Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Comparison of High-resolution Computed Tomography Findings in Drug-Sensitive and Drug-Resistant Pulmonary Tuberculosis Patients

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Abstract

Introduction: Tuberculosis is a global public health problem by the World Health Organization. The high-resolution computed tomography (HRCT) scans provide more accurate information about the extent and distribution of PTB and is the investigation of choice for PTB.

Aims and Objectives: This study aims to describe the findings of HRCT chest in drug-sensitive (DS) and drug-resistant (DR) pulmonary tuberculosis patients and compare them.

Materials and Methods: This is a cross-sectional study, comprised 114 patients (80 drug-sensitive and 34 drug-resistant patients). HRCT chest was done in the Department of Radiodiagnosis, Gandhi Medical College and Hamidia Hospital over a period of 18 months after taking proper history and consent. All the patients are either having drug-sensitive or drug-resistant tuberculosis confirmed by CBNAAT.

Results: Among 114 patients in the study, majority of them were young males. History of smoking (70.5%) and defaulters (82.4%) are the most common risk factors associated with the drug resistance patients. On HRCT of drug-sensitive patients, we found that consolidation (97.5%), tree-in-bud sign (96.25%), lymphadenopathy (93.75%), glass opacities (88.75%), and cavities (86.25%) were most common findings and among drug resistance patients, all (100%) patients were found positive for consolidation, 91.2% for ground-glass opacities, 100% cavities, all positive for (100%) tree-in-bud sign, and 94.1% for nodules.

Conclusion: Drug-resistant TB patients were comparatively younger than the drug-resistant TB patients. Smoking and drug defaultation were the major causes of MDR TB. HRCT examination shows consolidation, tree-in-bud sign, lymphadenopathy, ground-glass opacities, nodules, and cavities which were most common findings in drug-resistant tuberculosis patients, while pleural effusion, tree-in-bud opacities, and consolidation were common findings in drug-sensitive patients.

Key words: High-resolution computed tomography, Drug-sensitive and drug-resistant tuberculosis patients

INTRODUCTION

Tuberculosis, a chronic infectious disease caused by air-borne transmission of aerosolized droplets of *Mycobacterium tuberculosis* (MTB), is a major global public health problem by the World Health Organization.[1]

Access this article online

www.ijss-sn.com

Month of Submission : 06-2020
Month of Peer Review : 07-2020
Month of Acceptance : 07-2020
Month of Publishing : 08-2020

There were an estimated 10.4 million new cases of tuberculosis and 1.7 million tuberculosis-related deaths every year, making tuberculosis one of the top 10 leading causes of death worldwide. Among the new cases identified, 90% were adults, 65% were men, 10% were children, and 10% had HIV coinfection. Among communicable diseases, tuberculosis is a major cause of mortality in the economically productive age group (15–49 years). The top seven countries in the world identified as having a high tuberculosis burden are India, Indonesia, China, the Philippines, Nigeria, Pakistan, and South Africa.[1]

The problem is exemplified many folds with the advent of drug resistance in TB. Multidrug-resistant (MDR) TB is defined as disease caused by strains of *M. tuberculosis*

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that are resistant to treatment with at least isoniazid (H) and rifampicin (R). Pre-extensively drug-resistant (pre-XDR) TB refers to disease caused by MDR strains that harbor additional resistance to either any fluoroquinolone (FQ) or any of the injectable second-line aminoglycosides (AMs). While XDR-TB refers to MDR-TB with additional resistance to both FQ and AM.[2]

The fundamental cause in the genesis of resistance to anti-tuberculosis drugs is the misuse of antibiotics to treat patients suffering from drug-susceptible tuberculosis, causing the mutation that occurs in the genome of *Mycobacterium*. Drug resistance arises mainly in areas where anti-tuberculosis programs are deficient. Moreover, immune-deficient patients of any background (both solid organ and bone marrow transplant, such as leukemia or lymphoma patients and those treated with corticosteroids) are more susceptible to infection with *M. tuberculosis*.[3]

The management of DR-TB is critical and based on laboratory confirmation of TB and a clear understanding of drug resistance aided by drug-susceptibility testing (DST) to ensure accurate diagnosis and early intervention of appropriate treatment.[4]

Delay in diagnosis of active cases of pulmonary TB increases the burden of the disease, and this delay in diagnosis is related to many reasons: TB can present clinically and radiologically like many other diseases as pneumonia, malignancy, and interstitial lung diseases, the yield of sputum smear is still low and needs few days to get the results. Culture for mycobacteria TB which is the gold standard in diagnosis of TB needs up to 6 weeks for sure results, even new radiometric cultures need about 2 week to give result and not available in every hospital.[5]

The delay in diagnosis causes delay in isolation of the patient with more chance for spread of infection and increase in severity of the disease. Because of limitations in the yield of chest X-ray in diagnosis of pulmonary TB (PTB), computed tomography (CT) scans provide more accurate information about the extent and distribution of PTB through the presence of cavities and satellite lesions that cannot be visualized on chest X-ray, and moreover, CT can contribute to distinguish active from old infection.[6]

There are data about the relationship between morphologic findings on high-resolution computed tomography (HRCT) and the number of AFB on sputum smears in patients with PTB. It was also shown that existence of cavities and airspace consolidation might be related to the degree of smear positivity in PTB patients.[7]

The present study is an attempt to compare the HRCT findings of drug-sensitive and drug-resistant pulmonary tuberculosis patients.

Aims and Objectives

The aim of the study was as follows:

- To describe the HRCT findings of drug-resistant pulmonary tuberculosis.
- To describe the HRCT findings in drug-sensitive pulmonary tuberculosis patients.
- To compare the HRCT findings of drug-sensitive (DS) and drug-resistant (DR) pulmonary tuberculosis.

