Case Series

DOI: 10.7860/JCDR/2026/89196.24380

Paediatrics Section

Atypical Presentations of Paediatric Tuberculosis: A Series of Seven Cases from a Tertiary Care Centre in South India

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ABSTRACT

Paediatric Tuberculosis (TB) remains one of the leading infectious causes of illness and death among children globally, with diverse clinical manifestations that often complicate diagnosis and management. This case series describes seven children aged nine months to 13 years who presented with atypical or extrapulmonary manifestations of TB at a tertiary care centre in South India. Diagnosis was based on a combination of clinical features, radiological findings, microbiological evidence (CBNAAT/GeneXpert, histopathology), and therapeutic response to Anti-Tubercular Therapy (ATT). The spectrum included Central Nervous System (CNS) tuberculoma presenting with seizures, calvarial TB with epidural extension, endobronchial TB mimicking acute severe asthma, tuberculous pleural effusion, pulmonary TB associated with Severe Acute Malnutrition (SAM), Pott's disease with paravertebral abscess, and disseminated TB with hepatic abscesses in infancy. Microbiological confirmation was obtained in selected cases, while others required clinicoradiological correlation. All children showed clinical improvement following initiation of ATT, supported by nutritional rehabilitation, corticosteroids, or surgical intervention when indicated. This series highlights the broad clinical spectrum of paediatric TB and underscores the importance of high clinical suspicion and early imaging to prevent diagnostic delays and long-term sequelae.

Keywords: Central nervous system tuberculosis, Disseminated tuberculosis, Endobronchial tuberculosis, Extrapulmonary tuberculosis, Severe acute malnutrition

INTRODUCTION

Tuberculosis (TB) remains a major public health concern in children, particularly in high-burden countries such as India, which accounts for a substantial proportion of global paediatric TB cases [1,2]. Young children are at increased risk of severe and disseminated disease due to immature immunity, leading to manifestations such as central nervous system TB, miliary disease, and extensive extrapulmonary involvement [3,4]. These forms contribute significantly to morbidity and long-term sequelae if not recognised early.

Diagnosis in children is challenging because the disease is typically paucibacillary and obtaining adequate samples may be difficult, resulting in low microbiological confirmation rates [5]. Clinical features are often non-specific or mimic other conditions such as pneumonia, asthma, neurocysticercosis, or malignancy. Radiological imaging therefore plays, an essential role when classical pulmonary findings are absent or microbiology is negative [6]. Malnutrition, which commonly co-exists with TB in India, further worsens disease severity and complicates clinical interpretation [7].

Timely diagnosis and prompt initiation of weight-band based ATT in accordance with National Tuberculosis Elimination Programme (NTEP) guidelines are essential to prevent long-term complications, including neurological deficits, spinal deformity, chronic lung disease, and growth failure in children with TB [8].

This case series describes seven children with uncommon or diagnostically challenging presentations of TB encountered at a tertiary care centre in South India. The objective is to highlight the diverse clinical manifestations, emphasise the value of clinicoradiological correlation in settings with low bacteriological yield, and reinforce the need for heightened suspicion to reduce diagnostic delays and long-term sequelae in paediatric TB.

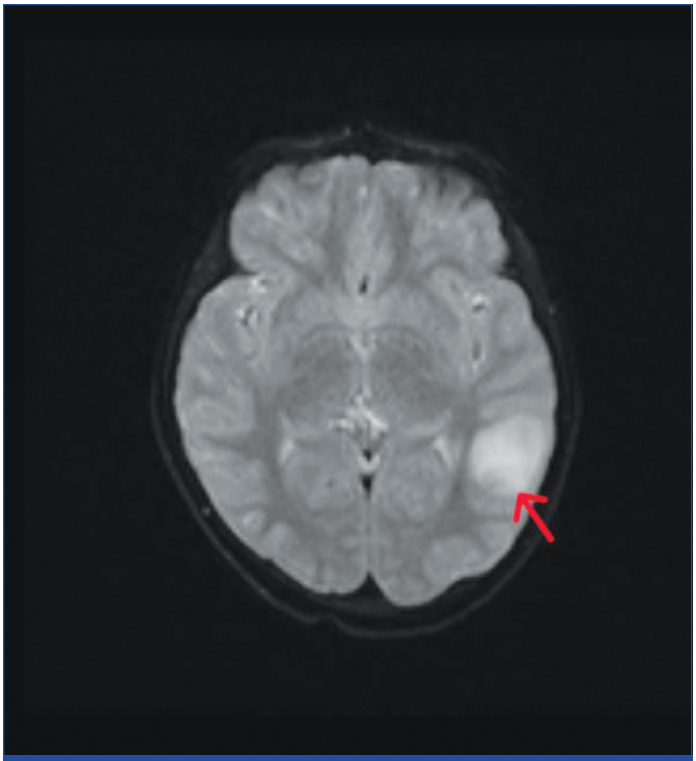
CASE SERIES

Case 1: Caseating Tuberculoma of the Left Temporal Lobe Presenting with Focal Seizures

