

**Comparison of findings of Chest X-ray and CT Thorax in Pulmonary Tuberculosis at Tertiary care Centre, Rajkot, Gujarat, India.**

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**Abstract**

**Introduction:** M tuberculosis is the species responsible for the vast majority of cases of Tuberculosis. Airborne mycobacterium are transmitted by droplets 1–5 µm in diameter, which can remain suspended in the air for several hours when a person with active tuberculosis coughs, sneezes, or speaks<sup>1</sup> the immune system is inadequate at controlling the initial infection, and active tuberculosis develops within the first 1–2 years<sup>2</sup>. Tuberculosis infects an estimated one-third of the world’s population, thereby making the disease a major public health issue<sup>3</sup>. Imaging (Chest X-ray and CT Thorax) plays a pivotal role in the diagnosis and management of tuberculosis.

**Aims and Objectives:** To Describe the spectrum of radiological appearances of pulmonary tuberculosis on Chest X-ray and CT scan and to observe and compare the Chest X-ray and CT-Thorax in Pulmonary Tuberculosis Patients.

**Materials and Methods:** An observational study was conducted on 50 patients at Department of radiology, PDU medical college and civil hospital, Rajkot, Gujarat over a period of 1.5 years from Nov 2018 to May 2020. Each of them underwent chest x ray and MDCT Thorax and comparative findings in both modalities were sorted and tabulated.

**Result:** High degree of correlation noted in findings like lymphadenopathy & bronchiectasis on CXR. CXR is highly insensitive for detecting GGOs as shown by both studies. High degree of discrepancy noted in positive finding like Consolidation, Cavitation, mediastinal lymphadenopathy, in pediatric age group affected with pulmonary tuberculosis.

**Conclusion:** CXR & CT-Thorax is very high degree of correlation in findings like consolidation (100%), cavitation (100%), pleural effusion & Fibronodular scarring. Most common radiological finding in our study is Pleural effusion on CXR. Most common radiological finding in our study is Pleural effusion & Lymphadenopathy

pathy on CT-Thorax. On CXR consolidation found predominantly in LUZ while cavitation were found predominantly in RUZ. Most common final radiological diagnosis in our study is Active TB.

**Keywords:** CXR, LUZ, RUZ, TB, CT SCAN.

## Introduction

Tuberculosis is caused by mycobacterial species in the Mycobacterium tuberculosis complex. Airborne mycobacteria are transmitted by droplets 1–5 µm in diameter, which can remain suspended in the air for several hours when a person with active tuberculosis coughs, sneezes, or speaks<sup>1</sup>. The airborne droplets reach the terminal airspaces by means of inhalation, where the droplets infect alveolar macrophages. In approximately 5% of infected individuals, the immune system is inadequate at controlling the initial infection, and active tuberculosis develops within the first 1–2 years<sup>2</sup>. In another 5% of infected individuals, the immune system is effective at controlling the initial infection, but viable mycobacteria remain dormant and reactivate at a later time<sup>2</sup>; this category is referred to as post primary or reactivation tuberculosis. The remaining 90% of individuals will never develop symptomatic disease and will harbor the infection only at a subclinical level, which is referred to as latent tuberculosis infection. In latent infection, the host immune response prevents the multiplication and spread of mycobacteria<sup>2</sup>. The immune response to mycobacteria has important implications for the clinical and imaging appearance of tuberculosis, particularly in immunocompromised patients.

Tuberculosis infects an estimated one-third of the world's population, thereby making the disease a major public health issue<sup>3</sup>. Imaging plays a pivotal role in the diagnosis and management of tuberculosis. In this article, the spectrum of radiologic appearance of pulmonary tuberculosis is discussed, with an emphasis on the role of

imaging within the clinical context. Laboratory testing for tuberculosis is also reviewed, to guide the radiologist in how laboratory findings are combined with clinical and imaging findings to diagnose tuberculosis and manage patients.

## Aims and objectives

- To describe the spectrum of radiological appearances of pulmonary tuberculosis on Chest X-ray and CT scan.
- To observe and compare the Chest X-ray and CT-Thorax in pulmonary tuberculosis.

## Materials and methods

An observational study was conducted at Department of radiology, PDU medical college and civil hospital, Rajkot, Gujarat over 1.5 years from Nov 2018 to May 2020 after approval from Institutional Ethics Committee [PDUMCR/IEC/17650/2018]. Each of them underwent chest x ray and MDCT Throat and comparative findings in both modalities were sorted and tabulated.

