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Role of Chest Imaging in Clinically Suspected Extrapulmonary Tuberculosis Without any Chest Symptoms

Sumit Kumar[1*], Aishwarya Naik[2], Vinita Rathi[3], Anupama Tandon[4]

[1,3,4]Department of Radiodiagnosis, UCMS and GTBH, Delhi, India
[2]Department of Radiodiagnosis, GB Pant Hospital, Delhi, India

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***Corresponding author**:
Dr Sumit Kumar
(Email: Skumar1@ucms.ac.in)

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ABSTRACT

Background: Establishing a definitive diagnosis of EPTB can be very difficult in resource limited developing countries. Objective: To assess whether chest imaging (chest radiograph and/or CT chest) can play a significant role in the diagnosis of suspected EPTB.

Methodology: Observational study was conducted in 120 patients of suspected EPTB who underwent radiography, sonography, or CT scan: or presented for review of any imaging studies done for EPTB. Chest Radiograph (CR) and CECT chest requested in these patients, who did not have pulmonary symptoms, were evaluated for tubercular infection.

Results: The commonest EPTB encountered among 120 patients was abdominal tuberculosis in 44/120 patients (36.66%). Chest Radiograph suggested pulmonary TB in 48 out of 112 patients (42.85%) with suspected EPTB and 24 out of 32 patients (75%) who underwent CECT chest. In 56 out of 120 patients (46.66%), pulmonary TB was observed on combined chest imaging (CR + CECT Chest). The commonest CR finding in patients with suspected EPTB was lymphadenopathy in 32 patients (66.66%). The commonest lung abnormalities on CECT chest were tree-in-bud opacities in 20 out of 32 patients (62.5%), and matted, necrotic mediastinal lymph nodes were also seen in 20 patients (62.5%).

Conclusion: Chest imaging can play a significant role in confirming diagnosis in 46% of suspected EPTB cases in whom available laboratory investigations are equivocal.

Keywords: Extrapulmonary Tuberculosis, Tuberculosis, Chest X Ray

INTRODUCTION

Extrapulmonary tuberculosis (EPTB) is commonly defined as Tuberculosis (TB) of such as pleura, lymph nodes, abdomen, Genito-urinary tract, bones, brain, etc. Multisystem involvement is very commonly seen.

Globally, one in five cases of TB present as EPTB in immunocompetent individuals; and extrapulmonary involvement can be seen in more than fifty percent of patients who suffer from acquired immunodeficiency syndrome (AIDS) and TB.

The problem in EPTB is the difficulty in establishing a definitive diagnosis since the clinical symptoms can mimic several other disease entities. Current diagnostics are inadequate to meet the clinical needs despite the huge burden of disease.[1] Pleural fluid cultures are seen positive only in 40% of *M. Tuberculosis* and smears are almost always negative for Acid-fast bacilli (AFB). Lymph

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node Fine needle aspiration cytology (FNAC) is not conclusive in 9.5% of patients with suspected TB. Sonography of the abdomen may be suggestive of TB but ascitic fluid analysis may not be confirmatory.[2] AFB is not so commonly seen on cerebrospinal fluid (CSF) sediment. The culture of CSF is diagnostic in up to 80% of cases but the results are late. The sensitivity of GeneXpert/ Cartridge Based Nucleic Acid Amplification test (CB NAAT) is 39.1% although specificity is 85.7%.[3] Molecular tests such as CBNAAT which takes very less time as compared to the liquid culture in the diagnosis of EPTB. However, its sensitivity varies according to various sites of EPTB. In addition to their variable diagnostic accuracy, the availability and cost of the diagnostic tests limits their role in diagnosing EPTB.

The definitive diagnosis of active pulmonary TB is quite challenging especially in patients who do not have microbiological evidence of *M. Tuberculosis* in sputum samples. However, imaging modalities like chest radiography (CR) and Computed Tomography (CT) scan which are non-invasive are readily available, can be done easily and their results are available immediately. The sensitivity of CR in detecting pulmonary involvement was 90%.[4] Therefore, the objective of this study is to explore the role of chest imaging in clinically suspected Extrapulmonary Tuberculosis without any chest symptoms.

MATERIALS AND METHODS

A prospective observational study was conducted from January 2024 to January 2025 in the 120 suspected EPTB patients who underwent radiography, sonography, or CT scan of any part of the body for suspected EPTB; or who presented for review of imaging studies for suspicion of EPTB. Children with EPTB below 2 years of age were excluded.

Written and informed consent was obtained after getting clearance from the Institutional Ethics Committee. A detailed clinical history of the patient, including the history of contact with tuberculosis and available laboratory investigations (biochemical, microbiological, and histopathological), was recorded. A contact survey was done in 100 patients. All patients of proven EPTB/ receiving anti-tubercular therapy (ATT) empirically were followed up clinico-radiologically till the completion of ATT or end of the study period.