A seven-year-old boy presented with headache and multiple episodes of vomiting for two days. On the day of admission, he developed an episode of behavioural arrest characterised by blank staring, lip-smacking, and unresponsiveness to verbal commands lasting 20-30 minutes, followed by transient drowsiness. There was no history of fever, trauma, prior seizures, visual disturbances, chronic cough, weight loss, or contact with a TB patient. There was no family history of TB, seizure disorder, or other significant neurological illness. Neurological examination was unremarkable, with no focal deficits.

Differential diagnoses included neurocysticercosis, pyogenic abscess, intracranial neoplasm, and tuberculoma. Cerebrospinal fluid examination revealed normal biochemical parameters and was negative for acid-fast bacilli and CBNAAT. Serology for neurocysticercosis was also negative. Magnetic Resonance Imaging (MRI) of the brain demonstrated a well-defined ring-enhancing lesion in the left temporal lobe with central caseation and surrounding vasogenic oedema, suggestive of a caseating tuberculoma [Table/Fig-1]. In view of the characteristic MRI findings, negative serology for neurocysticercosis, absence of clinical features suggestive of pyogenic infection or malignancy, and the high endemicity of TB in the region, a presumptive diagnosis of CNS tuberculoma was made.

The child was initiated on weight-band appropriate ATT under the NTEP, consisting of isoniazid (H), rifampicin (R), ethambutol (E), and pyrazinamide (Z) in the intensive phase for two months, followed by isoniazid, rifampicin, and ethambutol in the continuation phase for ten months (2HRZE/10HRE). Adjunctive treatment included



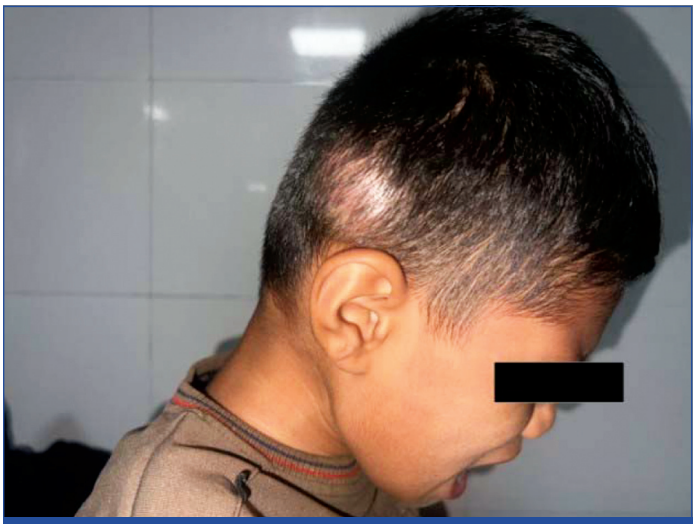
[Table/Fig-1]: MRI brain of Case 1 showing a solitary ring-enhancing lesion in the left temporal lobe with central caseation and surrounding oedema suggestive of tuberculoma (Red arrow).

dexamethasone (0.6 mg/kg/day) tapered over four weeks and levetiracetam (15 mg/kg/day) for six months. The child remained seizure-free during follow-up.

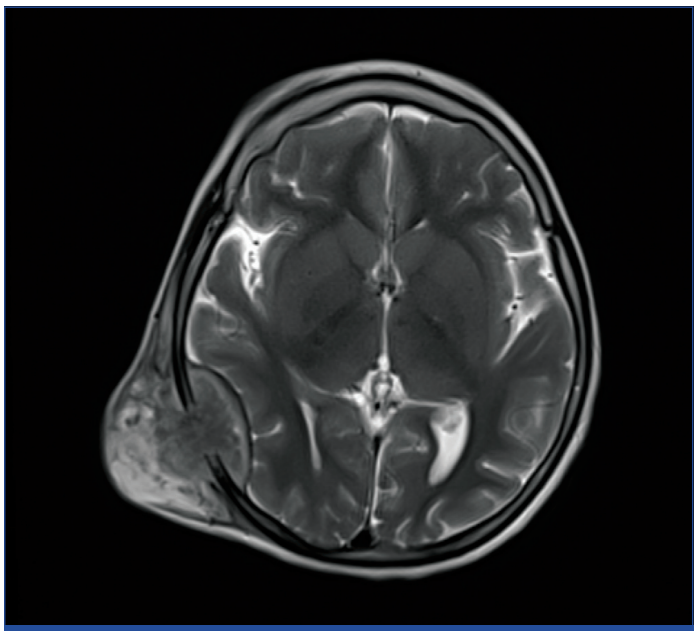
Case 2: Calvarial Tuberculosis with Epidural and Subgaleal Abscess in a Child with Global Developmental Delay and Hypotonic Cerebral Palsy