MATERIALS AND METHODS

Study Design

This was a cross-sectional analytical study

Study Center

This study was conducted at the Department of Radiodiagnosis Gandhi Medical College and associated Hamidia Hospital, Bhopal.

Duration of Study

The study duration was 18 months (September 1, 2017–June 31, 2019).

Adults patients referred to our department for HRCT who were sputum smear positive and drug susceptibility determined by Sputum culture sensitivity test and CBNAAT (cartridge-based nucleic acid amplification test) were included in our study.

All patients were subjected to:

- Detailed medical history taken.
- Symptom review about symptoms of pulmonary TB as cough, hemoptysis, constitutional symptoms as loss of weight, fever, or night sweating.
- General physical examination.

HRCT Chest

All chest MDCT studies were performed with MDCT scanner. Volumetric 1.25 mm slice thickness MDCT chest acquisition was done with the patient supine in the cranial-to-caudal direction during a single breath hold.

Inclusion Criteria

The following criteria were included in the study:

- Patients >18 years
- Sputum AFB examinations positive for tuberculosis
- Newly diagnosed case on treatment or defaulter, with or without positive chest radiograph finding.
- Drug-susceptibility testing (CB-NAAT or sputum culture and sensitivity) – to categorize the patients as drug sensitive or drug resistance.

Exclusion Criteria

The following criteria were excluded from the study:

- Patients < 18 years
- Patients with known malignancy
- Patients who are HIV positive
- Pregnant female
- Patients not ready to give consent

Sample Size

All patients were referred to our department for HRCT chest and fulfilled of the inclusion criteria (n = 114).

Investigation Details

On HRCT scans, the presence of each parenchymal abnormality, tree-in-bud signs, consolidation, ground-glass opacities and bronchial dilatation, cavities, presence of pleural effusion, pleural thickening, pericardial effusion, and lymphadenopathy were recorded.

Statistical Analysis

All the data analyses were performed using IBM SPSS ver. 20 software. Frequency distribution and cross-tabulation were used to prepare the tables. Data are expressed as number and percentage. PRISM and Microsoft Office were used to prepare the graphs. Chi-square test was used to compare the distribution. $P < 0.05$ is considered as statistically significant.

RESULTS

In the present study, majority of the drug-sensitive patient's had age between 31 and 40 years (33.8%), followed by 23.8% of patients who had age between 21 and 30 years, 15% had between 41 and 50 years, and 11.3% of patients had age between 61 and 70 years.

In the present study among the drug-sensitive patients, male preponderance was observed with 68.8% of males and 31.3% of females.

In the present study, the most common constitutional symptoms among drug-sensitive patients was cough which was present in all the patients (100%) followed by fever in 73.8%, weight loss in 57.5%, night sweat in 48.8%, and hemoptysis in 48.8% of patients.

In the present study, a history of smoking was reported in 72.5%, whereas 23.8% were defaulters among the drug-sensitive patients.

On HRCT examination of drug-sensitive patients, we found that 97.5% of patients were found positive for consolidation, 88.75 for ground-glass opacities, 86.25 for cavities, 96.25% for tree-in-bud sign, 46.25% for nodules, 83.75% for pleural effusion, 35% for pleural thickening, 35% for pericardial effusion, 93.75% for lymphadenopathy, 25% for bronchiectasis, 41.25% for atelectasis, 17.5% for calcified granuloma, and 27.5% for peribronchial thickening. Out of that, consolidation (97.5%), tree-in-bud sign (96.25%), lymphadenopathy (93.75%), glass opacities (88.75%), and cavities (86.25%) were most common findings.

Among the drug resistance patients, majority of them had age between 21 and 30 years (44.1%) followed by 31 and 40 years (29.4%) and 41 and 50 years (14.7%).

Among the drug resistance patients, majority were male (61.8%) and 38.2% were female.

In the present study, the most common constitutional symptoms among drug resistance patients was cough which was present in all the patients (100%) followed by fever in 97.1%, weight loss in 88.2%, night sweat in 79.4%, and hemoptysis in 82.4% of patients.

In the present study, a history of smoking was reported in 70.5%, whereas 82.4% were defaulters among the drug resistance patients.

On HRCT examination of drug resistance patients, we found that all (100%) patients were found positive for consolidation, 91.2% for ground-glass opacities, all positive for (100%) cavities , all positive for (100%) tree-in-bud sign, 94.1% for nodules, 21.4% for pleural Effusion, 85.3% for pleural thickening, 61.8% for pericardial effusion, 88.2% for lymphadenopathy, 79.4% for bronchiectasis, 61.8% for atelectasis, 58.8% for calcified granuloma, and 76.4% for peribronchial thickening.

Patients divided which were categorized into six groups on the basis of their age.

In the present study, a history of smoking was reported in 72.5% of drug-sensitive patients, whereas 70.5% were defaulters among the drug-sensitive patients.

History of defaulters was reported in 23.8% of drug-sensitive patients, whereas 82.4% were defaulters among drug-resistant patients. Statistically significant correlation was found between defaulters and drug-resistant patients (P<0.001)

On HRCT examination of drug-sensitive patients, we found that 97.5% of patients were found positive for consolidation, 88.75% for ground-glass opacities, 86.25% for cavities, 96.25% for tree-in-bud sign, 46.25% for nodules, 83.75% for pleural effusion, 35% for pleural

thickening, 35% for pericardial effusion, 93.75% for lymphadenopathy , 25% for bronchiectasis, 41.25% for atelectasis, 17.5% for calcified granuloma, and 27.5% for peribronchial thickening. Out of that, consolidation (97.5%), tree-in-bud sign (96.25%), lymphadenopathy (93.75%), glass opacities (88.75%), and cavities (86.25%) were most common findings.