Statistical Analysis: Descriptive type statistics were analysed, with data/observations being as mean ± Standard Deviation (SD). Positivity of CR and CT chest were expressed as percentages. The sensitivity of chest imaging in making a diagnosis of EPTB was calculated.

Ethics of approval statement: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

The study was approved by the Institutional Ethics Committee -Human Research (IEC-HR), University College of Medical Sciences.

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of University of Delhi with **IECHR/ 2024/PG/47/58-R1.**

RESULTS

A total of 120 patients were studied. Age of patients varied from 7-60years. Mean age of patient was 22.3years. Eighty-eight patients were male, and 32 patients were female. Male to female ratio was 1.9:1.

The common symptoms in suspected EPTB were fever n=80[66.7%], abdominal pain n=52 [43.3%], loss of appetite/weight loss n=44 [36.7%], backache n=12[10%], and right upper quadrant pain n=8 [6.7%]. Change in voice n=4 [3.33%] spine deformity n=4 [3.33%] increased frequency of micturition n=4 [3.33%] and eyelid swelling n=4 [3.33%] were also seen.

The types of EPTB observed among 120 patients were abdominal tuberculosis n=44 [36.66%]), tubercular meningitis n=16 [13.33%]), Pott's spine n=16 [13.33%]), pleural TB n=12 [10%]), genitourinary TB n=12 [10%]), lymph nodal TB n= 8 [6.66%]), laryngeal TB n=4 [3.33%]), orbital TB n=4 [3.33%] and osteomyelitis of rib n=4 [3.33%]. A total of 40 out of 120 patients were confirmed microbiologically or pathologically to have tubercular infection Summary of laboratory and clinical variables is given in **Table 1.**

The radiological investigations requested were: Contrast enhanced Computed Tomography /CECT abdomen (52), CECT chest + abdomen (8), CECT chest (20), CECT head + chest (4), CECT head (4), CECT neck (4), Non contrast Computed Tomography/NCCT spine (4), Ultrasound (USG) abdomen (4), Intravenous Urography (4), and Magnetic Resonance Imaging/MRI (16). Chest Radiograph (CR) was available in 112 patients, and CT chest was done in 32 out of 120 patients. 116 out of 120 patients responded to ATT in our study.

Chest imaging in suspected EPTB: Available Chest Radiograph suggested pulmonary TB in 48 out of 112 patients (42.85%) with suspected EPTB. Out of 32 patients of suspected EPTB who underwent CECT chest, 24 showed pulmonary TB (75%) 16 patients showed pulmonary TB on CR and CT, and 8 showed Pulmonary tuberculosis (PTB) on CT, but CR was not available. In 8 patients, combined chest imaging (i.e., both CR and CT features) was indeterminate for pulmonary TB (PTB).

Thus, in 56 out of 120 patients (46.66%) with suspected EPTB, PTB was identified on combined chest imaging, i.e., CR and/or CT scan. Out of 52 patients with suspected EPTB who underwent an abdominal CT scan, PTB was diagnosed incidentally on sections through the lung bases in 8 patients.

Table 1: Laboratory investigation variables in EPTB patients

Parameter	Positive /Abnormal (%)	Key Findings
Past History of TB	6.7 (8/120)	8 patients (4 with ATT allergy).
Family History/TB Contact	20 (24/120)	Close exposure in 24 cases.
Anemia	64.28 (77/120)	Hemoglobin <12 g/dL in 77 patients
Leukocytosis	35.71 (43/120)	Elevated TLC (>11,000/mm³)
Lymphocytosis	13.3 (16/120)	Linked to TB/HIV co-infections.
Mantoux Test Positive*	100 (12/12 tested)	Induration range: 13×15 mm to 39×35 mm
Sputum AFB Positive	3.3 (4/120)	Positive in suspected laryngeal TB case
Urine AFB Positive*	100 (12/12 tested)	All tested patients positive
HIV ELISA Positive*	100 (8/8 tested)	All CNS TB patients positive; CD4 not mentioned
CSF CBNAAT Positive*	75 (12/16 tested)	Confirmed CNS TB
Ascitic Fluid CBNAAT Negative*	0 (0/8 tested)	No TB detected in ascitic fluid
Pleural Pus CBNAAT Positive*	100 (4/4 tested)	Positive in pleural TB patients
FNAC Positive for TB*	50 (8/16 tested)	FNAC showed TB features in cervical and axillary nodes
Cervical LN TB on FNAC	3.33 (4/120)	Tubercular lymphadenitis
Axillary granulomatous FNAC	3.33 (4/120)	Granulomas suggestive of TB
Total Microbiological/Pathological Confirmation	33.33 (40/120)	Confirmed through AFB, CBNAAT, or histopathology

*Asterisk (*) represent subset calculation of selected patients and does not represent percentage in relation to total sample.

The contact survey was positive in 12 out of 100 patients. Sensitivity of combined chest imaging, i.e., CR and/or CECT chest in EPTB, was 46.66%. Specificity could not be calculated as there were no patients free from disease in our study.

