmatic attention, extrapulmonary tuberculosis (EPTB) constitutes a substantial portion of the overall disease burden and often leads to severe morbidity, disability, and mortality if not diagnosed and treated promptly.

EPTB refers to TB occurring in organs or tissues outside the lungs. The most common forms in Bangladesh include lymph node tuberculosis (LNTB), pleural TB, abdominal TB, osteoarticular TB, and tuberculous meningitis (TBM). Each form presents with unique clinical features, diagnostic complexities, and therapeutic requirements. Particularly in resource-limited settings such as Bangladesh, prompt diagnosis is hindered by nonspecific symptoms, restricted access to histopathology services, limited biopsy facilities, and uneven availability of molecular diagnostics.

EPTB in Bangladesh unduly affects women, children, and individuals of lower socioeconomic status.[2,3] These patterns

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represent broader global trends. Diagnosis is often delayed because EPTB is paucibacillary, resulting in low sensitivity for sputum smear microscopy. Until recently, a large number of EPTB cases remained undetected. With the expanded rollout of GeneXpert MTB/RIF assays, the detection of EPTB has improved, although obtaining suitable specimens continues to be a challenge.

This review seeks to consolidate evidence on extrapulmonary tuberculosis in Bangladesh by exploring epidemiology, risk factors, pathogenesis, clinical presentation, diagnostic approaches, treatment guidelines, existing local research, challenges, and avenues for future investigation.

This narrative review synthesizes published literature from BanglaJol, PubMed-indexed Journals, NTP reports, & WHO guidance published in recent time.

2. Epidemiology of Extrapulmonary Tuberculosis in Bangladesh

2.1 National Burden

National TB reports estimate that EPTB accounts for approximately 15-20% of all notified TB cases in Bangladesh.[1] However, studies from tertiary hospitals report substantially higher proportions-often 30-40%- as individuals with complex or unusual forms of the disease tend to seek care at specialized facilities.

A study from Shaheed Ziaur Rahman Medical College Hospital analyzed 200 EPTB cases and found lymph node tuberculosis (47%), pleural TB (18%), abdominal TB (10%), and skeletal TB (6%) as the most common types.[4] Another study from Mymensingh Medical College Hospital reported that EPTB accounted for 32.6% of TB cases, with cervical LNTB comprising the largest share.[5]

Studies in pediatric populations show even higher rates, with extrapulmonary TB accounting for 40–60% all childhood TB cases seen at tertiary hospitals.[6]

2.2 Factors Influencing Prevalence Estimates

The reported prevalence of extrapulmonary TB in Bangladesh varies due to several factors. Referral bias arises because tertiary care centers often manage more complicated and chronic EPTB cases. Enhanced diagnostic capacity, particularly the increased use of GeneXpert on extrapulmonary specimens, has improved case detection. Underreporting is common in peripheral health facilities that lack the resources for specimen collection. Additionally, sociodemographic factors, such as higher rates of EPTB among women, can inflate apparent prevalence in certain regions.

2.3 Geographic Distribution

Although nationally stratified data are limited, hospital-based studies indicate that extrapulmonary TB is prevalent across all regions of Bangladesh. In the northwestern region, higher rates of lymph node and abdominal TB have been reported in Bogura and Rajshahi. Tertiary centers in the Dhaka region document increased cases of pleural and central nervous system TB. The Mymensingh division shows a particularly high proportion of lymph node TB among both adults and children.[5,6]

2.4. Trends Over Time

Several local studies indicate a gradual rise in the proportion of extrapulmonary TB relative to pulmonary TB over the past decade, driven in part by improved case detection through expanded access to GeneXpert, FNAC, and imaging. While the incidence of pulmonary TB has declined, EPTB proportions have remained stable or increased. These trends are consistent with global observations, where enhanced TB control is often associated with a higher relative prevalence of extrapulmonary forms.

