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ORIGINAL RESEARCH ARTICLE

HIGH RESOLUTION COMPUTED TOMOGRAPHY AND CHEST X-RAY FINDINGS IN PATIENT WITH PULMONARY TUBERCULOSIS

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ABSTRACT

Background: Pulmonary Tuberculosis (PTB) is a major public health problem in Nepal. Diagnosis of pulmonary tuberculosis is done by bacteriological confirmation of respiratory specimen however Negative smear needs clinical and radiological evaluation for the diagnosis in suspected patient. This study focuses on radiological findings in both Pulmonary bacteriologically confirmed (PBC) and pulmonary clinically diagnosed (PCD) Tuberculosis.

Methods: This observational study was conducted at Chitwan Medical College between Feb 2019 to July 2019. 45 Patient diagnosed with PTB were enrolled. Chest X-ray (CXR) and High Resolution Computed Tomography (HRCT) chest reports were analysed for the presence of findings that suggest active infection like cavity, consolidation, tree in bud, etc in PBC and PCD.

Results: A total of 45 PTB patients with mean age: 54.60 ± 19 years were included. 53.3 % were PBC and 46.7 % were PCD tuberculosis, CXR findings in PBC and PCD tuberculosis was nodular infiltrate 45.8% versus 2.4%, consolidation 45% versus 42.9%, cavity 8.3% versus 14.3% respectively however 12.5% PBC tuberculosis patient had a normal chest x-ray. HRCT chest in PBC and PCD showed cavity in 45.8% versus 23%, tree in bud 25% versus 52.4%, consolidation 62.5 versus 57.1%, ground glass opacity 29.2% versus 23.8% respectively and none of the HRCT chest was normal. In comparison to the CXR, HRCT chest shows more cavitary lesions in PBC and tree in bud was more common in PCD.

Conclusions: This study has found that radiological findings suggestive of active PTB was more obvious in HRCT than CXR. Presence of cavity, lobar consolidation and tree in bud lesion in HRCT chest were more frequently observed in both PBC and PCD Tuberculosis.

INTRODUCTION

Tuberculosis (TB) is an infection caused by mycobacterium tuberculosis and is a leading cause of mortality, predominantly in developing country.[1] In Nepal total of 31764 cases of TB were notified and registered in 2016/17. About 71 % of all TB cases were pulmonary cases, out of which 77% were bacteriologically confirmed.[2] WHO classifies PTB into pulmonary bacteriologically confirmed tuberculosis (PBC) and pulmonary clinically diagnosed tuberculosis (PCD). Chest x-ray (CXR) is historically done in all the suspected patient of PTB but CXR is initially correct only in 49% of all cases.[3] On the other hand, High Resolution Computed Tomography(HRCT) scan of chest can correctly diagnose 91% of cases of PTB.[4] HRCT chest findings of active PTB include tree-in-bud appearance, lobular consolidation, cavitation and bronchial wall thickening.[5]

Although chest radiographs and sputum Acid-Fast Bacilli (AFB) usually provide adequate information for the diagnosis of active pulmonary tuberculosis, clinicians usually face the problem in sputum smears negative suspected PTB patients. In such situation they have difficulties about whether anti-tubercular therapy (ATT) should be initiated for these patients, because prompt initiation of ATT will make them non-infectious and eventually cured. In such scenario radiological imaging may help in early diagnosis of suspected disease.[6]

In patients with suspected PTB, when every effort to diagnose a case by bacteriological conformation fails, clinical and radiological features may help in formulating diagnosis. Despite this fact one of the major causes of delay in case detection is less frequent use of radiological modalities like CXR and HRCT chest. Hence this study aimed to evaluate chest X-rays and HRCT chest findings of Pulmonary Tuberculosis in both PBC and PCD tuberculosis.

METHODS

This observational study was conducted in authors center from Feb 2019 to July 2019 wherein 45 cases of pulmonary tuberculosis were included. Necessary permission from Institutional Review Committee (IRC) (ref no-076/077-004) was taken prior to the study. All the patients enrolled in this study were explained about the nature of the study and informed written consent was obtained. Relevant data was collected by direct interview and analysis of the final reports.