CR: The CR findings in patients with suspected EPTB were lymphadenopathy in 32, fluffy/infiltrative opacities (24), mild pleural effusion (16), and nodular opacities (16). Infiltration was seen in the left middle zone and bilateral upper zones of the lungs. Lymphadenopathy was seen in the right paratracheal region in 16 patients and in the bilateral paratracheal regions in 4 patients. Nodular opacities were seen involving the upper zones. Cavities and miliary TB were seen in 4 patients each. Incidental findings in the dorsal spine suggesting tuberculosis were seen in CR of 8 patients with suspected EPTB. 32 patients showed a combination of findings on CR. The most common radiographic finding on CR, seen in combination with other radiographic features, was infiltrative lesions in 20 out of 32 patients (62.5%).

CECT chest: The most common lung abnormalities seen on CECT chest were tree-in-bud opacities seen in 20/32 (62.5%) patients, almost equally frequently in all lobes of both lungs; nodular opacities and cavities (5-6 mm in size) in 12 patients; fibrotic lesions (20) and mild pleural effusion (20); matted and necrotic mediastinal lymph nodes of size between 1.0 to 4.0 cm were seen in 20 patients (62.5%). Nodes were seen in the paratracheal region in 16 patients, prevascular in 16, aortopulmonary window in 8, subcarinal in 12; precarinal, azygo-esophageal recess, bilateral paratracheal regions, left hilar, and bilateral hilar in 4 patients each.

Tree-in-bud opacities were associated with fibrosis (12 patients), pleural effusion (8 patients), necrotic, conglomerated mediastinal lymphadenopathy (12 patients), cavities (5-6 mm) (4 patients), and nodular opacities (4 patients) in our study.

Combined chest imaging: In 12 out of 24 (50%) patients who underwent CR and CECT, no additional significant findings were seen on CT compared to CR for diagnosis. CT chest identified mediastinal nodes in 12 patients, which were not seen on CR.

24 out of 40 (60%) patients of proven EPTB (CNS TB- 8, spinal TB- 4, renal TB- 4, nodal TB- 4, and pleural TB- 4) could be diagnosed based on EPTB imaging findings; and chest imaging also suggested PTB in these patients CT in 16 and CR in 8 patients.

48 out of 120 patients were found to have disseminated tuberculosis, out of which 24 were diagnosed incidentally by imaging. Incidental liver and/or splenic granulomas were seen in 8 patients with CNS TB, and incidental vertebral lesions suggestive of tuberculosis were found in 8 patients with suspicious CNS TB. Imaging findings of few selected cases are summarized in **Table 2.**

DISCUSSION

The treatment of patients with suspected EPTB is delayed as presence of fewer *Mycobacterium* bacilli in EPTB samples often limits the identification of AFB by microscopy. Culture of *M. tuberculosis* and tissue sampling, which are the gold standard for establishing the diagnosis, can take up to 8–10 weeks, and the sensitivity is quite variable depending on the host and site.[1] Chest imaging (including CR and/or CT scan) can play a promising role in diagnosing PTB in these patients, thus initiating early anti-tubercular therapy.

Types of EPTB: The most frequent type of EPTB was abdominal TB (36.66%), in our study. Pleural TB was observed in 10% of cases and Lymph nodal TB in 6.6%. On the other hand in 492 cases with EPTB, Velingker et al found that the maximum number of cases belonged to the pleural cavity (39.43%).