3. Risk Factors for Extrapulmonary TB in the Bangladesh

Multiple studies have identified several risk factors for extrapulmonary TB in Bangladesh. Demographically, women are more likely than men to develop EPTB, with a female-to-male ratio of 1.4:1 reported in Mymensingh, potentially due to hormonal influences, nutritional deficiencies, and greater healthcare-seeking behavior for conditions like lymphadenopathy.[5] Children and young adults under 40 are disproportionately affected, with lymph node TB being the most common form in pediatric populations.[6] Socioeconomic factors—including low income, overcrowding, and poor housing—along with malnutrition and micronutrient deficiencies, particularly iron and vitamin D, further increase susceptibility by impairing cell-mediated immunity.[7] Medical and biological factors also play a role: although HIV prevalence is low (~0.01%), HIV-positive individuals experience more severe and disseminated EPTB.[8] Diabetes, highly prevalent in Bangladesh, predisposes to abdominal and pleural TB due to immune dysfunction.[9] Previous inadequate TB treatment raises the risk of both EPTB and drug-resistant disease. Genetic predisposition, suggested by NRAMP1, VDR, and TLR polymorphisms in South Asian populations, may also influence susceptibility, though Bangladesh-specific data are limited.

4. Pathogenesis of Extrapulmonary Tuberculosis

EPTB develops when *Mycobacterium tuberculosis* spreads outside the lungs through hematogenous or lymphatic dissemination.[10,11,12]

4.1 Mechanisms of Dissemination

Extrapulmonary TB pathogenesis involves two primary phases. During the primary infection, *Mycobacterium tuberculosis* bacilli can disseminate to extrapulmonary sites before a robust immune response is established.[10,13] In the reactivation phase, dormant bacilli within these tissues may become active during periods of immunosuppression, leading to clinical disease.[13,14]

4.2 Immune Response

Granuloma formation is the hallmark of tuberculosis pathology, comprising macrophages, epithelioid cells, Langerhans giant cells, and a surrounding lymphocytic cuff.[15] Cytokines such as TNF-α, IFN-α, and IL-12 play key roles in regulating macrophage activation and maintaining granuloma integrity, with dysregulation increasing the risk of progressive extrapulmonary disease.[15,16,17]

4.3 Paucibacillary Nature

Extrapulmonary TB lesions are typically paucibacillary, which limits the sensitivity of smear microscopy, culture, and drug susceptibility testing.[18] Consequently, molecular diagnostics such as GeneXpert and histopathological evaluation remain essential for accurate and timely diagnosis.[19,20]

4.4 Organ-Specific Pathogenesis

Extrapulmonary TB manifests differently depending on the affected site. Lymph node TB typically begins in regional lymph nodes following primary infection, with caseous necrosis potentially leading to cold abscesses and sinus formation.[12,21] Pleural TB is largely hypersensitivity-mediated, resulting in lymphocyte-rich exudative effusions.[22] Central nervous system TB arises from rupture of a subependymal tubercle into the cerebrospinal fluid, causing basal meningeal exudates, vasculitis, and hydrocephalus.[23] Abdominal TB may involve the gut, mesenteric lymph nodes, or peritoneum and can clinically mimic malignancy, appendicitis, or Crohn's disease.[24,25]

5. Clinical Features of Extrapulmonary Tuberculosis

Extrapulmonary TB (EPTB) can affect any organ system. In Bangladesh, the most common forms are lymph node TB (LNTB), pleural TB, abdominal TB, osteoarticular TB, and central nervous system (CNS) TB. Wide variation in site-specific symptoms and overlap with other diseases commonly leads to delayed diagnosis.

5.1 Lymph Node Tuberculosis

Lymph node TB (LNTB) is the most prevalent form of extrapulmonary TB in Bangladesh, representing 40–50% of cases in many tertiary care centers.[4,5] Clinically, it presents as painless, progressively enlarging lymph nodes, most commonly in the cervical region, particularly the posterior triangle. Nodes may be discrete or matted, with sinus tract formation occurring in advanced disease. Systemic features such as low-grade fever, night sweats, and weight loss may also be present. Differential diagnoses include lymphoma, metastatic carcinoma, reactive lymphadenitis, and Kikuchi disease. Fine-needle aspiration cytology remains a key diagnostic tool in Bangladesh owing to its wide availability and cost-effectiveness.

5.2 Pleural Tuberculosis

Pleural tuberculosis is the second most common form of EPTB in Bangladesh, frequently affecting young adults, with a higher incidence in males. Clinical features include acute or subacute fever, dyspnea, and diminished breath sounds secondary to pleural effusion. Potential complications include fibrothorax, chronic respiratory impairment, and disease recurrence, highlighting the importance of timely diagnosis and appropriate management.