## Inclusion criteria

- All suspicious and diagnosed cases of pulmonary tuberculosis referred to our department.
- Patient of all age

## Exclusion criteria

- Patients not willing to be part of study.
- Patients with contraindication of IV iodinated contrast and turn out to be non-tuberculous infection.

## Sample size

The study was conducted on 50 patients, who presented in the department within the study period and fulfilled the inclusion criteria. These patients were enrolled in the study by convenient sampling.

## Data collection

The indication and details of the radiological procedure was explained to the patient. A written consent was obtained either from patient or his/her relatives. Each patient had undergone Computed tomography (CT scan-

16 slice) and x-ray as indicated. The data was primarily gathered for various aspects of the study chest x ray and CT scan and then extrapolated to arrive at a conclusion.

**Statistical Analysis**

Different statistical methods to be used are: Percentage, Tables.

**Observation and analysis**

Final radiological diagnosis	No. of cases
Active TB	28(56%)
Healed TB	9(18%)
Healed TB with active infection	9(18%)
NAD CXR	4(8%)

Fig 1: Distribution of Final radiological diagnosis.

Most common final diagnosis was active Tuberculosis in 28 patients (56%). [ Table/Fig. 1]

Findings	CXR	CT-Thorax
Consolidation	15(30%)	15(30%)
Cavitation	19(38%)	19(38%)
GGO	0(0%)	3(6%)
Tree in bud/Centrilobular nodules	3(6%)	13(26%)
Random nodules(miliary)	6(12%)	12(24%)
Pleural effusion	21(42%)	22(44%)
Lymphadenopathy	9(18%)	22(44%)
Fibro nodular scarring	9(18%)	12(24%)
Pleural thickening	1(2%)	19(38%)
Pleural calcification	1(2%)	6(12%)
Bronchiectasis	7(14%)	9(18%)

Fig. 2: Comparison of CXR and CT-Thorax for various findings

**Discussion**

The present study is carried out on 50 cases of renal masses, in the duration of 1 year and 6 months. The comparison done between CXR and CT-Thorax in proven & suspected cases of pulmonary tuberculosis

Fig. 3: CXR findings correlation with other studies.

Findings	Our Study n=50 (%)	Yuan MK, Lai YC, Chang CY and Chang SC <sup>4</sup> [n=133 (%)]
Consolidation	15(30)	72 (54.1)
Cavitation	19(38)	26 (19.5)
Random nodules (miliary)	6(12)	4 (3.0)
Pleural effusion	21(42)	31 (23.3)
Pleural thickening & calcifications	1(2)	23 (17.3)
Mediastinal widening	1(2)	1 (0.8)

In our study consolidation was found only in 15(30%) cases where as in study done by Yuan MK, Lai YC, Chang CY and Chang SC <sup>4</sup> shows in 72(54.1%) cases. This difference may be due to difference in sample size & epidemiology. In our study cavitation was found only in 19(38%) cases where as in study done by Yuan MK, Lai YC, Chang CY and Chang SC <sup>4</sup> shows in 26 (19.5%) cases. There is marked difference noted in pleural thickening & calcification between our study and study done by Yuan MK, Lai YC, Chang CY and Chang SC <sup>4</sup>. This difference may be due to difference in sample size & epidemiology.

Mediastinal widening noted in one case in our and Yuan MK, Lai YC, Chang CY and Chang SC studies. In our study is due to Multiloculated Para spinal collection. [ Table/Fig. 3]

Fig. 5: CT-Thorax findings correlation with other studies

Findings	Our Study n=50 (%)	Hatipoglu, Osma, Manisali, Ufan, Balci, Akko flu, Akpinar, Karli kaya, Yiiksel <sup>6</sup> [n=68 (%)]

Consolidation	15(30)	14(20.5)
Cavitation	19(38)	20(29.4)
GGO	3(6)	16(23.5)
Tree in bud	13(26)	23(33.8)
Miliary	12(24)	1(1.47)
Pleural effusion	22(44)	2(2.9)
Lymphadenopathy >10mm	13(26)	5(7.3)
Fibro nodular scarring	12(24)	55(80.8)
Pleural thickening	19(38)	44(64.7)
Bronchiectasis	9(18)	42(61.7)

In our study & study done by Hatipoglu, Osma, Manisali, Ufan, Balci, Akko flu, Akpinar, Karli kaya, Yiksel <sup>6</sup> moderate degree of correlation noted in findings like consolidation, cavitation & tree in bud nodules.