Patients age more than 18 years with bacteriologically con-

firmed pulmonary tuberculosis were undergone CXR and HRCT chest, clinically diagnosed pulmonary tuberculosis patient having CXR and HRCT chest and Patient under anti-tubercular therapy having CXR and HRCT chest were included in this study. Patient having Pleural pathology and patient with MDR PTB were excluded.

Patterns of disease activity were analyzed in both chest x-ray and HRCT by pulmonary critical care medicine (PCCM) fellows. The terms used for interpretation of radiological findings were presence or absence of cavity, lobar consolidation, infiltrates, ground glass opacity, micronodule, macronodule, bronchiectasis, tree in bud opacity etc. Findings were recorded in proforma and if radiological findings did not reveal any abnormality it was recorded as normal. SPSS version 16 was used for data recording and analysis. For the purpose of this study P-value of <0.05 was accepted as significant.

RESULTS

A of 45 patients (Range: 21 – 90 years) with mean age: 54.60 ± 19.01 years were enrolled in the study. There were 21 males (46.7 %) and 24 females (53.3 %). Cough and fever were the predominant symptoms in most of the patients while 15 patients (33.3 %) also had hemoptysis. Very few patients presented with anorexia and dyspnea. 57.8 % of the patient presented with symptom of >3 weeks duration. 10 patients (22.2 %) had past history of PTB, 13.3 % were current consumers of alcohol and 10/45 were current smokers. Chronic obstructive pulmonary disease, diabetes and hypertension were the most common comorbidities in these patients. Out of 45 patient, 24 (53.3 %) were PBC and 21 (46.7 %) were PCD Tuberculosis. The two groups were not different based on age, sex and duration of symptoms. Characteristics of study population in PBC and PCD (Table 1).

Table 1: Characteristics of study population in PBC and PCD group

Variables	PBC (n= 24)	PCD (n= 21)	p-value
Age (years)	51.75 ± 19.90	57.85 ± 17.86	NS*
Sex (Male/Female)	13-Nov	11-Oct	NS*
Duration of symptoms			NS*
<1 week	2	3	
1-2 weeks	6	8	
>3 weeks	16	10	

*NS=Non-Significant

Among PBC 4 samples were Gene x-pert positive. 8 patients (33.3 %) showed positive AFB reports in bronchoalveolar lavage (BAL) specimens. Common CXR findings in both PBC and PCD tuberculosis were nodular infiltrates 45.8% vs 52.4%, consolidation 45.8% vs 42.95%, cavity 8.3% vs 14.3% respectively, 4/24 chest x-ray showed hilar lymphadenopathy in PBC whereas only 1 chest rays shows hilar lymphadenopathy in PCD, 3/45 tuberculosis patient had a normal chest x-ray. Chest X-ray findings in PBC and PCD (Table 2).

Table 2: X-ray findings in bacteriologically confirmed pulmonary TB (PBC) and clinically diagnosed pulmonary TB (PCD)

X-ray findings	PBC (n = 24) (%)	PCD (n = 21) (%)
Normal	3 (12.5 %)	0
Fibrosis	1 (4.2 %)	0
Infiltrate (primarily nodular infiltrate)	11 (45.8 %)	11 (52.4 %)
Cavity	2 (8.3 %)	3 (14.3 %)
Consolidation	11 (45.8 %)	9 (42.9 %)
Nodular opacity	2 (8.3 %)	3 (14.3 %)
Hilar lymphadenopathy	4 (16.7 %)	1 (4.8 %)
Collapse	0	1 (4.8 %)
Pleural effusion	1 (4.2 %)	3 (14.3 %)
Miliary pattern	1 (4.2 %)	2 (9.5 %)

HRCT chest in PBC and PCD showed cavity in 45.8% vs. 23%, tree in bud 25% vs. 52.4%, consolidation 62.5 vs 57.1%, ground glass opacity 29.2% vs 23.8% respectively. None of the HRCT chest shows normal findings. In comparison to the chest x-ray cavity, tree in bud are more common findings in HRCT chest. HRCT findings in PBC and PCD (Table 3).