On HRCT examination of drug resistance patients, we found that all (100%) patients were found positive for consolidation, 91.2% for ground-glass opacities, all positive for (100%) cavities, all positive for (100%) tree-in-bud sign, 94.1% for nodules, 91.2% for pleural effusion, 85.3% for pleural thickening, 61.8% for pericardial effusion, 88.2% for lymphadenopathy, 79.4% for bronchiectasis, 61.8% for atelectasis, 58.8% for calcified granuloma, and 41.2% for peribronchial thickening.

On HRCT examination of drug sensitive and resistance patients, we found that all (100%) patients were found positive for consolidation, tree in bud, and nodules among drug-sensitive patients compared to drug-sensitive patients, in which the consolidation was positive in 97.5%, tree in bud positive in 96.2%, and cavities were present in 86.2% of patients [Tables 1-5, Figures 1-5, and Graphs 1-11].

DISCUSSION

Tuberculosis is one of the oldest ailments having an impact on humankind and is a noteworthy reason for mortality around the world. Drug-susceptible tuberculosis is curable in essentially all cases. In the event that it is left untreated, the malady may be deadly within a time span of 5 years in 50–65% of cases.[8]

Age

In the present study, majority of the drug-sensitive patient's had age between 31 and 40 years (33.8%), followed by 23.8% of patients who had age between 21 and 30 years, 15% had between 41 and 50 years, and 11.3% of patients had age between 61 and 70 years. Similarly, in the study of Icksan *et al.*,[9] a total of 183 drug-sensitive patient's, majority of them had age between <30 years 49 (27%) and 42 (23%) had age between 40 and 49 followed by 38 (21%) had age between 30 and 39 years and 16% had 50–59. In Li *et al.*[10] study, the mean age of the drug-sensitive patient's was 47.5 years and age range from 16 to 86 years ($P = 0.005$). In other study of Deesuwan *et al.*,[11] patients' age result was not much different. The WHO in 2013 stated that most TB patients are in their productive age. High level of mobility and social interaction in productive ages supports the higher prevalence of TB due to the increased risk of exposure.[12] In the study of Cha *et al.*,[13] of 141 patients of drug-sensitive tuberculosis, the mean age was 51 years and mean age range was 15–85 years.

In the present study, among the drug resistance patients, majority of them had age between 21 and 30 years (44.1%) followed by 31–40 years (29.4%) and 41–50 years (14.7%). Whereas in Icksan *et al.*[9] study, 183 patients from multidrug resistance TB group, majority of patients 31% were in the age group of 40–49 years, 30% were in the age of 30–39 followed by 19% of patients in the age group of <30 years, and 16% and 4% of patients had age 50–59 and >59, respectively. In Li *et al.*[10] study, the mean age of the drug resistance TB patients was 39.0 years and age range from 12 to 81 years. In other study of Deesuwan *et al.*,[11] patient's age result was not much different. The WHO in 2013 stated that most TB patients are in their productive age. High level of mobility and social interaction in productive ages supports the higher prevalence of TB due to the increased risk of exposure.[12] In the study of Cha *et al.*,[13] 53 patients of multidrug-resistant tuberculosis mean age were 38 years; age range was 15–74 years. On comparing the age distribution between both the groups, we found that majority of the drug-resistant patients were younger as compared to drug-sensitive patients.

Gender

In the present study among the drug-sensitive patients, male preponderance was observed with 68.8% of males and 31.3% of females. Similarly, in the study of Icksan *et al.*,[10] majority of the drug-sensitive patients were male 127 (69%) and 56 (31%) females. In Li *et al.*[10] study, males were predominant 61 (68.5%) than females 28 (31.5%) in drug-sensitive patients group ($P = 0.63$). In the study of Cha *et al.*,[13] of 141 patients of drug-sensitive tuberculosis, majority of males than females ratio 79:69.

In the present study among the drug resistance patients, majority were male (61.8%) and 38.2% were female. Similarly, in the study of Icksan *et al.,*[9] genders of the drug resistance patients were mostly male 96 (52%) than female 87 (48%). Li *et al.*[9] observed majority of males 58 (65.2%) than females 31 (34.8%) in drug resistance patients ($P = 0.63$). In the study of Cha *et al.*,[13] 53 patients of multidrug-resistant majority of males than female ratio (32:21). Male preponderance was observed in both drug-sensitive and drug-resistant patients.

Constitutional Symptoms

In the present study, the most common constitutional symptoms among drug-sensitive patients was cough which was present in all the patients (100%) followed by fever in 73.8%, weight loss in 57.5%, night sweat in 48.8%, and hemoptysis in 48.8% of patients. In the study of Tueller *et al.*,[14] the most frequent symptom was cough (69%),

followed by weight loss (43%), night sweats (31%), fever (27%), dyspnea (12%), and hemoptysis (11%). Forty-seven (66%) patients had two or more symptoms. In the study of Sun *et al*.,[15] cough was the most common symptom for the pulmonary tuberculosis patients, 38 of the 41 (92.7%) patients had cough. The less frequent manifestations were fever (26/41, 63.4%) and weight loss (28/41, 68.3%). The frequencies of hemoptysis, appetite loss, night sweats, and chest pain were even lower. In the study of Raghuvanshi *et al*.,[16] between clinical findings chronic cough and night sweats were significantly linked to a greater possibility for PTB.