A seven-year-old girl with global developmental delay and a known case of hypotonic cerebral palsy with seizure disorder presented with swelling over the right-side of the head for 20 days, associated with intermittent low grade fever for one week [Table/Fig-2]. She had a history of delayed attainment of developmental milestones since four months of age and was receiving levetiracetam (20 mg/kg/dose twice daily) since four months of age. There was no history of trauma or TB contact. On examination, the swelling was soft, fluctuant, and measured 5×4 cm. Her neurological status was unchanged from baseline.

MRI of the brain revealed a mass lesion centered in the right temporal bone with extracalvarial and extradural extension. The extracalvarial component measured 4.8×5×2.7 cm, while the extradural component measured 3.5×4.1×1.8 cm. A 2.2-cm calvarial defect was noted, with peripheral contrast enhancement and a central non-enhancing component, suggestive of an infective pathology [Table/Fig-3]. Fine-needle aspiration cytology demonstrated necrotising granulomatous inflammation, and CBNAAT detected *Mycobacterium tuberculosis* with rifampicin sensitivity , confirming the diagnosis of tuberculous osteomyelitis of the skull with subgaleal and epidural abscess formation.



[Table/Fig-2]: Clinical photograph of Case 2 showing swelling over the right temporoparietal region of the scalp.



[Table/Fig-3]: MRI brain of Case 2 demonstrating a lesion involving the calvarium with extracranial and epidural components, suggestive of tuberculous osteomyelitis with abscess formation.

The child underwent surgical debridement and abscess evacuation, followed by weight-band appropriate ATT for a total duration of 12 months (i.e., 2HRZE/10HRE). The postoperative period was uneventful, and the wound healed well without discharge. The child completed the full course of therapy and, on follow-up over 12 months, had no recurrence of swelling or fever and no new neurological symptoms.

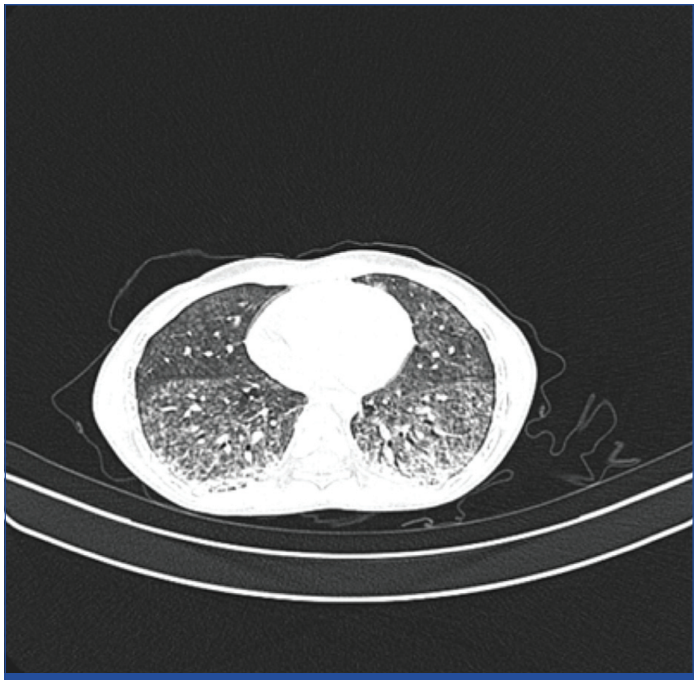
Case 3: Endobronchial Tuberculosis Presenting as Acute Severe Wheeze

A 12-year-old boy presented with acute onset breathlessness and dry cough for three days. He had been treated at a peripheral centre as a case of acute severe asthma with nebulised bronchodilators and systemic corticosteroids, but his symptoms did not improve. There was no prior history of asthma, allergy, or recurrent wheezing.

On admission, the child was tachypnoeic (respiratory rate of 52/min) and hypoxic, with an oxygen saturation of 84% on room air. Other vital parameters were stable. Auscultation revealed widespread wheeze with reduced air entry on the right-side. Chest radiograph showed hyperinflated lung fields. High-Resolution Computed Tomography (HRCT) of the thorax revealed multiple centrilobular nodules with a tree-in-bud pattern and patchy areas of consolidation in the right lung [Table/Fig-4].