5.3 Abdominal Tuberculosis

Abdominal tuberculosis is relatively common in Bangladesh, driven by high rates of malnutrition and enteric infections. Patients typically present with abdominal pain, weight loss, fever, ascites, palpable abdominal masses, or altered bowel habits. The ileocecal region, peritoneum, and abdominal lymph nodes are the most frequently affected sites, with hepatosplenic involvement occurring rarely. Abdominal TB can mimic other conditions, including malignancy, Crohn's disease, and intestinal obstruction, making early recognition and appropriate diagnostic evaluation essential.

5.4 Osteoarticular Tuberculosis

Osteoarticular tuberculosis often presents late, with the spine—manifesting as Pott's disease—being the most commonly affected site. Clinical features include back pain, progressive kyphosis, and neurological deficits resulting from spinal cord compression, while peripheral joint involvement presents with swelling and stiffness. The thoracolumbar spine, hip, and knee joints are the most frequently affected sites. Delayed diagnosis can result in permanent deformities and functional impairment, underscoring the importance of early recognition and management.

5.5 Central Nervous System Tuberculosis

Central nervous system (CNS) tuberculosis is among the most severe forms of EPTB in Bangladesh, associated with high mortality and substantial long term neurological disability. It manifests as tuberculous meningitis, intracranial tuberculomas, or spinal arachnoiditis. Clinical features of tuberculous meningitis include fever, headache, neck stiffness, altered consciousness, cranial nerve palsies, and seizures. Complications such as hydrocephalus, cerebral infarction, and long-term neurological deficits are common. Early recognition and prompt intervention are essential to improve outcomes and reduce morbidity and mortality.[26]

5.6 Genitourinary Tuberculosis

Genitourinary TB is frequently underdiagnosed due to its nonspecific clinical presentation. Common symptoms include

dysuria, hematuria, flank pain, infertility in women, and scrotal swelling in men. If left untreated, renal involvement can result in irreversible kidney damage, highlighting the need for timely recognition and management.[27]

5.7 Cutaneous Tuberculosis

Cutaneous tuberculosis is rare in Bangladesh, accounting for less than 1% of EPTB cases, and includes forms such as lupus vulgaris, scrofuloderma, and tuberculosis verrucosa cutis. These manifestations are often misdiagnosed as fungal infections or dermatologic malignancies, underscoring the need for careful clinical and histopathological evaluation.

6. Diagnosis of Extrapulmonary TB

Diagnosing EPTB is difficult because of its paucibacillary character and the frequent requirement for invasive specimen collection. WHO and the NTP in Bangladesh recommend an integrated approach combining clinical, radiological, microbiological, and histopathological assessments.

6.1 Conventional Methods

6.1.1 Tuberculin Skin Test (TST)

The tuberculin skin test (TST) is widely available in Bangladesh and remains a useful supportive tool for diagnosing extrapulmonary TB. However, its interpretation is limited by false-positive results in BCG-vaccinated individuals and false-negative results in populations with malnutrition or HIV infection.

6.1.2 Erythrocyte Sedimentation Rate (ESR)

Often elevated, but nonspecific.

6.1.3 Cytology & Histopathology

Key modalities in Bangladesh, given the broad access to FNAC.

6.4.4 FNAC Findings

Fine-needle aspiration cytology (FNAC) remains a valuable diagnostic tool for EPTB, revealing characteristic features such as granulomatous inflammation, caseous necrosis, and epithelioid cells. When combined with GeneXpert testing, FNAC substantially enhances diagnostic yield, improving the accuracy and speed of extrapulmonary TB detection.

6.2 Microbiological Methods

Smear microscopy has limited utility in extrapulmonary TB due to low sensitivity, typically below 20%. Culture remains the gold standard for diagnosis but is slow, requiring 4–8 weeks, and demonstrates low positivity in EPTB cases (10–30%). Additionally, the availability of automated culture systems such as MGIT is limited in district hospitals, restricting access to timely microbiological confirmation.