In the present study, the most common constitutional symptoms among drug resistance patients was cough which was present in all the patients (100%) followed by fever in 97.1%, weight loss in 88.2%, night sweat in 79.4%, and hemoptysis in 82.4% of patients. In the study of Tueller *et al*.,[14] the most frequent symptom was cough (69%), followed by weight loss (43%), night sweats (31%), fever (27%), dyspnea (12%), and hemoptysis (11%). Forty-seven (66%) patients had two or more symptoms. In the study of Sun *et al*.,[15] cough was the most common symptom for the multidrug-resistant pulmonary tuberculosis patients, 38 of the 41 (92.7%) patients had cough. The less frequent manifestations were fever (26/41, 63.4%) and weight loss (28/41, 68.3%). The frequencies of hemoptysis, appetite loss, night sweats, and chest pain were even lower. In the study of Raghuvanshi *et al*.,[16] between clinical findings chronic cough and night sweats were significantly linked to a greater possibility for PTB. All the patients of Kulkarni *et al*.[17] study, that is, 100% presented with fever, cough and weight loss followed by loss of appetite (i.e., 70%) and remaining presenting symptoms were breathlessness on exertion (40%) and hemoptysis (20%). This is comparable to the study findings carried out by Gupta *et al*.,[18] showed fever, cough, and weight loss to be the most common symptom among these patients. Out of these constitutional symptoms, fever, weight loss, night sweat, and hemoptysis were more common in drug resistance patients as compared to drug-sensitive patients.

Smoking and Defaulter

In the present study, a history of smoking was reported in 70.5%, whereas 82.4% were defaulters among the drug resistance patients. Statistically significant correlation was found between history of defaulter and drug-resistant patients ($P < 0.05$). Similarly, in the study of Rao *et al*.,[19] history of smoking was observed in 16 (5%) and 41 (7.5%) were non-smokers. A study by Gaude *et al*.[20] from Karnataka showed a significant association of $P < 0.05$ for smoking in the development of drug resistance. Twenty-one patients (31.8%) had a history of smoking, while 32 patients (43.5%) had a history of alcohol consumption. Another 14 patients had a history of smoking as well as alcohol consumption, thus predisposing them for the development of TB. A reasons may be due to high level of literacy (86%) and public awareness which has resulted in lesser percentage of population being addicted to alcoholism and smoking compared to other parts of Karnataka. The result of Shariff *et al*.[21] study suggests that those patients who are passive smokers have 75% less chance of developing MDR-TB compared to non-passive smokers (OR 0.25, 95% CI 0.07–0.87). This means that defaulters were more in drug resistance cases as compared to drug sensitive ($P < 0.001$). However, smoking status was comparable between both the groups as revealed by the insignificant *P* value.

HRCT

On HRCT examination of drug-sensitive patients, we found that 97.5% of patients were found positive for consolidation, 88.75% for ground-glass opacities, 86.25% for cavities, 96.25% for tree-in-bud sign, 46.25% for nodules, 83.75% for pleural effusion, 35% for pleural thickening, 35% for pericardial effusion, 93.75% for lymphadenopathy, 25% for bronchiectasis, 41.25% for atelectasis, 17.5% for calcified granuloma, and 27.5% for peribronchial thickening. Out of that, consolidation (97.5%), tree-in-bud sign (96.25%), lymphadenopathy (93.75%), glass opacities (88.75%), and cavities (86.25%) were most common findings. Icksan *et al*.[9] recorded that active lesion of lung parenchymal was found less in DS-TB and dominated by multiple consolidation and multiple cavities. Most of the lung parenchymal active lesions in DS-TB were also found in the upper right lung. Active lesions for DS-TB group were infiltrate (66.7%), consolidation (20.8%), the cavity (6%), and ground-glass opacity (2.7%). Deesuwan *et al*.[11] and Cha *et al*.[13] stated that multiple reticulonodular infiltrate, ground-glass opacity, and multiple or solitary cavities are the dominant X-ray findings for DS-TB patients. Hashemian *et al*.[22] observed that the most common finding in HRCT of these patients was ARDS-like radiologic manifestations (17.1%), followed by parenchymal nodular infiltration (13.6%) and cavitation (10.9%), consolidation (10.2%), interstitial involvement (9.5%), calcified parenchymal mass (8.3%), ground-glass opacities (7.5%), and pleural effusion or thickening (6.9%). Radiographic evidence of lymphadenopathy was seen in up to 43% of adults.

On HRCT examination of drug resistance patients, we found that all (100%) patients were found positive for consolidation, 91.2 for ground-glass opacities, all positive for (100%) cavities , all positive for 100% tree-in-bud sign, 94.1% for nodules, 21.4% for pleural effusion, 85.3% for pleural thickening, 61.8% for pericardial effusion, 88.2% for lymphadenopathy,

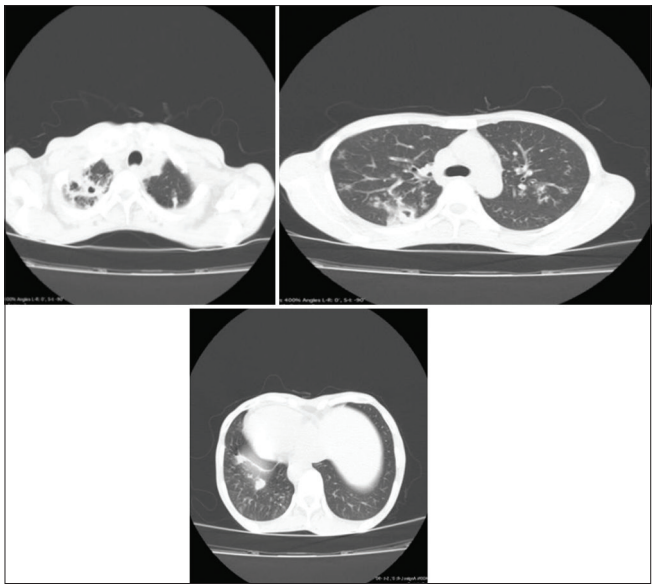


Figure 1: HRCT chest axial sections in a patient with drug-resistant tuberculosis showing multiple thick-walled cavities with centrilobular nodules arranged in branching pattern giving tree-in-bud appearance along with calcified granuloma