Table 2: Imaging findings of few selected cases of proven EPTB cases

S. No.	Type of EPTB	EPTB imaging findings	Imaging Diagnosis of EPTB	Chest imaging	Diagnostic test	Final diagnosis
1	CNS TB	MRI brain- extensive enhancing basal exudates with numerous conglomerated ring-enhancing lesions. (Fig. 1) Gyriform intense enhancement in right fronto-parietal region with hydrocephalus.	CNS TB (Tubercular meningitis)	Chest radiograph suggested miliary TB (Fig. 1)	CSF CBNAAT for TB-positive	Disseminated TB
2	CNS TB	CECT brain- Multiple, well-defined, variable-sized, homogenous and ring-enhancing, nodular and conglomerated lesions diffusely scattered in cerebrum and cerebellum (with surrounding moderate edema) and in basal cistern	CNS TB (TB meningitis with tuberculomas)	Normal CR	CSF CBNAAT for TB-positive	CNS TB
3	CNS TB	No imaging done	Not applicable	CECT chest showed Tree in bud nodules scattered in both lung fields with multiple, conglomerated, necrotic mediastinal lymph nodes + multiple, hypodense granulomas in liver (Fig. 2) and spleen+ erosion of right lamina of T10 vertebra with paravertebral abscess	CSF CBNAAT for TB positive	Disseminated TB
4	Urinary Tract TB	Sonography KUB- Normal	Negative for urinary TB	Normal CR	Urine positive for AFB on microscopic examination	urinary tract TB
5	Urinary tract TB	Intravenous Urography- normal	Negative for urinary tract TB	Suspicion of TB on CR (Bulky left hilum, calcification in right hilum)	Urine positive for AFB on microscopic examination	urinary tract TB
6	Urinary tract TB	CECT abdomen- Irregularity of outline of both kidneys at mid and lower poles. Multiple, heterogeneously enhancing/necrotic, conglomerated nodes at left renal hilum level	renal TB	CR positive	Urine positive for AFB on microscopic examination	Disseminated TB
7	Pleural TB	CECT chest- Split pleura sign with Smooth thickening between left 7th and 8th posterior ribs; few hypodense granulomas in liver	Suspicion of Pleural TB	CECT Chest suggested PTB	Pus CBNAAT for TB-positive	Disseminated TB
8	Pott's spine	MRI- peri-discal erosion at T11-T12 level with bilateral pre-paravertebral abscess fromT8-L1 level. Large right psoas abscess (L1-L4 vertebral level).	Spinal TB	Normal CR	Pus CBNAAT for TB-positive from paraspinal abscess Cervical lymph node FNAC- Tubercular lymphadenitis	Disseminated TB
9	Lymph nodal TB	Retro areolar hypodense area with peripheral rim enhancement in right breast and bilateral axillary conglomerated lymphadenopathy (L>>R), few showing calcification	Lymph nodal TB with? right breast abscess	CECT chest suggested PTB	FNAC of left axillary Lymph node- granulomas suggestive of TB	Disseminated TB
10	Laryngeal TB	Irregularity with heterogenous enhancement of laryngeal surface of epiglottis, aryepiglottic folds, false and true vocal cords.	Suspicion of laryngeal TB in a patient with complaints of hoarseness of voice	CR suggested PTB Contact survey positive	Sputum microscopic examination positive for AFB	Disseminated TB

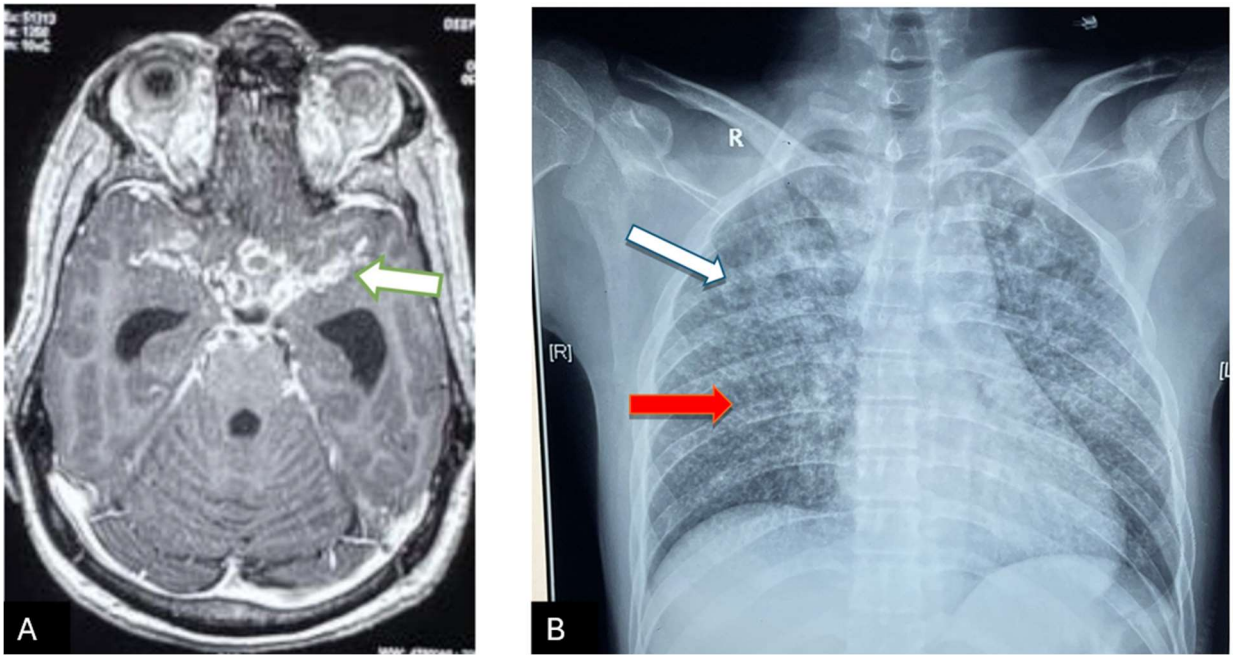

Figure 1: Chest radiograph in TB meningitis (A): Contrast Enhanced-MRI Brain (T1W axial section) showing extensive enhancing exudates with numerous conglomerated ring-enhancing lesions (white arrow) within basal subarachnoid cisterns and bilateral sylvian fissures with dilatation of temporal horns of lateral ventricles, suggestive of hydrocephalus. CSF CBNAAT was positive for TB. **(B):** Chest radiograph-supine (AP view) showed infiltrative lesions (white arrow) in right upper zone with miliary mottling (red arrow) in rest of the lung fields, suggestive of Pulmonary TB.