In our study & study done by Hatipoglu, Osma, Manisali, Ufan, Balci, Akko flu, Akpinar, Karli kaya, Yiksel <sup>6</sup> poor correlation noted in findings like fibro nodular scarring, pleural thickening & bronchiectasis this may be due to large no. of cases of old pulmonary tuberculosis. [ Table/Fig. 4].

Fig. 6: CT-Thorax findings correlation with other studies

Findings	Our Study n=50 (%)	Bolursaz M et al <sup>5</sup> [n=38(%)]
Consolidation	15(30)	19(50)
Cavitation	19(38)	7(18.4)
Lymphadenopathy	22(44)	22(57.4)
Bronchiectasis	9(18)	11(28.9)

High degree of discrepancy noted between positive findings in both studies maybe due to epidemiology and case distribution & age group as Bolursaz MR et al.<sup>5</sup> study done on pediatric age group. [ Table/Fig. 6].

**Conclusion**

- Most common final radiological diagnosis in our

study is Active TB.

- Most common radiological finding in our study is Pleural effusion on CXR.
- Most common radiological finding in our study is Pleural effusion & Lymphadenopathy on CT-Thorax.
- CT-Thorax is more accurate in findings multiple & subtle cavitation and consolidation.
- On CT-Thorax enlarged lymph nodes mostly appears heterogeneous conglomerated & without calcification.
- Majority of cases with pleural effusion were unilateral.
- CXR & CT-Thorax is very high degree of correlation in findings like consolidation (100%), cavitation (100%), pleural effusion & Fibro nodular scarring.

CXR & CT-Thorax shows poor correlation in findings like nodules, lym phadenopathy, pleural thickening & pleural calcification. CXR in comparison with CT-Thorax shows poor predictability for diagnosing loculated effusion & empyema.

Thus as per my study CXR shows very high predictability for diagnosing and monitoring pulmonary tuberculosis however, CT-Thorax is only indicated in case of suspected complications or inconclusive CXR findings.

By creating awareness of spectrum of radiographic findings in early stage of pulmonary tuberculosis, will help in early diagnosis of the disease by advising chest X ray as primary investigation in suspected patient, which may limit the functional disability of the patient.

[The procedure will be explained in understandable language before examination. Patient or institution does not have to bear any extra expenses for this study as it is necessary for treatment planning].

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**Legend Figures**

Fig. 1: Chest X-ray PA view.



B/ L basal airspace opacification consistent with consolidation.

Fig. 2: Thorax Axial image –Pulmonary window at Cardiac level.



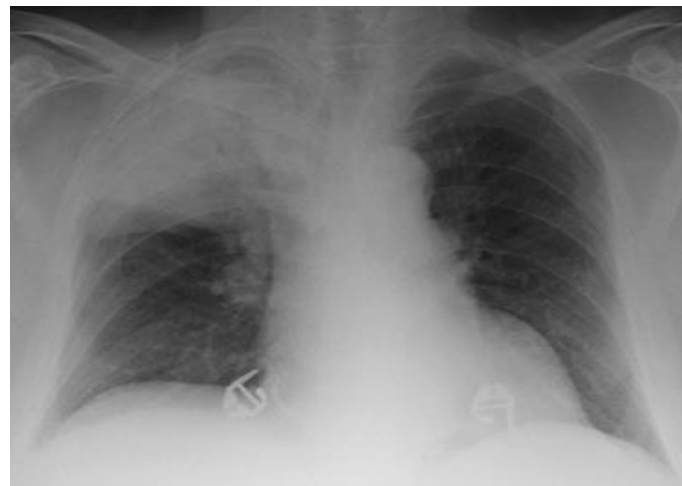
B/L posterior segment LL consolidation.

Fig. 3: CT thorax-axial image- mediastinal window at sub carinal level.



Heterogeneously enhancing subcarinal lymph node.

Fig. 4: Chest X-ray PA view.



RT UZ well defined air space opacification with few air

bronchogram pattern consistent with consolidation.

Fig. 5: CT Thorax axial image- pulmonary window.



RT UL consolidation with air bronchogram with Bronchiectasis changes.