Induced sputum smear microscopy and CBNAAT, obtained following nebulisation with 3% hypertonic saline, were negative for *Mycobacterium tuberculosis*, while the Mantoux test showed significant induration. Based on the characteristic HRCT findings, positive Mantoux test, and poor response to bronchodilator therapy, a diagnosis of endobronchial TB was considered.

The child was initiated on weight-band appropriate ATT under the NTEP, consisting of isoniazid (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E) in the intensive phase, followed by isoniazid, rifampicin, and ethambutol in the continuation phase (i.e., 2HRZE/4HRE). Oral



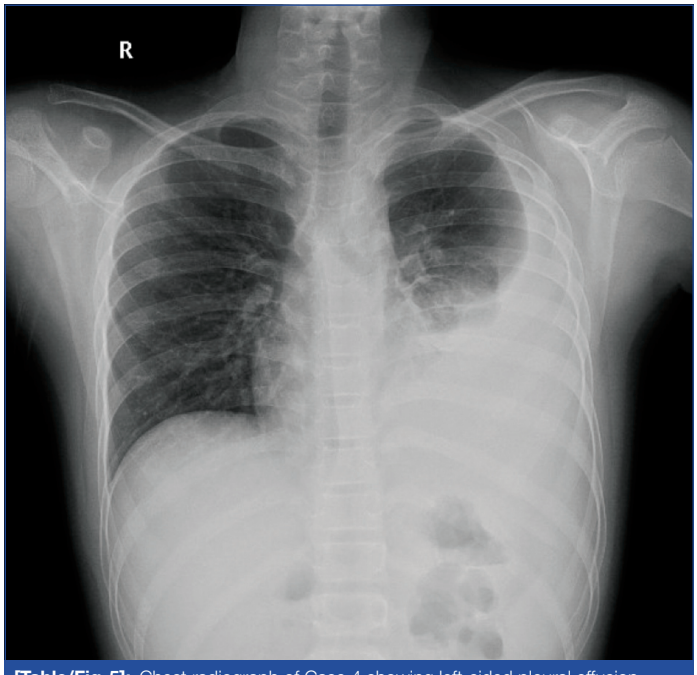
[Table/Fig-4]: HRCT thorax of Case 3 showing centrilobular nodules with a tree-in-bud pattern and patchy consolidation, suggestive of endobronchial spread of infection.

prednisolone (2 mg/kg/day) was administered and tapered over four weeks to reduce endobronchial inflammation and airway obstruction.

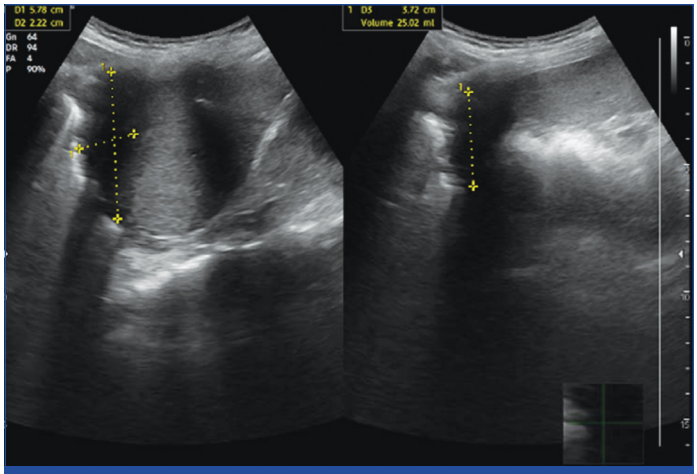
The child showed gradual clinical improvement, with resolution of respiratory distress and successful weaning off oxygen. He remained afebrile and haemodynamically stable. At follow-up, the child was tolerating ATT well, with no recurrence of breathing difficulty, and was advised regular growth monitoring and pulmonary follow-up.

Case 4: Tuberculous Pleural Effusion with Loculations in an Adolescent

A 13-year-old boy presented with low-grade fever, dry cough, weight loss, and left-sided pleuritic chest pain for six weeks. There was a history of household contact with pulmonary TB. Clinical examination revealed decreased breath sounds and reduced chest expansion over the left lower hemithorax. Chest radiograph demonstrated a left-sided pleural effusion [Table/Fig-5], while ultrasonography showed pleural effusion with underlying lung collapse/consolidation and loculations [Table/Fig-6].



[Table/Fig-5]: Chest radiograph of Case 4 showing left-sided pleural effusion.



[Table/Fig-6]: USG of Case 4 showing pleural effusion with underlying lung collapse/consolidation and loculations.