6.3 Molecular Diagnostics

6.3.1 GeneXpert MTB/RIF

The introduction of GeneXpert represents a major advancement in the diagnosis of extrapulmonary TB in Bangladesh, as it allows rapid detection of *Mycobacterium tuberculosis* and rifampicin resistance. The assay demonstrates high sensitivity for lymph node and central nervous system TB and is recommended as the first-line test for all EPTB specimens. Reported positivity rates vary by specimen type, ranging from 50–80% for lymph node aspirates, 40–60% for cerebrospinal fluid, and less than 30% for pleural effusions.[28]

6.3.2 Line Probe Assay (LPA)

Used for drug resistance detection in MTB culture isolates or smear-positive specimens.

Limited role in smear-negative EPTB.

6.4 Radiological Investigations

Chest X-ray

6.4.1 Chest imaging is particularly useful for detecting pleural effusions, miliary TB, and secondary pulmonary involvement, aiding in the diagnosis and management of extrapulmonary tuberculosis

6.4.2. Ultrasound

Imaging plays a key role in the diagnosis of abdominal TB, with ascites, lymphadenopathy, and bowel wall thickening serving as important diagnostic indicators. These imaging modalities are widely accessible across healthcare facilities in Bangladesh.

6.4.3 CT & MRI

Extended or specialized treatment regimens are essential for managing central nervous system, spinal, and intra-abdominal TB; however, their widespread use is limited by high costs and restricted accessibility.

6.5. Diagnostic Challenges in Bangladesh

The management of extrapulmonary TB in Bangladesh is constrained by several systemic challenges, including inadequate biopsy facilities at district-level hospitals, delays in obtaining imaging referrals, limited awareness of EPTB presentations among general practitioners, restricted access to molecular diagnostics in rural areas, and financial barriers that prevent patients from undergoing advanced investigations.

7. Drug-Resistant Extrapulmonary TB

Drug-resistant TB (DR-TB), including MDR-TB (resistance to both rifampicin and isoniazid), is less common in EPTB but still clinically significant.

7.1 Epidemiology of DR-EPTB in Bangladesh

In Bangladesh, the national prevalence of multidrug-resistant TB (MDR-TB) is approximately 1.6% among new cases and 29% among previously treated cases. A significant proportion of MDR-TB occurs at extrapulmonary sites, with tertiary hospitals reporting that 3–7% of EPTB patients have MDR-EPTB.[25]

7.2 Clinical Features

Drug-resistant extrapulmonary TB (DR-EPTB) generally resembles drug-sensitive disease in clinical presentation; however, it progresses more rapidly, responds more slowly to therapy, necessitates prolonged treatment, and carries a higher risk of complications.

7.3 Diagnosis

GeneXpert MTB/RIF is the key tool.

Culture and phenotypic drug susceptibility testing (DST) are required for second-line resistance.

8. Treatment and Management of /Extrapulmonary TB

Treatment of EPTB in Bangladesh follows WHO and NTP TB guidelines.

8.1 First-Line Treatment for Drug-Sensitive EPTB

Standard Regimen

The recommended 6-month treatment regimen for extrapulmonary tuberculosis (EPTB) includes a 2-month intensive phase with isoniazid (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E), followed by a 4-month continuation phase with isoniazid and rifampicin.[45,46]. This regimen is routinely applied to manage lymph node, pleural, abdominal, genitourinary, and cutaneous forms of EPTB, ensuring effective disease control while minimizing treatment duration.[19,50,51]

8.2 Extended Treatment (9–12 Months)

Extended or specialized treatment regimens are indicated for central nervous system (CNS) TB, spinal TB, and disseminated TB due to the slow penetration of anti-TB drugs into the cerebrospinal fluid and bone.[50,51]

8.3 Use of Steroids

Adjunctive corticosteroid therapy, such as dexamethasone or prednisolone, is recommended for TB meningitis, pericardial TB, and selected cases of severe pleural TB to reduce inflammation and improve clinical outcomes.[35,51].

7.4 Treatment of MDR-EPTB

Management of multidrug-resistant (MDR) EPTB follows the National TB Program's (NTP) recommended MDR regimen. Eligible patients may receive a shorter 9–11 month regimen, while more complicated cases typically require an extended 18–20 month course.[38,43,44] MDR-TB involving the central nervous system or spine necessitates individualized treatment plans tailored to the patient's clinical status.[44]

8.5 Monitoring Response

Clinical improvement in extrapulmonary TB (EPTB) may be gradual, and patient monitoring should include assessment of symptom resolution, regression of enlarged lymph nodes, radiological improvement, and weight gain.[49,50]