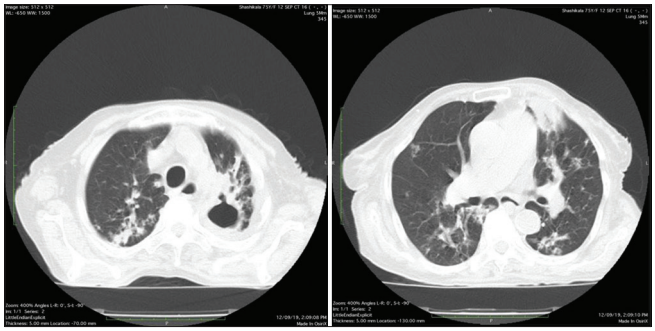


Figure 2: HRCT chest axial sections in a patient with drug-resistant tuberculosis showing large thick-walled cavity with adjacent apical pleural thickening and bronchiectasis changes in the left upper lobe. Small patch of consolidation noted in lingular segment

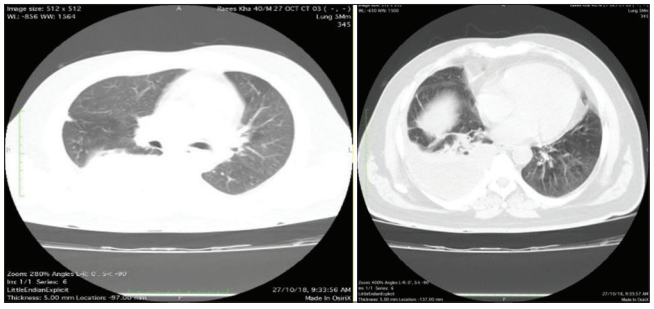


Figure 3: HRCT chest axial sections in a patient with drug-sensitive tuberculosis showing right-sided pleural effusion with areas of ground-glass haziness.

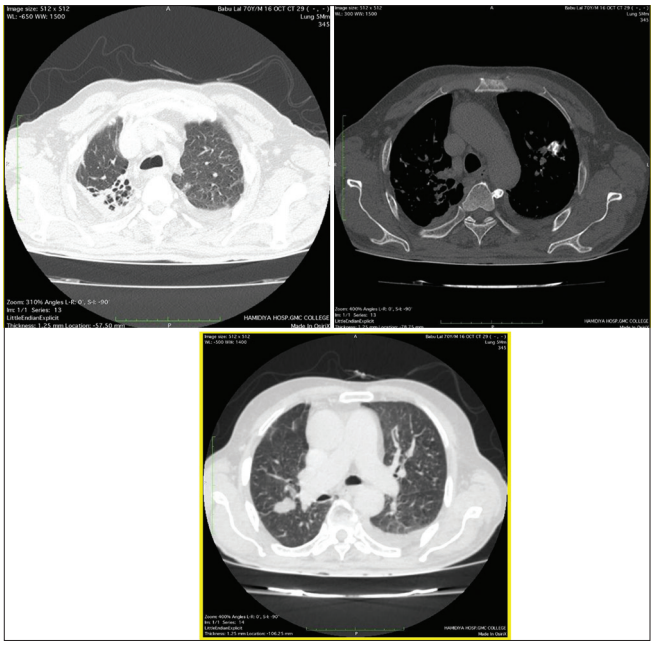


Figure 4: HRCT chest axial sections lung and mediastinal windows in a patients with drug-resistant tuberculosis patient showing fibrobronchiectatic changes in apical segment of the right upper lobe, calcified granuloma in anterior segment of the left upper lobe, and nodules in posterior segment of the right upper lobe along the oblique fissure

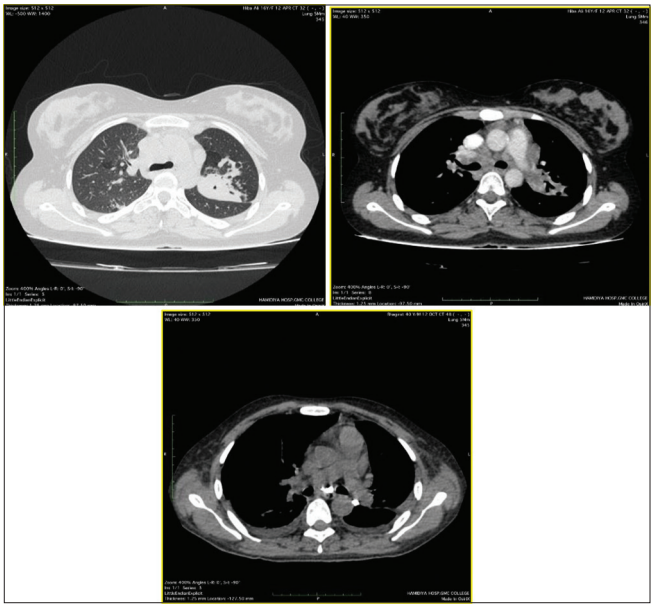
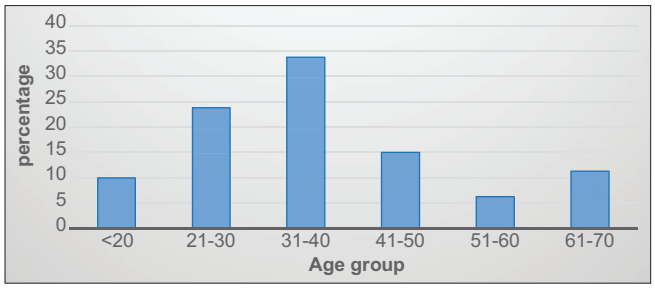
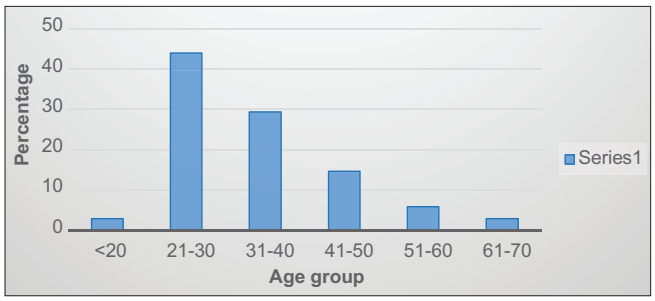