Diagnostic thoracentesis yielded straw-coloured fluid. Pleural fluid analysis revealed an exudative effusion with protein 6.1 g/dL, Lactate Dehydrogenase (LDH) 320 IU/L, Adenosine Deaminase (ADA) 45.63 IU/L, and total cell count of 1750 cells/mm^3 with 98% lymphocytes. Induced sputum CBNAAT, pleural fluid CBNAAT, pleural fluid culture, and blood culture were negative for *Mycobacterium tuberculosis* and other pathogens. In view of the characteristic clinical presentation, household TB contact, lymphocyte-predominant exudative pleural effusion with elevated ADA, and exclusion of alternative diagnoses, a diagnosis of tuberculous pleural effusion was made.

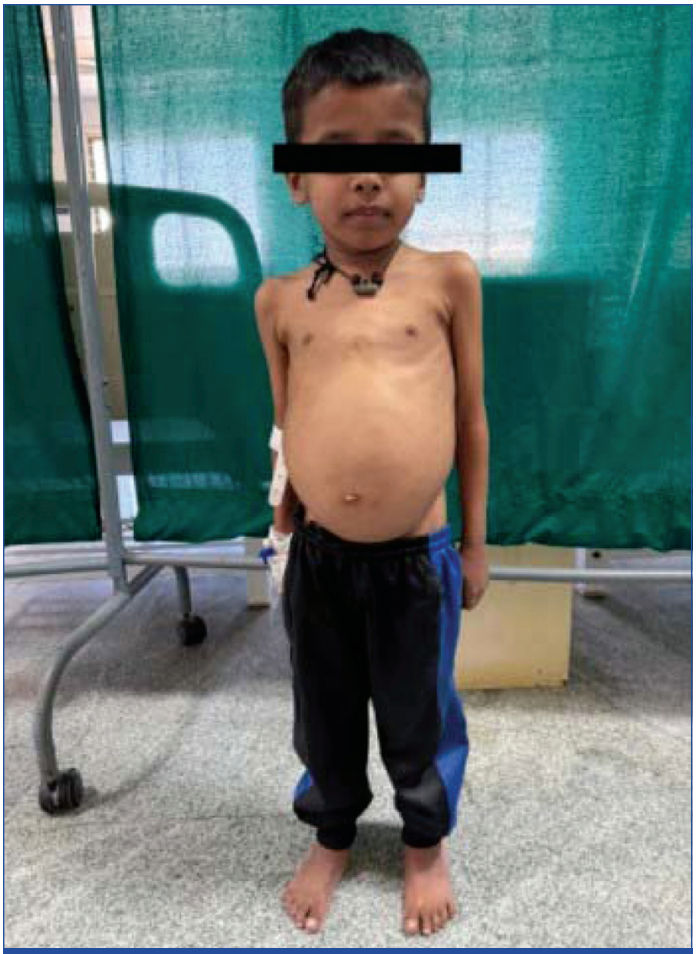
Due to loculation and respiratory compromise, an intercostal drain was inserted. The child was initiated on weight-band appropriate ATT (i.e., 2HRZE/4HRE). He showed clinical improvement with resolution of respiratory distress, improved appetite, and weight gain, and was discharged in stable condition for continuation of therapy under NTEP follow-up.

Case 5: Pulmonary Tuberculosis in a Child with Severe Acute Malnutrition (SAM) with Superadded Bacterial Pneumonia

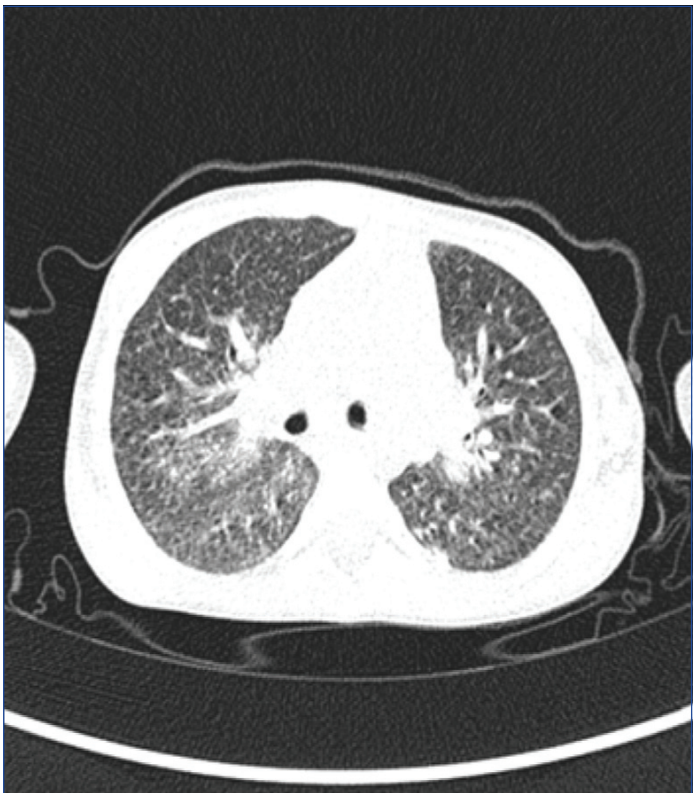
A four-year-old boy presented with progressive weight loss, easy fatigability, and evening rise of fever for one and a half months, along with productive cough and recent abdominal discomfort. Examination revealed SAM, frontal bossing, tachypnoea (respiratory rate of 50/min) with retractions, hepatosplenomegaly, and bilateral pedal oedema [Table/Fig-7]. Chest auscultation revealed diffuse crepitations. Chest radiograph showed bilateral infiltrates, and HRCT demonstrated multilobar consolidation, centrilobular nodules, and ground-glass opacities in the right upper lobe, suggestive of pulmonary TB with superadded bacterial pneumonia [Table/Fig-8].