9. Special Populations

9.1 Pediatric EPTB

In children in Bangladesh, lymph node TB (LNTB) and central nervous system (CNS) TB are particularly common. Management is complicated by challenges such as difficulty obtaining adequate diagnostic samples, prevalent malnutrition, and an increased risk of disseminated disease.[48,49]

Pregnant Women

EPTB is often misdiagnosed. Treatment similar to adults but streptomycin is contraindicated.[35] TBM and severe EPTB need careful multidisciplinary management.[41]

9.3 HIV Co-infection

People living with HIV have higher risk of EPTB and disseminated diseases.[50] presentation may be atypical. Concurrent antiretroviral therapy must be started or optimized per standard guidelines, balancing timing relative to TB therapy to reduce immune reconstitution inflammatory syndrome (IRIS). Outcome improve with early ART.[50,51]

10. Health System Challenges in the Diagnosis and Management of EPTB in Bangladesh

Extrapulmonary tuberculosis (EPTB) poses significant challenges to the healthcare system in Bangladesh. Accurate diagnosis relies on specialized investigations, including biopsies, imaging, and experienced clinical evaluation, yet these resources are unevenly distributed nationwide. Treatment outcomes are further affected by diagnostic delays, issues with adherence, and limited follow-up capacity. The following section highlights the key systemic gaps impacting EPTB management in the country.

10.1 Diagnostic Limitations

10.1.1 Limited Access to GeneXpert for EPTB Samples. Although GeneXpert machines are broadly available for pulmonary TB diagnosis in Bangladesh, many centers lack the infrastructure to process extrapulmonary specimens, including cerebrospinal fluid, tissue biopsies, aspirates, and

pleural fluid. This limitation contributes to delayed or missed diagnoses and hampers timely management of EPTB.[32,46]

10.1.2 Inadequate Biopsy and Surgical Facilities
Most district-level hospitals in Bangladesh lack trained surgeons for lymph node excision, facilities for ultrasound-guided biopsies, and core-needle biopsy equipment. Consequently, patients are often required to travel to tertiary care centers for appropriate diagnostic procedures, contributing to delays in diagnosis and treatment.[45]

10.1.3 Limited Histopathology Capacity
Many public hospitals in Bangladesh experience prolonged turnaround times for biopsy reports, often ranging from two to six weeks, compounded by shortages of pathology specialists and inadequate reagents and equipment. These limitations substantially delay definitive diagnosis and the initiation of appropriate treatment for EPTB.[45,47]

10.2 Human Resource Constraints
In Bangladesh, limited awareness of extrapulmonary TB among general practitioners, surgeons, and ENT specialists contributes to delays in diagnosis and treatment, as many clinicians are unfamiliar with updated diagnostic algorithms, the use of GeneXpert on extrapulmonary specimens, and the management of drug-resistant EPTB.[45,47] Additionally, overburdened DOTS centers primarily focus on pulmonary TB, with EPTB receiving comparatively less attention, further exacerbating gaps in timely and effective care.[37]

10.3 Socioeconomic Barriers
The economic burden of extrapulmonary TB in Bangladesh is substantial. Advanced imaging modalities such as CT, MRI, and endoscopy, which are often required for diagnosing abdominal or CNS TB, are costly for low-income families. In addition, patients face significant indirect costs, including travel to tertiary care centers, lost wages, prolonged waiting times, and hospitalization for complex cases. These financial and logistical challenges can lead to treatment interruptions and negatively impact clinical outcomes.[45,47]

10.4 Patient-Level Challenges
10.4.1 Delayed Health-Seeking Behavior
Cultural practices and limited awareness of EPTB often lead patients in Bangladesh to seek care from informal providers, rely on traditional home remedies, or ignore early symptoms such as lymph node swelling, resulting in delayed diagnosis and treatment.[45]

10.4.2 Poor Treatment Adherence
Long regimens (9–12 months for CNS and bone TB) challenge adherence.[40,41]

10.5 Programmatic Limitations
10.5.1 Limited Data on EPTB
National TB Program (NTP) reports in Bangladesh frequently aggregate extrapulmonary TB cases without detailing specific subtypes, limiting the ability to conduct evidence-based planning and resource allocation.[37]

10.5.2 Lack of Standardized Algorithms
Despite the presence of national guidelines for EPTB management, their implementation is inconsistent across healthcare facilities, resulting in variable diagnostic and treatment practices.[37]

11. Recommendations for Improving EPTB Care in Bangladesh
To reduce the morbidity and long-term complications associated with EPTB, a combination of clinical, diagnostic, and policy interventions is required.