Figure 5: HRCT chest axial sections lung and mediastinal windows in a patient with drug-resistant tuberculosis patient showing consolidation in anterior segment of the right upper lobe, multiple conglomerated and calcified mediastinal lymph nodes

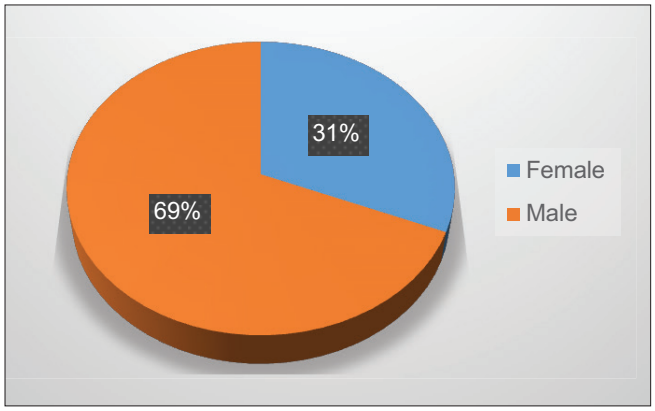
79.4% for bronchiectasis, 61.8% for atelectasis, 58.8% for calcified granuloma, and 76.4% for peribronchial thickening. In the study of Joshi *et al.*,[23] out of 50 patients, nodules were present in 41 patients, cavities in 26 patients, consolidation in 25 patients, fibrosis in 25 patients, 22 patients had tree-in-bud/V-Y pattern of nodules, 21 patients had collapse, and 20 patients had bronchiectasis. Of the 26 patients who had cavities, 23 patients (88%) had multiple (>1) cavities and 3 patients



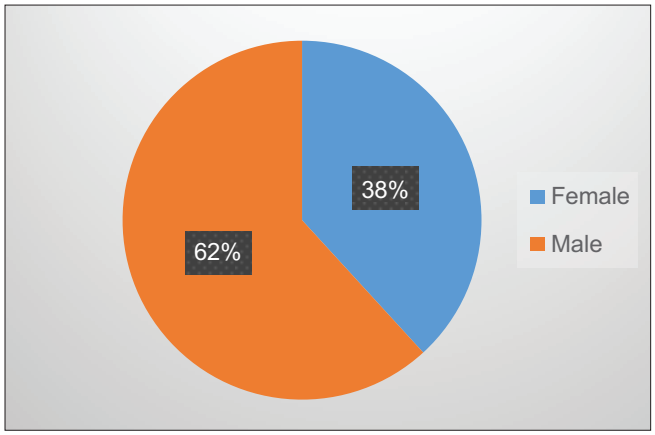
Graph 1: Age distribution of drug sensitive patients



Graph 2: Age distribution of drug resistant patients

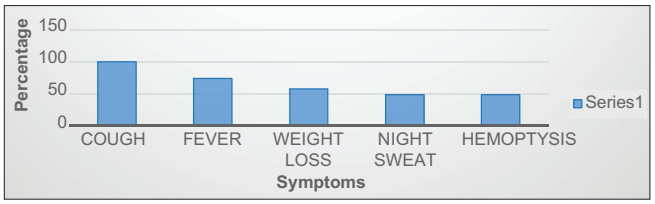


Graph 3: Gender distribution of drug sensitive patients

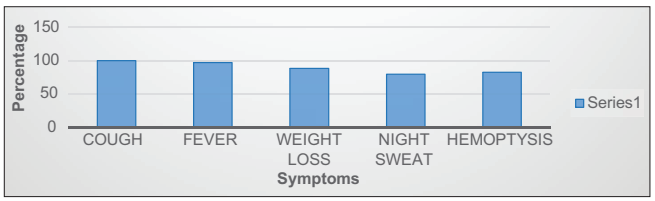


Graph 4: Gender distirbution of drug resistant patients

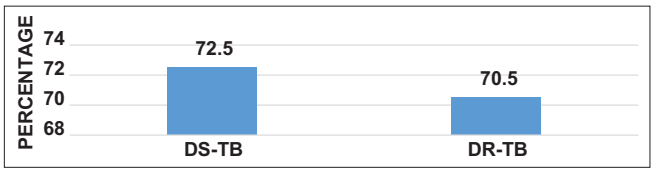
(12%) had single cavity, lymphadenopathy was present in 33 patients. Pleural involvement was seen in 25 patients,



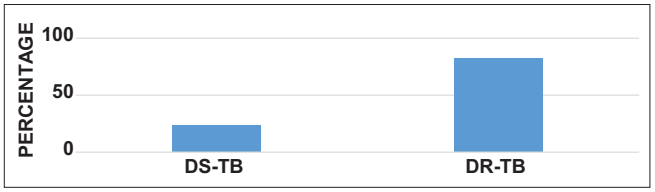
Graph 5: Constitutional symptoms of drug sensitive patients



