A COMPARATIVE STUDY OF CHEST RADIOGRAPHIC FEATURES BETWEEN HIV SEROPOSITIVE AND HIV SERONEGATIVE PATIENTS OF PULMONARY TUBERCULOSIS

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ABSTRACT

Chest radiographic appearance of pulmonary tuberculosis (TB) in Human Immunodeficiency Virus (HIV) positive patients was reviewed. A study group of 50 HIV +ve cases and a control group of 100 HIV -ve cases were analysed. The chest radiographs of HIV seropositive group showed significantly higher incidence of thoracic lymphadenopathy (36% vs 8%, $P<.001$), pleural effusion (28% vs 10%, $P<.01$) and miliary pattern (12% vs 2%, $P<.05$) as compared to the seronegative group. Cavitation was less common in the seropositive group (8% vs 35%, $P<.001$) than the seronegative group. Upper zone involvement was significantly less common in the study group (38% vs 77%, $P<.001$) as compared to the control group.

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KEY WORDS : Chest radiograph; HIV infection; Pulmonary tuberculosis.

Introduction

Tuberculosis is as old as mankind. It has, for a long time, caused considerable morbidity and mortality all over the world especially in the developing countries like India. Nearly 100 years from the date of discovery of tubercle bacillus (in 1882), an entirely new fatal disease "AIDS" (Acquired Immuno Deficiency Syndrome) has shocked the entire world. From the beginning of AIDS pandemic, an association between *Mycobacterium tuberculosis* and HIV was noted. HIV infected people are increasingly found to have TB and conversely patients with TB are frequently found to have HIV infection [1].

In the absence of a positive bacteriologic examination, a chest radiograph provides an easily available and reasonably sensitive modality to detect a lesion, to assess the site, severity and extent of the disease. It also helps to make a presumptive diagnosis of pulmonary TB for early institution of treatment [2] especially for countries like India where TB is very prevalent. Various studies have revealed that pulmonary TB in HIV seropositive patients often presents atypical radiographic features [3,4]. Conversely, many patients of proven pulmonary TB with atypical chest radiographic findings are often found to be HIV seropositive [5,6].

Material and Methods

The present study was carried out in a referral hospital for chest diseases, which admits cases of pulmonary TB for indoor treatment. Between Dec 95 and Jan 97 a total of 50 HIV +ve patients with pulmonary TB and 100 patients of pulmonary TB who were HIV -ve were studied. Only hospitalised male patients were studied. All cases of pulmonary TB were routinely subjected to HIV screening test. Thus, patients were separated into two groups - those who were seropositive for HIV infection (study group) and those who were HIV seronegative (control group). For each seropositive pulmonary TB patient, two age matched HIV seronegative pulmonary TB patients (control group) were selected by systematic random sampling.

Exclusion criteria : (Both for cases and controls)

(a) Patients with rapidly evolving and/or resolving pulmonary infiltrates and patients with known concomitant non-tuberculous (eg. *Pneumocystis carinii*) pulmonary infection were excluded.

(b) Patients of pulmonary TB with a known concomitant disease (eg. pulmonary TB and diabetes mellitus, pulmonary TB and COPD etc) were also excluded from the study.

Collection of data : Each patient was interviewed and the investigator collected all data personally. Case sheets were con-

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sulted to confirm individual statements and other findings, which could not be obtained from the patients. Detailed medical and personal history of each case was recorded.

Investigations : The following investigations were carried out in each patient (both for cases and controls).

Blood test : Hb, TLC, DLC, ESR, LFT, blood sugar (fasting and post prandial), HBsAg, VDRL, blood urea, serum creatinine and serum uric acid. Each case was subjected to HIV screening test at two ICMR referral centers; Sputum smears (three different specimens) and culture for acid-fast bacillus (AFB); Mantoux test, pleural fluid analysis (wherever indicated), lymph node FNAC (wherever indicated).

Chest radiograph : Standard posteroanterior chest radiographs were taken routinely in all subjects at the time of admission. Lateral views and tomograms were taken wherever indicated. The initial chest radiographs (both for cases and controls) were evaluated for the following lesions : (a) hilar and/or mediastinal adenopathy, (b) localised pulmonary infiltrates involving middle or lower lung fields, (c) localized pulmonary infiltrates involving upper lung fields, (d) miliary infiltrates, (e) pulmonary cavity, (f) pleural effusion, (g) pericardial effusion, (h) diffuse scarring and fibrosis, (i) any other finding not noted above.