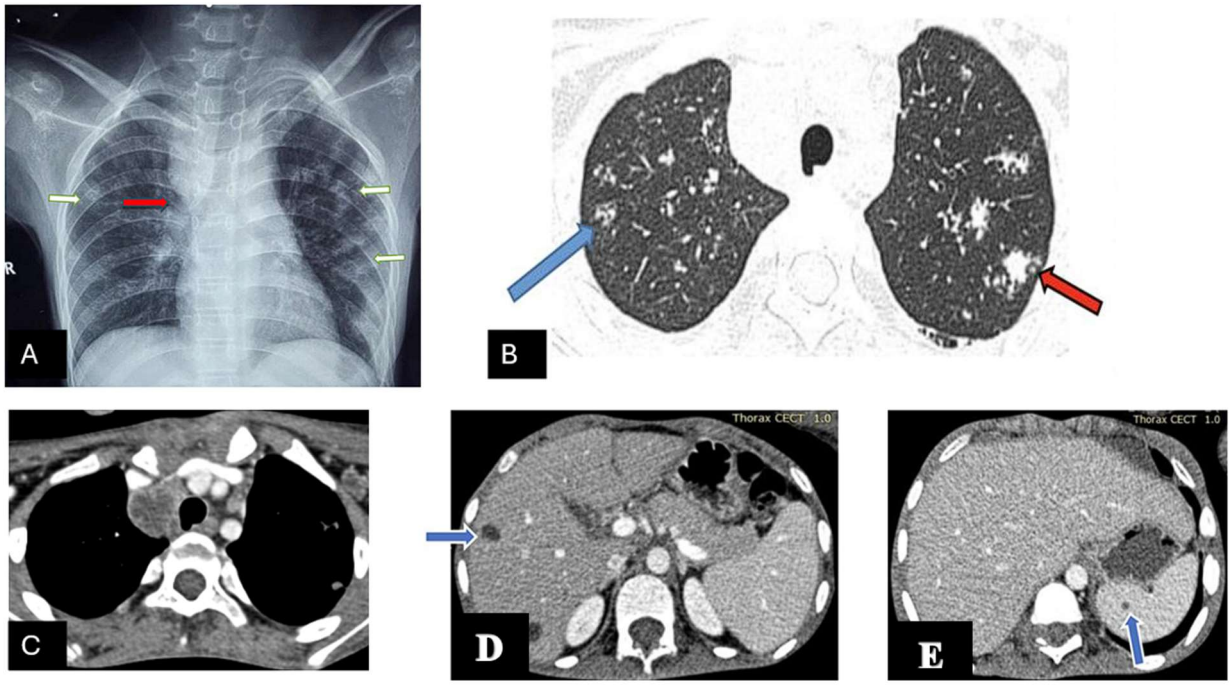

Fig 2: Chest Imaging (CR and CT scan) in CNS TB -In a patient of TB meningitis (CSF CB NAAT was positive for TB) Chest radiograph (A) shows infiltrative lesions in right and left upper zone; and mid zone (white arrows) with widened right paratracheal stripe (red arrow), suggestive of lymphadenopathy. The findings were confirmed on CECT chest requested, showing (B) tree-in-bud nodules in right (blue arrow) and confluent tree in bud nodules in left (red arrow) upper lobe.; with (C) matted, necrotic right paratracheal nodes (blue arrow). Incidental hypodense sub-centimeter granulomas seen in (D) liver and (E) spleen (blue arrows). So, the final diagnosis was Disseminated TB.