Table 3: HRCT findings in bacteriologically confirmed pulmonary TB (PBC) and clinically diagnosed pulmonary TB (PCD)

HRCT findings	PBC (n = 24) (%)	PCD (n = 21) (%)
Ill-defined nodule or macronodule	3 (12.5 %)	4 (19.0%)
Consolidation	15 (62.5 %)	12 (57.1 %)
Tree-in-bud	6 (25.0 %)	11 (52.4 %)
Cavity	11 (45.8 %)	5 (23.8 %)
Ground glass opacity (GGO)	7 (29.2 %)	5 (23.8 %)
Bronchiectasis	3 (12.5 %)	4 (19.0 %)
Atelectasis	1 (4.2 %)	3 (14.3 %)
Miliary pattern	2 (8.3 %)	1 (4.8 %)
Fibrosis or Septal thickening	3 (12.5 %)	7 (33.3 %)
Bronchial wall thickening	1 (4.2 %)	0
Hilar lymphadenopathy	2 (8.3 %)	1 (4.8 %)

DISCUSSION

Chest X-ray and Sputum AFB are routinely done in suspected PTB patient. CXR can be normal in persons with culture-confirmed pulmonary TB.7 In most of the tuberculosis centers, even after meticulous search the bacteriological positive yield from sputum is around 16 to 50% despite clinical profile and chest x-ray lesions being consistent with diagnosis of pulmonary tuberculosis.8 HRCT chest is better than plain chest radiograph

in identification of the disease activity of pulmonary TB, mostly in subtle areas of consolidation, cavitation, bronchogenic and miliary spread.[9]
In a study that compared the CXR and HRCT chest, HRCT showed cavities in 58% of patients with active PTB, whereas only 22% in chest radiographs.10 Findings in our study also shows cavity 45.8% in HRCT vs 8.3% in CXR of PBC and 23.8% vs 14.3% of PCD respectively. These findings suggest that HRCT is more superior in detection of parenchymal disease where chest x ray is inconclusive.

Majority of the patient in this study had a symptoms suggestive of PTB for more >3 weeks duration. Cough and fever was the more common symptoms, however 21/45 patient had negative sputum AFB for 2 consecutive samples and had minimal or no chest x-ray findings but HRCT chest showed consolidation in 12/21(57.1 %), tree in bud 11/21(52.4 %) and cavity in 5/21(23.8 %). Our results was consistent with the study conducted in Ankara, Turkey in 85 sputum negative pulmonary tuberculosis patient where centrilobular nodules, consolidation and cavity were significantly higher on HRCT in clinically suspected patient.[11]

In our study HRCT chest findings in PBC patients were consolidation(62.5 %), cavity (45.8 %), tree in bud (25.0 %), hilar lymphadenopathy (8.3 %) and miliary pattern 8.3%. where as chest x ray findings in same population was cavity 8.3% ,consolidation 45.8 % and nodular opacity 8.3 %. Findings of this study was consistent with another descriptive case study carried out in 50 AFB positive patient at Rawalpindi, HRCT chest findings in their study was lobular consolidation 84%, cavitation 76%, 'tree-in-bud' appearance 68%, lymphadenopathy 8% and miliary nodules in 4% cases.12 Similar results was seen in retrospective correlational study conducted over a period of six months in 50 patients by Drusty K. Majmudar in india.[13]

Patient with negative AFB sputum but having strong clinical and radiological suspicion of active PTB underwent bronchoscopy and BAL from HRCT suspected pathological area. Among them 8 patient showed positive for AFB in BAL samples. Findings of this study is supported by a study in 100 patients suspected to have smear-negative active pulmonary, where HRCT chest findings segregate higher risk patients among the suspected for further laboratory tests or bronchoscopy.[14]

There are some limitation to our study. As the imaging findings were analysed by fellows of pulmonary and critical care medicine there might be variation in findings of HRCT and CXR. BAL was not performed in all the sputum negative patient which could have underestimated the actual number of PBC Tuberculosis.

CONCLUSION

None Our study concluded that radiological findings are helpful in diagnosis of pulmonary tuberculosis patient, HRCT chest is more useful for recognition of disease activity than chest radiography. Findings like cavity, tree in bud and lobar consolidation are more clearly seen in HRCT which can easily be missed in chest x-ray, especially in sputum negative case.

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CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

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