Graph 6: Constitutional symptoms of drug resistant patients

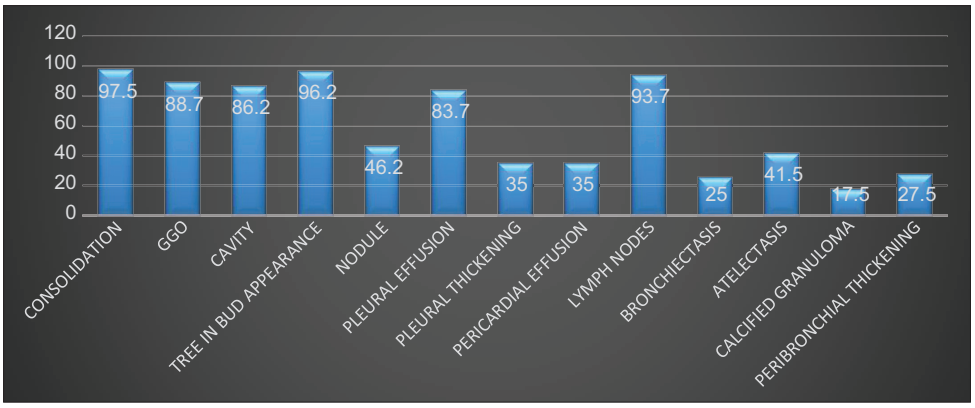


Graph 7: Distribution of history of smoking among DS-TB and DR-TB patients

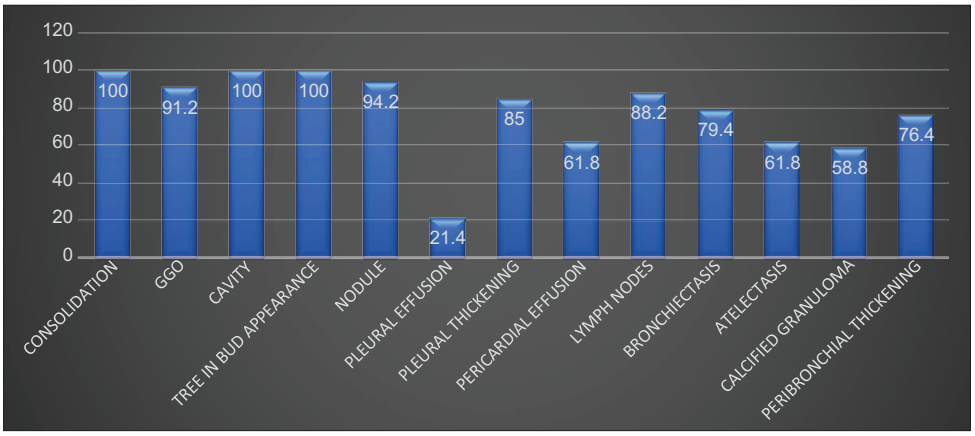


Graph 8: Distribution of history of defaulters among DS-TB and DR-TB patients

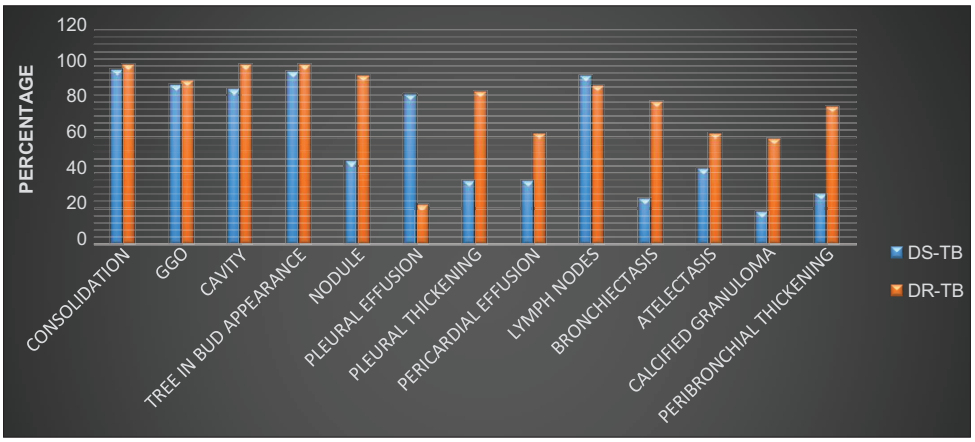
14 patients had pleural effusion, and 11 patients had pleural thickening. Kritski *et al.*[24] performed a study among patients requiring retreatment and found that the presence of cavitary lesions was significantly associated with an unfavorable outcome. However, this finding was not associated with MDR-TB. Icksan *et al.*[9] noted that active lesion morphologies in MDR-TB were consolidation (57.4%), cavity (57.9%), infiltrate (36.6%), and ground-glass opacity (1.1%). These active lesions were found mostly in the right upper lung. Cavity with ≤4 cm in MDR-TB was found most on upper right lung (66.1%) and had a significant difference compared to DS-TB (14.2%) group ($P < 0.005$). Multiple cavities were found on 68.3% MDR-TB group and had a significant difference compared to 14.2% of DS-TB group ($P < 0.005$)). Deesuwan *et al.*[11] and Cha *et al.*[13] stated that active lesions that were mostly found in thorax X-ray for MDR-TB patients are multiple consolidations and multiple cavities. These studies supported the hypothesis that the dominant characteristic lesions in MDR-TB are multiple consolidations and multiple cavities ($P < 0.005$).