11.1 Strengthening Diagnostic Capacity
11.1.1 Expand GeneXpert Use for EPTB
GeneXpert testing should be routinely performed on extrapulmonary specimens, particularly lymph node aspirates, cerebrospinal fluid, and pleural fluid, with a dedicated supply of cartidge allocation for EPTB to ensure timely and accurate diagnosis.[33,35,46]

11.1.2 Establish Biopsy and FNAC Units at District Hospitals
District hospitals should be equipped with biopsy and FNAC capabilities, including training surgeons for minor excisions, installing ultrasound-guided biopsy systems, and providing adequate cytopathology support.[45]

11.1.3 Improve Pathology Services
Pathology services can be strengthened by deploying digital pathology solutions, recruiting additional histopathologists, and reducing biopsy report turnaround times to facilitate prompt diagnosis and treatment.[45,47]

11.2 Professional Training
11.2.1 EPTB Training Modules
Training programs should be developed for healthcare providers who frequently encounter EPTB, including general physicians, surgeons, gynecologists, ENT specialists, and pediatricians, to improve early recognition, appropriate diagnostic testing, and effective management.[46,50]

11.2.2 Updated Clinical Guidelines

To improve extrapulmonary TB management, it is essential that all physicians have access to the NTP EPTB guidelines, the latest WHO 2022 updates, and standardized protocols for managing multidrug-resistant TB.[45,37]

11.3 Public Health Interventions

11.3.1 Community Awareness Campaigns

Public health campaigns should emphasize early recognition of EPTB symptoms, including persistent lymph node swelling, chronic abdominal pain, prolonged fever, and back pain accompanied by neurological signs.[45,47]

11.3.2 Target High-Risk Populations

Awareness and screening efforts should prioritize high-risk groups, such as malnourished individuals, patients with diabetes, children, and immunocompromised populations, to facilitate timely diagnosis and treatment.[48,49]

11.4 Improve Treatment Monitoring

Effective management of extrapulmonary TB requires standardized follow-up schedules, with monthly monitoring recommended for patients with CNS TB, osteoarticular TB, and MDR-EPTB. The use of digital adherence tools, such as mobile phone reminders and monthly teleconsultations, can further support treatment adherence and timely identification of complications.[35,40]

11.5 Research Priorities

Key gaps for Bangladeshi researchers:

a. Accurate national prevalence of EPTB types

b. Genomic studies of M. tuberculosis strains causing EPTB

c. Outcome studies comparing 6-month vs. extended regimens

d. Pediatric EPTB cohorts

e. Economic burden and diagnostic delay assessments

f. High quality randomized trials and prospective cohorts specifically addressing optimal duration of therapy for different EPTB sites (especially CNS and osteoarticular disease).

g. Longitudinal studies on functional outcome and rehabilitation needs after sever EPTB (e.g., TB meningitis, spinal TB) to guide integrated care models.[39,40,45]

12. Conclusion

Extrapulmonary tuberculosis (EPTB) constitutes a significant and clinically important portion of the TB burden in Bangladesh. Although pulmonary TB continues to receive the majority of public health attention, EPTB contributes substantially to morbidity and long-term disability. Diagnosis remains challenging due to nonspecific clinical manifestations and limited access to sensitive diagnostic tools in many regions.[39,40,45] Lymph node and pleural TB are the most common forms, whereas central nervous system and spinal TB carry the highest risk of severe disability and mortality.

Recent advancements—including the expanded use of GeneXpert, enhanced FNAC services, and increasing clinical awareness—have improved diagnostic capacity; however, significant gaps persist.[45,46] Strengthening district-level diagnostic infrastructure, broadening molecular testing availability, enhancing clinician training, and improving follow-up systems are critical to ensuring timely and effective management.[35,37,45] Further investments in research and surveillance are necessary to provide a more accurate understanding of EPTB epidemiology and to guide evidence-based policy decisions. Through coordinated efforts across clinical, laboratory, and public health sectors, Bangladesh can substantially reduce the burden of extrapulmonary TB and advance toward its national TB control objectives.

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