TruNAT for *Mycobacterium tuberculosis* was negative, and microbiological confirmation could not be obtained. However, in view of the chronic constitutional symptoms, SAM, persistent respiratory symptoms, and characteristic radiological findings, a clinicoradiological diagnosis of pulmonary TB was made.

The child was started on weight-band appropriate ATT for a duration of six months (i.e., 2HRZE/4HRE), along with intravenous antibiotics for two weeks, bronchodilator nebulisation, oxygen supplementation, and nutritional rehabilitation with high-calorie feeds and supplements. Intravenous dexamethasone (0.6 mg/kg/day) was administered because of significant respiratory distress at presentation and gradually tapered over two weeks. Bronchodilator nebulisations were gradually spaced out as the child's respiratory status improved. During the two-week hospital stay, he showed progressive resolution of respiratory distress, improved oral intake, and weight gain. The child was discharged in a stable condition with advice to continue ATT and follow-up for nutritional monitoring.



[Table/Fig-7]: Clinical photograph of Case 5 showing severe wasting consistent with Severe Acute Malnutrition (SAM).



[Table/Fig-8]: HRCT thorax of Case 5 showing multilobar consolidation with air bronchograms and centrilobular nodules.

Case 6: Spinal Tuberculosis (Pott's Disease) with Paravertebral and Psoas Abscess

A six-year-old girl with a history of contact with a treated TB case presented with chronic low back pain for one year, progressive difficulty in walking, and a lower back swelling for six months. She also had intermittent fever, night sweats, and weight loss. Examination revealed a gibbus deformity over the lumbar region, paraspinal swelling, scoliosis, and restricted truncal movements, with no focal neurological deficits.

The MRI of the spine demonstrated spondylodiscitis involving the L3-L5 vertebrae with minimal vertebral collapse, large paravertebral collections, bilateral psoas abscesses, and anterior epidural extension causing displacement of the thecal sac. Laboratory investigations revealed elevated inflammatory markers (Erythrocyte Sedimentation Rate (ESR): 58-100 mm/hr; C-reactive Protein (CRP): 2.69-15.47 mg/L), microcytic hypochromic anaemia with thrombocytosis, and a strongly positive Mantoux test (44 mm). Chest radiograph was normal, while gastric lavage for acid-fast bacilli and CBNAAT were negative.

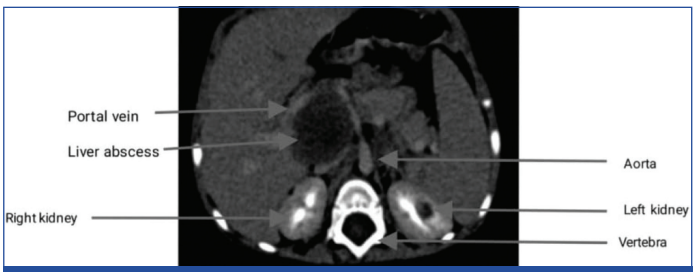
Differential diagnoses included pyogenic spondylodiscitis and spinal neoplasms. However, the chronic presentation, history of TB contact, strongly positive Mantoux test, and characteristic MRI findings of contiguous vertebral involvement with paravertebral and bilateral psoas abscesses favoured a diagnosis of Pott's disease.

The child was initiated on weight-band appropriate ATT (i.e., 2HRZE/10HRE), along with spinal immobilisation and nutritional support. Surgical intervention was deferred in view of the absence of neurological compromise.

The child completed the prescribed course of ATT with significant improvement in pain, mobility, and systemic symptoms. However, persistent radiological lesions were noted on follow-up imaging, and CT-guided biopsy has been planned for further evaluation. The child remains under follow-up with the orthopaedics and radiology teams.