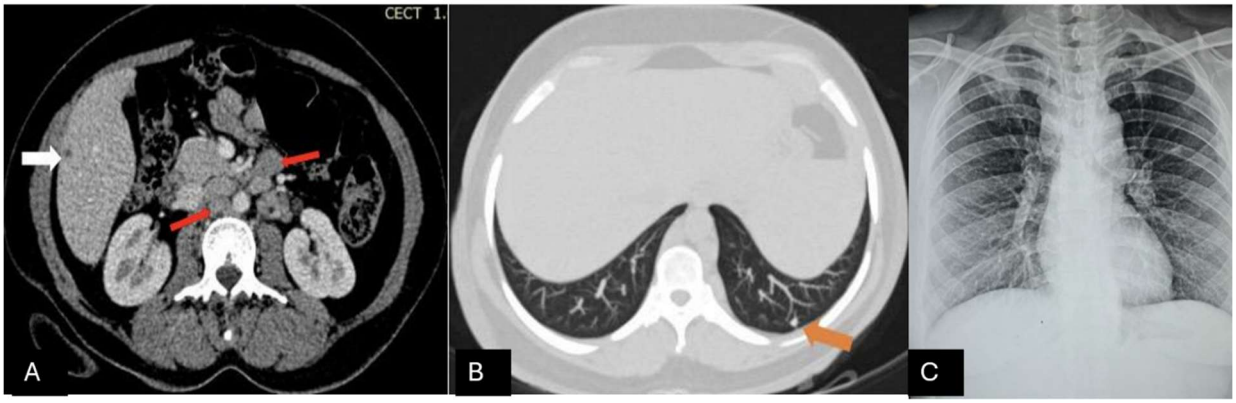

Figure 3: Chest radiograph in abdominal TB (EPTB) (A): Abdominal CECT (axial section) shows multiple enlarged, conglomerated lymph nodes in mesentery and retroperitoneum (red arrows). A hypodense granuloma (white arrow) is also seen in liver. (B) Lung window (Maximum Intensity Projection) through the upper abdomen shows few centrilobular nodules (orange arrow). (C): Chest radiograph PA view shows right paratracheal stripe widening (blue arrow) suggestive of lymphadenopathy. Laboratory investigations for TB were equivocal. ATT was started based on clinico-radiological diagnosis of Disseminated TB; and the patient had no complaints after 6 months.

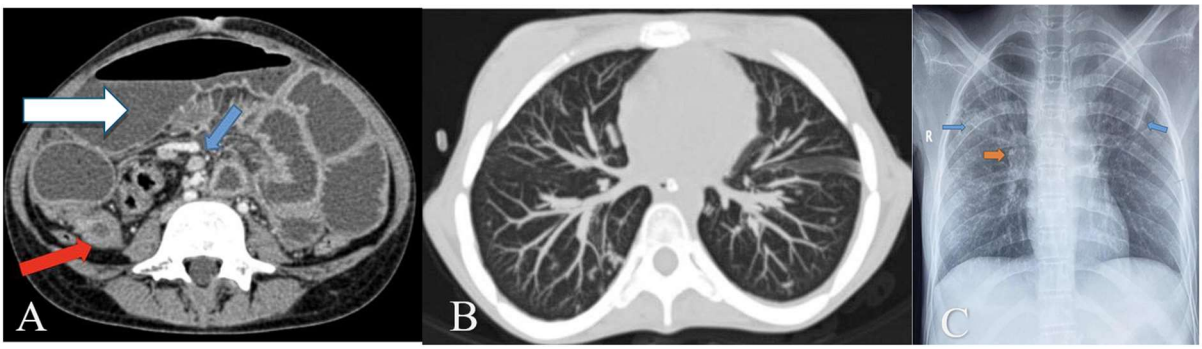

Figure 4: Chest radiograph in abdominal TB (A): Abdominal CECT (axial section) showing circumferential, symmetrical, enhancing wall thickening in ileo-cecal junction (red arrow) causing dilatation of proximal ileal loops showing air-fluid level (white arrow) suggestive of small intestinal obstruction. Mesenteric node with central hypodensity and peripheral enhancement also seen (blue arrow). (B) Lung window (axial section) MIP (Maximum Intensity Projection) through the upper abdomen shows tree in bud nodules in right lower lobe (yellow arrow). (C) Chest PA radiograph showing fibro-infiltrative opacities (blue arrow) in right and left upper zones; and right hilar node (orange arrow), suggestive of pulmonary TB. Laboratory investigations were non-confirmatory, but the patient recovered on empirical treatment for Disseminated TB.

Lymph node and lymphatic TB were found in 27.6%, making it the second most common site.[5] Gupta et al. reported lymph nodes (46.43%) were the most common EPTB site, followed by pleural effusion (40.71%).[6]

Chest radiograph suggested pulmonary TB in 48 out of 112 patients (42.85%) with suspected EPTB. However, Gupta et al, detected parenchymal lesions in 82.85% of 140 EPTB patients on chest X-ray.[6] This marked difference in detection of PTB could be due to the difference in spectrum of types of EPTB in the two studies. Our study had a higher number of abdominal TB cases (36.66%) compared to a high percentage of lymph nodal TB (46.43%) and pleural effusion (40.71%) cases in the study by Gupta et al.

Combined imaging (CR and/or CT Chest) suggested pulmonary TB in 56 out of 120 (46.66%) suspected EPTB patients: 48 PTB on CR (including 16 showing PTB on both CT and CR) + 8 PTB on only CT Chest in our study. CT detected an additional 13 cases of EPTB over X-ray in the study by Gupta et al. with sample size of 560 EPTB patients.[6] In our study of 120 suspected EPTB patients, CT chest had an additional yield of 8 over CR. Additionallyamong 52 patients with suspected EPTB who underwent CECT abdomen, PTB was incidentally detected in 8 patients (15.3%) in the visualized portion of the chest **(Fig 3.).** Therefore, we advocate Chest radiograph in all patients with suspected EPTB; and CECT chest should be done if CR is negative for PTB, but clinical suspicion is high.