Each lung field was visually subdivided into three vertical zones of equal height (upper, middle and lower) from apex to the hemi-diaphragm. Abnormalities were located within a particular zone and their predominant distribution was established.

Criteria for diagnoses were as follows : (a) Pulmonary TB - Clinical, radiological, laboratory parameters (eg. sputum smears, culture, Mantoux test, lymph node FNAC, pleural fluid analysis etc) and response (clinical and radiological) to antitubercular treatment were taken into account for diagnosis of pulmonary TB [2,7,8]. (b) HIV positivity - Patients found to be seropositive by Enzyme Immuno Assay, at two ICMR referral centers were considered as study group.

The data so obtained were tabulated and subjected to standard statistical analysis (Chi square test for 2x2 contingency table) to achieve a valid comparison. Statistical significance was taken at $P < 0.05$.

Results

A total of 50 HIV seropositive (cases) and 100 HIV seronegative (controls) patients of pulmonary TB were studied. The mean age of presentation of HIV +ve pulmonary TB was 31 years. 93% of HIV +ve patients were 40 years and below. Overall sputum positivity (smear and/or culture) was significantly lower ($P < 0.005$) in HIV +ve group as compared to the HIV -ve group (16% vs 43%). Majority of patients in both the groups presented with cough, fever, weight loss in varying combinations, along with other symptoms. However, haemoptysis was a less common presenting feature (16% vs 49%) in the study group ($P < 0.001$) (Fig-1).

Chest radiograph findings : (Table-1, Fig-2, Fig-3 and Fig-4)

(a) Adenopathy : 18 (36%) HIV +ve cases demonstrated hilar adenopathy as compared to 8 (8%) in the control group ($p < 0.001$). Bilateral hilar adenopathy was more common ($p < 0.005$) in the study group (16% vs 2%) as compared to the control group. (b) Pulmonary infiltrates : incidence of upper zone (UZ) alveolar infiltrates was higher in the control group (77% vs 38%, $p < 0.001$). Bilateral upper zone distribution of infiltrates was also significantly higher in the control group than the study group (28% vs 10%, $p < 0.05$). However, there was no significant difference between the two groups in involvement of middle and/or lower zones. Although the control group showed apparently higher fre-

TABLE 1

Summary of chest radiograph findings

Chest radiograph findings	Study group HIV +ve (n=50)	Control group HIV -ve (n=100)	p value
(a) Adenopathy			
- Hilar (Total)	18 (36%)	08 (8%)	< 0.001
- Bilateral Hilar	08 (16%)	02 (2%)	< 0.005
- Paratracheal	01 (2%)	02 (2%)	NS
(b) Pulmonary infiltrates			
- Upper zone only	05 (10%)	30 (30%)	< 0.02
- Total upper zone	19 (38%)	77 (77%)	< 0.001
- Bilateral upper zone	05 (10%)	28 (28%)	< 0.05
- Mid zone	26 (52%)	58 (58%)	NS
- Lower zone	10 (20%)	26 (26%)	NS
- Diffuse (all zones)	03 (6%)	12 (12%)	NS
(c) Cavity			
- Total	04 (8%)	35 (35%)	< 0.001
- Bilateral	0 (0%)	05 (5%)	NS
(d) Miliary TB	06 (12%)	02 (2%)	< 0.05
(e) Pleural effusion			
- Total	14 (28%)	10 (10%)	< 0.01
- Bilateral	02 (4%)	0 (0%)	NS
(f) Pericardial effusion	02 (4%)	0 (0%)	NS
(g) Fibrosis, scarring with volume loss	04 (8%)	16 (16%)	NS

NS - Not significant

quency of diffuse infiltrates (i.e. all zones of one or both lung fields) as compared to the study group, this finding was not significant statistically ($p > 0.10$). It was also observed that overall, there was no significant predilection for involvement of any particular side (right or left) in both the groups. (c) Cavitation : only 4 (8%) HIV +ve patients showed evidence of cavitation as compared to 35 (35%) of HIV -ve patients ($p < 0.001$). 5 (5%) control group patients had multiple cavities as compared to none in the study group. (d) Miliary tuberculosis : the study group showed significantly higher frequency of miliary tuberculosis as compared to the