Case 7: Disseminated Tuberculosis with Hepatic Abscesses in an Infant

A nine-month-old male infant presented with prolonged fever, poor feeding, and failure to thrive. Examination revealed hepatomegaly and severe malnutrition. Ultrasonography showed multiple hypoechoic lesions in the liver suggestive of abscesses. Contrast-enhanced Computed Tomography (CT) confirmed multiple hepatic abscesses with necrotic abdominal lymph nodes [Table/Fig-9].



[Table/Fig-9]: Contrast-enhanced CT abdomen of Case 7 showing multiple hypodense lesions in the liver suggestive of hepatic abscesses.

Differential diagnoses included pyogenic liver abscess, fungal infection, and malignancy. Aspiration of hepatic lesions was performed, and CBNAAT detected *Mycobacterium tuberculosis*. Blood culture grew methicillin-sensitive *Staphylococcus aureus*, suggesting secondary bacteraemia.

The diagnosis of disseminated TB with hepatic involvement was established. ATT was initiated along with intravenous antibiotics and aggressive nutritional rehabilitation. The infant showed gradual defervescence and improvement in feeding and activity levels.

DISCUSSION

Paediatric TB continues to pose significant diagnostic and therapeutic challenges in India due to its varied clinical manifestations and low microbiological yield [7]. This case series highlights rare and diagnostically challenging manifestations of paediatric TB, including endobronchial TB mimicking acute severe asthma, calvarial TB with

extracranial-intracranial extension, and disseminated TB presenting as hepatic abscesses in infancy. Several cases in this series were diagnosed based on composite clinical, epidemiological, and radiological criteria rather than bacteriological confirmation, reflecting real-world challenges in paediatric TB diagnosis. These uncommon presentations underscore the need for heightened clinical suspicion in endemic settings [Table/Fig-10].

Central nervous system TB remains a major contributor to morbidity in children. Tuberculomas frequently present with seizures and may mimic neurocysticercosis, particularly in endemic regions. MRI plays a crucial role in differentiating tuberculomas from neurocysticercosis by demonstrating characteristic features such as central caseation, perilesional oedema, and associated meningeal involvement. Early initiation of ATT along with corticosteroids has been shown to improve neurological outcomes and reduce long-term sequelae [8].

Calvarial TB is an exceptionally rare manifestation of skeletal TB, accounting for less than 1% of osteoarticular TB cases. The disease usually presents as a slowly progressive scalp swelling and may be associated with osteolytic lesions, epidural collections, or intracranial extension. Sant'Anna CC et al., reported that diagnosis is often delayed because the condition mimics pyogenic osteomyelitis, neoplasms, or Langerhans cell histiocytosis [9]. Similar observations were reported by Santra A et al., Dias RB et al., and Swaroop S et al., who emphasised the importance of MRI in defining the extent of disease and guiding surgical management [10-12]. Our case reinforces these findings and demonstrates the value of combining imaging, histopathology, and CBNAAT for definitive diagnosis. Surgical drainage combined with prolonged ATT resulted in complete recovery.

Endobronchial TB is increasingly recognised and may mimic asthma or pneumonia, leading to misdiagnosis and delayed treatment [13]. HRCT findings such as tree-in-bud nodules are crucial diagnostic clues when sputum CBNAAT is negative [14]. Corticosteroids may be considered in selected cases of endobronchial TB to reduce bronchial inflammation, airway oedema, and the risk of bronchial stenosis [15]. This highlights the importance of advanced imaging in children with unexplained or refractory respiratory symptoms.

Pleural TB commonly affects older children and adolescents and typically presents as lymphocytic exudative pleural effusion. Elevated adenosine deaminase levels support the diagnosis in high-burden settings despite low microbiological yield [16]. Early drainage of significant effusions combined with ATT results in favourable outcomes.

The association between TB and SAM is well-established and represents a major public health challenge in low- and middle-income countries. Malnutrition impairs cell-mediated immunity and increases susceptibility to both primary infection and progression to severe disease, while active TB further exacerbates nutritional deficits through chronic inflammation and increased metabolic demands. Studies from India have consistently demonstrated higher rates of severe disease, disseminated infection, and mortality among malnourished children with TB. The child described in our series exemplifies this bidirectional relationship and underscores the importance of integrating nutritional rehabilitation into TB management programs.

Osteoarticular TB frequently presents with insidious and nonspecific symptoms, often resulting in delayed diagnosis and an increased risk of spinal deformity and neurological complications [17]. Spinal TB in children can often be managed conservatively with ATT in the absence of neurological deficits, as demonstrated in this series.

Infants and young children are particularly vulnerable to disseminated TB due to immature immune responses. Case reports by Sagar T et al., and subsequent paediatric studies have emphasised that hepatic involvement usually reflects haematogenous dissemination and is most frequently encountered in infants, immunocompromised children, or those without BCG vaccination [18]. Severe or atypical presentations should prompt evaluation for underlying immunodeficiency, as highlighted in the infant described in this series.