Chest Radiograph (CR) Findings in Suspected Extrapulmonary Tuberculosis (EPTB): In our study, among 44 patients with abdominal TB, CR was diagnostic of pulmonary TB in 24 (54.54%) patients. **(Fig. 3 & 4).** Four out of 16 (25%) patients with TB meningitis showed miliary TB/pulmonary TB on CR. (CSF CBNAAT for TB was

also positive in these patients (**Fig.2);** and in another 4 patients CECT suggested PTB.

All 4 patients with suspicion of laryngeal TB in our study CR suggested PTB and PTB were also seen on contact surveys in 2 of them. In our study, 4 out of 12 patients (33.33%) with microbiologically proven urinary tract TB showed infiltrations in the upper zones on CR, suggestive of PTB.

Forty-eight patients in our study who were suspected to have EPTB and whose CR suggested PTB, the commonest finding was mediastinal lymphadenopathy in 32 (66.6%) patients abdominal TB (08), Pott's spine (08), CNS TB (04), nodal TB (04), and urinary tract TB (08). Mediastinal lymphadenopathy was most frequent in the right paratracheal region (16 patients). Bilateral paratracheal nodes were observed in 4 patients, where suspicion of lymphoma was also considered. Unilateral hilar nodes were seen in 12 patients. Lymphadenopathy in PTB typically involves the right paratracheal and hilar lymph nodes in adults.[7]

The next most common finding on CR was dense or fluffy/infiltrative opacities in 24/48 (50%) patients, observed in bilateral upper zones and left mid-zone of the lung. Cavities and lobar consolidation/collapse were found in 8 (16.66%) patients, in the left upper zone. In an Ethiopian study on 481 EPTB patients, consolidation was found in 7.2% of cases.[8]

Mild pleural effusion was seen in 16 out of 48 (33.33%) patients showing PTB on CR, of which 8 patients (50%) had pleural TB. Arega et al. (2020) found that pleural effusion was present in 42.8% of pleural TB patients on CR.[8] In our study, active pulmonary TB was detected by radiography in 4 out of 12 (33.33%) patients and by tomography in 4 out of 8 (50%) patients with pleural TB. Thus, CT chest is more sensitive for detecting PTB in suspected pleural EPTB cases than CR.

A combination of various radiographic features of TB was found in 32 out of 48 (66.66%) patients in our study. 16 patients had a solitary radiographic feature left pleural effusion (08), ill-defined radiopacities in right upper zone, and right paratracheal stripe widening (08). Fluffy/infiltrative opacities were the most common radiographic finding on CR, seen in combination with other radiographic features, in 20 out of 32 patients (62.5%). Radiographically, infiltration combined with right paratracheal lymphadenopathy was detected in 8 out of 32 (25%) patients. In a study by El Hazmi et al. on EPTB patients, the most common combination of CR findings was pleural effusion and intrathoracic lymphadenopathy in 22% of cases.[9]

Contact survey was positive in only 12/100 (12%) patients with EPTB in our study, 4 patients with abdominal TB, 4 with CNS TB, and 4 with Pott's spine. 8 out of these 12 patients (66.66%) also had CR showing PTB, and the patients with CNS TB showed pulmonary TB on chest CT. All these 12 patients received ATT empirically.

Spectrum of Chest CT Findings in Suspected Extra-Pulmonary Tuberculosis (EPTB): In our study, among 32 patients with suspected EPTB who underwent CECT chest, areas of consolidation were noted. These findings are consistent with those reported by Chao-Jung Wei et al., who observed multiple consolidations with ill-defined alveolar infiltrates in 112 out of 160 (70%) EPTB cases.[10] Additionally, CT revealed cavitary lesions measuring 5–6 mm in diameter in 12 patients (37.5%).

Matted and necrotic mediastinal lymph nodes between 1.0 to 4.0 cm (maximum dimension) were also seen in 20 patients (62.5%) of suspected EPTB in our study. Tubercular nodes are >2 cm and have hypoattenuation centers on contrast CT, representing necrosis,[11] as seen in our study. The right paratracheal, hilar, aortopulmonary and subcarinal lymph node groups are commonly involved in EPTB,[11] as observed in our study.

Mild pleural effusion was observed in 20 out of 32 (62.5%) patients on CT scan. Wei et al. observed pleural effusion in 80/160 (50%) patients, among whom 36 (19%) had TB empyema, which was diagnosed by pleural biopsy and TB culture.[10]

Disseminated TB: CECT chest revealed additional findings compared to CR, leading to a diagnosis of disseminated TB.

Incidental sub-centimeteric, hypodense, rounded liver and splenic granulomas were seen in 8 patients with CNS TB. Hepatosplenic TB may present as miliary or macronodular involvement. The lesions are hypoattenuating on CT and may show peripheral post-contrast enhancement.[1]

Incidental vertebral lesions suggestive of TB were seen in 8 patients with suspected CNS TB as irregular sclerotic-lytic lesions in the thoracic vertebral bodies with or without decrease in disc space and adjacent paravertebral abscesses. We found disseminated TB on combined (CR/CT) imaging in 24/120 (20%) patients.