Graph 9: HRCT Positive findings of DS-TB patients



Graph 10: HRCT Positive findings in DR-TB Patients



Graph 11: Comparing the HRCT Positive findings of DS and DR-TB patients

Table 1: Age distribution of drug-sensitive and drug-resistant patients

Age group	Frequency of drug-sensitive patients (*n*=80)	Percentage of drug-sensitive patients	Frequency of drug-resistant patients (*n*=34)	Percentage of drug-resistant patients
<20	8	10.0	1	2.9
21–30	19	23.8	15	44.1
31–40	27	33.8	10	29.4
41–50	12	15.0	5	14.7
51–60	5	6.3	2	5.9
61–70	9	11.3	1	2.9
Total	80	100.0	34	100.0

Table 2: Gender distribution of drug-sensitive and drug-resistant patients

Gender	Frequency of drug-sensitive patients (*n*=80)	Percentage of drug-sensitive patients	Frequency of drug-resistant patients (*n*=34)	Percentage of drug-resistant patients
Female	25	31.3	13	38.2
Male	55	68.8	21	61.8
Total	80	100.0	34	100.0

Table 3: Constitutional symptoms of drug-sensitive and drug-resistant patients

Symptoms	No. of drug-sensitive patients (*n*=80)	Percentage of drug-sensitive patients	No. of drug-resistant patients (*n*=34)	Percentage of drug-resistant patients
Cough	80	100	34	100.0
Fever	59	73.8	33	97.1
Weight loss	46	57.5	30	88.2
Night sweat	39	48.8	27	79.4
Hemoptysis	39	48.8	28	82.4

Table 4: History distribution of drug-sensitive and drug-resistant tuberculosis patients

History	No. of drug-sensitive patients (*n*=80)	Percentage of drug-sensitive patients	No. of drug-resistant patients (*n*=34)	Percentage of drug-resistant patients	*P* value
Defaulter	19	23.8	28	82.4	<0.001
Smoking	58	72.5	24	70.5	0.346

Table 5: HRCT findings of drug-sensitive and drug-resistant tuberculosis patients

Findings		No. of drug-sensitive patients (*n*=80)	Percentage of drug-sensitive patients	No. of drug-resistant patients (*n*=34)	Percentage of drug-resistant patients	*P* value
Consolidation	Negative	2	2.5	0	0.0	0.342
	Positive	78	97.5	34	100.0	
Ground-glass opacities	Negative	9	11.25	3	8.8	0.128
	Positive	71	88.75	31	91.2	
Cavities	Negative	11	13.75	00	0.0	<0.001
	Positive	69	86.25	34	100.0	
Tree-in-bud sign	Negative	3	3.75	00	0.0	0.255
	Positive	77	96.25	34	100.0	
Nodules	Negative	43	53.75	2	5.9	0.001
	Positive	37	46.25	32	94.1	
Pleural effusion	Negative	13	16.25	16	47.6	0.003
	Positive	67	83.75	18	52.4	
Pleural thickening	Negative	52	65	5	14.7	0.001
	Positive	28	35	29	85.3	
Pericardial effusion	Negative	52	65	13	38.2	0.021
	Positive	28	35	21	61.8	
Lymphadenopathy	Negative	5	6.25	4	11.8	0.678
	Positive	75	93.75	30	88.2	
Bronchiectasis	Negative	60	75	7	20.6	0.001
	Positive	20	25	27	79.4	
Atelectasis	Negative	47	58.75	13	38.2	0.212
	Positive	33	41.25	21	61.8	
Calcified granuloma	Negative	66	82.5	14	41.2	0.002
	Positive	14	17.5	20	58.8	
Peribronchial thickening	Negative	58	72.5	8	23.8	0.012
	Positive	22	27.5	26	76.4	

On comparing HCRT between both the groups, we found that pleural effusion (0.003) was more in drug-sensitive patients as compared to drug resistance patients. Cavities ($P < 0.001$), nodules ($P = 0.002$), pleural thickening ($P = 0.012$), pericardial effusion ($P = 0.021$), bronchiectasis ($P = 0.002$), calcified granuloma ($P = 0.002$), and peribronchial thickening (0.012) were more common in drug resistance patients as compared to drug-sensitive patients. While the distribution of consolidation, GGO, and tree-in-bud opacities was quite higher in both the groups.

In the present study, age distribution of drug-resistant TB patients was 21–30 (44.1%), 31–40 (29.4%), and 41–50 (14.7%) where age distribution of drug sensitive was 31–40 (33.8%), 21–30 (23.8%), 41–50 (15%), and 61–70 (11.3%). This shows that the drug-resistant patients were comparatively younger than the drug-sensitive patents. Similar results were recorded by Cha *et al*.[13] where the mean ages were significantly different for the DS-TB group (mean age, 51 years; median age, 53 years; age range, 15–85 years, standard error, 1.61), the MDR TB group (mean age, 38 years; median age, 31 years; age range, 15–74 years, standard error, 2.41), or the XDR TB group (mean age, 36 years; median age, 30 years; age range, 19–75 years, standard error, 4.27). Patients with DS-TB were older as compared to patients with MDR TB or XDR TB.

In the present study, 82.4% of patients of multidrug-resistant TB were defaulters. Similar observation were made by Monadil *et al*.,[25] where out of 76 TB patients, 34 had a history of TB of which 17 (23.9%) were defaulters and later developed MDR TB which 50% of the patients with a history of TB.

CONCLUSION

Results of the current study show that tuberculosis is a major health burden mainly affecting the working age group males. Drug-resistant TB patients were comparatively younger than the drug resistant TB patients. Common constitutional symptoms among drug-sensitive patients were cough, fever, weight loss, night sweat, and hemoptysis. Smoking and drug defaultation were the major causes of MDR TB. HRCT examination shows that consolidation, tree-in-bud sign, lymphadenopathy, ground-glass opacities, nodules, and cavities were most common findings in drug-resistant tuberculosis patients, while pleural effusion, tree-in-bud opacities, and consolidation were most common findings in drug-sensitive patients.

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How to cite this article: Kaushal L, Rajput P. Comparison of high-resolution computed tomography Findings in Drug-Sensitive and Drug-Resistant Pulmonary Tuberculosis Patients. Int J Sci Stud 2020;8(5):88-97.

Source of Support: Nil, **Conflicts of Interest:** None declared.