Microbiological confirmation was achieved in only three of the seven cases despite extensive evaluation. While molecular diagnostic techniques such as GeneXpert and TruNAT have improved diagnostic sensitivity, clinical and radiological correlation remains indispensable in paediatric TB because of the paucibacillary nature of the disease. The World Health Organisation (WHO) Consolidated Guidelines for Tuberculosis in Children and Adolescents similarly emphasise that treatment decisions should not be delayed while awaiting microbiological confirmation when clinical suspicion is high [19].

The present series is unique in demonstrating multiple rare manifestations of paediatric TB encountered within a single tertiary-care centre. Collectively, these cases reinforce the protean nature of childhood TB and emphasise that TB should remain an important

No.	Age/Sex	Type of Tuberculosis (TB)	Diagnostic Dilemma/ Why TB was considered	Microbiology Confirmation	Treatment	Outcome	Key learning point
1	7y7m/Male	CNS tuberculoma	MRI distinguishing tuberculoma from NCC; negative CSF studies	Negative	ATT + Steroids + AED	Seizure-free	MRI is superior to CT in differentiating tuberculoma from NCC in endemic settings.
2	7y5m/Female	Calvarial TB with intracranial extension	Progressive scalp swelling in a child with no acute infection; MRI revealed ↑abscess	Positive (CBNAAT)	Surgical excision + ATT	Complete recovery	Calvarial TB, though rare, should be considered in chronic scalp swellings with bony defect.
3	12y4m/Male	Endobronchial TB	Refractory "asthma"; no response to bronchodilators; HRCT pathognomonic	Negative	ATT + Steroids	Resolved	Tree-in-bud nodules on HRCT are diagnostic clues for EBTB in children with wheeze.
4	13y/Male	Pleural effusion	Contact history + lymphocytic exudate with high ADA; negative CBNAAT	Negative	ICD + ATT	Improved	Elevated ADA in pleural fluid remains a strong diagnostic tool in high-burden settings.
5	4y/Male	Pulmonary TB with SAM	Chronic symptoms in malnourished child; radiology suggestive; no response to antibiotics	Negative	ATT + Nutrition	Improved	TB should be suspected in SAM with refractory respiratory symptoms despite negative microbiology.
6	6y2m/Female	Pott's disease	Chronic back pain with vertebral destruction on MRI; positive Mantoux	Negative	ATT + Immobilisation	Improved	Spinal TB can be managed conservatively if no neurological deficits are present.
7	9m/Male	Disseminated TB with hepatic abscesses	Infants with fever, hepatomegaly, no BCG; hepatic lesions on USG/ CT	Positive (CBNAAT)	ATT + Antibiotics	Improved	Hepatic abscess in infants warrants evaluation for disseminated TB and possible immunodeficiency.

[Table/Fig-10]: Summary of cases, diagnostic challenges, and key learning points.

differential diagnosis in children presenting with unexplained seizures, chronic scalp swellings, refractory wheeze, persistent pleural effusion, vertebral destruction, severe malnutrition with chronic respiratory symptoms, or unusual visceral abscesses. Early recognition, timely imaging, multidisciplinary evaluation, and prompt initiation of ATT remain critical to reducing morbidity and preventing long-term sequelae.

Limitation(s)

Limitations of this series include the small sample size, single-centre design, and inability to obtain microbiological confirmation in all cases. Nevertheless, these cases reflect real-world challenges faced by clinicians practicing in TB-endemic regions and provide important educational insights into atypical manifestations of paediatric TB.

CONCLUSION(S)

Paediatric TB can present with a wide spectrum of atypical and misleading manifestations, particularly in endemic regions where limited microbiological yield complicates diagnosis. Early recognition based on clinical suspicion and radiological assessment, supported by targeted laboratory investigations, is essential to ensure timely initiation of ATT. Multidisciplinary evaluation and integration of nutritional and supportive care further improve outcomes. Awareness of such diverse presentations can help clinicians avoid diagnostic delays, reduce morbidity, and prevent long-term sequelae in affected children. In settings where microbiological confirmation is not feasible, clinicoradiological correlation remains crucial for establishing the diagnosis and guiding timely treatment.

Ethical considerations: This study was approved by the Institutional Ethics Committee of Vydehi Institute of Medical Sciences and Research Centre. Written informed consent was obtained from parents/guardians for publication of clinical details and images. Patient identity has been anonymised.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 11, 2026
- Manual Googling: Jun 25, 2026
- iThenticate Software: Jun 27, 2026 (1%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Mar 25, 2026**
Date of Peer Review: **May 29, 2026**
Date of Acceptance: **Jun 30, 2026**
Date of Publishing: **Sep 01, 2026**