Fig. 1 : Symptoms at presentation in HIV positive and negative patients Pul - Pulmonary

Fig. 2 : Chest radiograph findings in HIV +ve and HIV -ve pulmonary TB patients Pul - Pulmonary; PI - Pleural

control group (12% vs 2%, $p < .05$). (e) Pleural effusion : pleural effusion was found in 14 (28%) of HIV +ve cases as compared to 10 (10%) HIV -ve patients ($p < .01$). 2 (4%) HIV +ve cases showed bilateral pleural effusion as compared to none in the control group. (f) Pericardial effusion : 2 (4%) HIV +ve cases, in addition to other lesions also had pericardial effusion. Pericardial effusion was not seen in any of the control group patients. (g) Fibrosis and scarring : although the control group showed slightly higher number of patients with fibrosis and scarring leading to volume loss (16% vs 8%), this finding was not significant statistically ($p > .05$).

Discussion

The present study was carried out to compare the chest radiographic findings of pulmonary TB in HIV +ve and HIV -ve patients admitted for indoor treatment. All were male patients of Armed Forces referred from various parts of the country. Majority of the study group patients were relatively young. Similar age trend was earlier reported by Mohanty et al [9] from Bombay and Solomon et al [10] from Madras.

Various studies worldwide reported 31-82% sputum positivity for HIV seropositive pulmonary TB [11]. We have observed relatively low (16% and 43%) sputum positivity rate for both study and control group. The reason for this low sputum positivity rate is not clear and needs further studies. Our study also revealed that haemoptysis as a presenting feature was much less common ($p < .001$) in the study group. This aspect was not highlighted by earlier studies.

Intrathoracic adenopathy has been reported in 25%-

Fig. 3 : Bilateral hilar adenopathy in a HIV +ve patient

Fig. 4 : Bilateral lower zone involvement with pleural effusion (right) in a HIV +ve patient

59% of HIV +ve pulmonary TB cases [3,11,12,13]. The present study confirms a similar (36%) incidence of intrathoracic adenopathy in HIV +ve cases. Moreover, it was also noted that the frequency of bilateral hilar adenopathy was significantly higher in HIV +ve group ($p < .005$), a feature not highlighted by the earlier authors. While Saks et al [13] found a very high incidence of para tracheal lymphadenopathy, the same was not noted in our study.

The control group showed significantly higher incidence of upper zone distribution of alveolar infiltrates as compared to the study group (77% vs 38%) confirming similar observations made earlier [3,14].

While Pitchenik et al [3] and Batungwanayo et al [14] observed significantly higher involvement of middle and lower zones in AIDS patients, the present study did not reveal any such association.

Cavitations have been reported in various studies varying from 0-56% in HIV +ve pulmonary TB cases [3,7,9,13,15]. Among the Indian population, higher incidence of cavitation was noted in HIV +ve cases, in Pondicherry series (50% of 6 patients) [15] and in a study at Madras (91.67% of 24 patients) [10]. Mohanty et al [9] also reported higher incidence of cavitation in both the groups (52.63% vs 54.25%). In contrast, our study revealed a significantly low incidence of cavitation in both the groups. Increased frequency of miliary TB (12% vs 2%, $P < .05$) and pleural effusion (28% vs 10%, $p < .01$) observed in the study group confirms earlier reports [3,13,14]. Normal radiographs have been reported in various series in 5-14% cases [3,16,17,18]. However, the present study did not reveal normal chest radiograph with pulmonary tuberculosis.

Limitations of the study

- The present study has the inherent limitation of a case control study eg. selection and information biases. However, adequate care has been taken to minimize such biases.
- Only male patients were studied. Hence it is not possible to comment on the influence of sex, if any, on the disease state in question and chest radiographic findings.
- CD4 counts could not be done because of lack of facility and hence chest radiographic findings could not be correlated with the degree of immunodeficiency, which would have been ideal.

The strong link between HIV and TB is a well established fact now. Radiologists, in their day to day practice will be confronted, on one hand with infrequent typical adult onset pulmonary TB and on the other hand, with sufficient number of unusual manifestations of TB and will find difficulty in differential diagnosis of individual cases. Suffice to say, that one needs to have knowledge of the current epidemiological trends as well as familiarity with the common and uncommon presentations of TB. Clinicians need to have a high index of suspicion and low threshold for initiation of treatment if we are to manage TB in the era of HIV and atypical chest radiographs.

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