LIMITATIONS & STRENGTHS

We acknowledge the limitation of the small sample size of each type of EPTB in this study, given that EPTB is a common disease in tropical countries. Further due to our study design, which included patients with EPTB but without chest symptoms, sputum analysis could not be performed to confirm pulmonary TB. However, the strength of this study lies in the fact that all the EPTB patients were followed up for response to ATT, which was administered in some patients based on clinical judgement, as per recent WHO guidelines.

CONCLUSION

We conclude that chest imaging (CR and CECT chest) plays a significant role in detecting pulmonary TB in pa-

tients extrapulmonary TB, who do not have chest symptoms, hence increasing the confidence in making a clinico-radiological diagnosis in 50% of suspected cases of EPTB.

In patients with suspected EPTB, where microbiological and histopathological methods fail to confirm the diagnosis, early diagnosis by chest imaging helps to prevent the spread of TB in the community.

Author contribution: SK contributed to the study design and manuscript preparation. **AN** was involved in data collection, data analysis and interpretation, and contributed to the manuscript preparation. **VR** participated in the study conception, data analysis and interpretation, and manuscript preparation. **AT** contributed to the study conception and was involved in manuscript preparation.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Informed Consent: The participants were informed about the study design and objectives. All participants provided informed consent for inclusion and for anonymous data publication before they participated in the study.

REFERENCES

1. Gambhir S, Mudalsha R, Rangan K, Dixit M, Barai S, Bomanji J. Imaging in extrapulmonary tuberculosis. International Journal of Infectious Diseases.2017; 56:237-47. DOI: https://doi.org/10.1016/j.ijid.2016.11.003 PMid:27838445
2. Westra SJ, Yikilmaz A, Lee EY. Pulmonary Infection. In: Coley BD. ed. Caffey's Paediatric Diagnostic Imaging 13th ed, Elsevier, North America;2019: pp 521.
3. Maulahela H, Simadibrata M, Nelwan EJ, Rahadiani N, Renesteen E, Suwarti SWT et al. Recent advances in the diagnosis of intestinal tuberculosis. BioMed Central Gastroenterology.2022;22(1):89. DOI: https://doi.org/10.1186/s12876-022-02171-7 PMid:35227196 PMCid:PMC8885312
4. Herath S, Lewis C. Pulmonary involvement in patients presenting with extra-pulmonary tuberculosis: thinking beyond a normal chest x-ray. J Prim Health Care.2014; 6:64-8. DOI: https://doi.org/10.1071/HC14064 PMid:24624413
5. Velingker A, Lawande D, Dcosta L. Clinico-epidemiological profile of extra pulmonary tuberculosis in Western India. International Journal of Contemporary Medical Research.2018;5:B1-B4.
6. Gupta KB, Jose M, Chaudhary U, Magu S. Pulmonary involvement in extrapulmonary tuberculosis patients. European Respiratory Journal. 2011;38(Suppl 55):p2705.
7. Nachiappan AC, Rahbar K, Shi X, Guy ES, Mortani Barbosa EJ Jr, Shroff GS, Ocazionez D, Schlesinger AE, Katz SI, Hammer MM. Pulmonary Tuberculosis: Role of Radiology in Diagnosis and Management. Radiographics. 2017 Jan-Feb;37(1):52-72. DOI: https://doi.org/10.1148/rg.2017160032 PMid:28076011
8. Arega B, Mersha A, Minda A et al. Epidemiology and the diagnostic challenge of extra-pulmonary tuberculosis in a teaching hospital in Ethiopia.PLOS ONE.2020;15: e0243945. DOI: https://doi.org/10.1371/journal.pone.0243945 PMid:33320897 PMCid:PMC7737896
9. El-Hazmi MM, Al-Otaibi FE. Predictors of pulmonary involvement in patients with extra-pulmonary tuberculosis. J Family Community Med. 2012;19:88-92. DOI: https://doi.org/10.4103/2230-8229.98287 PMid:22870411 PMCid:PMC3410185
10. Chao-Jung Wei, Chui-Mei Tiu, Jen-Dar Chen, Yi-Hong Chou, Cheng-Yen Chang, Chun Yu. Computed tomography features acute pulmonary tuberculosis. The American Journal of Emergency Medicine; 2004:171-4. DOI: https://doi.org/10.1016/j.ajem.2004.02.004 PMid:15138951
11. Garg MK, Kalra N. Radiological manifestations of pulmonary tuberculosis. In: Diagnostic Radiology 3rd edition ed. Chowdhury V, Gupta AK, Khandelwal N. Jaypee Brother Medical Publishers, New Delhi, India.2010; pp.60-8. DOI: https://doi.org/10.5005/jp/books/11433_4