Original Research Article

To Study Pulmonary Complications in Patients Living with HIV (PLH) in a Tertiary Care Hospital in India

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ABSTRACT

Background: Pulmonary disease is one of the most frequent complications of HIV infection. Three of the 10 most common AIDS-defining illnesses are recurrent bacterial pneumonia, tuberculosis, and pneumonia due to the unicellular fungus P. jirovecii¹. Pneumocystis jirovecii pneumonia is hallmark of AIDS².

Aims and Objectives: To study pulmonary complications in people living with HIV and radiological findings in lungs of PLHIV with pulmonary disease by Digital chest X-ray, HRCT (High resonance computed tomography) Thorax.

Material and Methods: Study period for this cross sectional study was from December 2018 to January 2019 and the total number of HIV patients admitted on IPD and OPD basis who fulfil inclusion and exclusion criterion was 60 in this duration with pulmonary involvement. The distribution of disease was expressed in proportion.

Results: In pulmonary tuberculosis patients with HIV, consolidation was most common finding on both digital chest x-ray and HRCT thorax. Prevalence of Pneumocystis jiroveci pneumonia, tuberculosis and Bacterial pneumonia was maximum in patient having cd4 count <50,200-500, >200/micro litre respectively. In pneumocystis jiroveci pneumonia maximum patients had ground glass haziness on chest X ray, prevalence of lower zone involvement was maximum followed by upper zone.

Conclusion: Prevalence of tuberculosis was maximum in patient with HIV followed by bacterial pneumonia and pneumocystis jiroveci pneumonia respectively. Most of the bacterial pneumonia patients had consolidation on digital chest x-ray (PA view) and most of the patients with ground glass haziness on chest x ray have pneumocystis jiroveci pneumonia infection.

Keywords: Pneumocystis jiroveci, PLHIV, HRCT, AIDS.
Introduction
Pulmonary system is most commonly involved system in PLHIV. In PLHIV, immunity is suppressed, hence lungs are prone for infectious and non-infectious pulmonary disease. Pneumonia is most common pulmonary manifestation followed by tuberculosis and pneumocystis jirovecii pneumonia. India is the second most populous country in the world and is ranked first among the 22 high burden countries, which accounts for 80% of all estimated incident cases of TB worldwide.

About 1/3 of deaths, all AIDS related death is associated with tuberculosis. Tuberculosis is the primary cause of death in 10-12% of HIV infected patients. About 60-80% patients with tuberculosis have pulmonary disease. MAC (Mycobacterium Avium Complex) infection is the late complication of HIV infection mostly seen in patients with CD4 COUNT<50.

Aims and Objectives
1. To study pulmonary complications in people living with HIV diagnosed by ELISA method.
2. To study relation between CD4 count and pulmonary disease in PLHIV.
3. To study radiological findings in lungs of PLHIV with pulmonary disease by Digital chest X-ray, HRCT (High resolution computer tomography) Thorax

Material and Methods
This cross sectional study was conducted in UPUMS (Uttar Pradesh university of medical sciences) Saifai, Etawah, India. The study period was from December 2018 to January 2019 and the total number of patients admitted on IPD and OPD basis who fulfill inclusion and exclusion criterion was 60 in this duration with pulmonary involvement, after taking written informed consent from patients. Blood sample were tested for anti –HIV antibodies by ELISA method. A detail clinical history and examination was done and relevant information related to each patient was filled in proforma.

Duration of Study
The study period was from December 2018 to January 2019.

Inclusion Criteria
1) HIV positive patient diagnosed by ELISA method.
2) Age >18yrs
3) Patients having pulmonary symptoms.

Exclusion Criteria
1) Age <18yrs
2) PLHIV with only URTI (upper respiratory tract infection).
3) HIV negative patients.
4) Patients not willing to give consent for study.

Following investigations were done.
1) Digital Chest x ray (PA view) for all patients.
2) Routine blood investigations in form of Blood culture, LFT, KFT, CBC, CD4 counts in all patients.
3) Sputum for AFB -1 sample on admission, AFB-2 early morning sample on day 2 of admission.
4) Sputum for gram staining AFB (Acid Fast Bacillus)
5) Sputum for culture and sensitivity for all patients.
6) PAS Stain for MAC (Mycobacterium Avium Complex).
7) Sputum for pneumocystis jiroveci for GMS staining.
8) Pleural fluid study i.e. cyto, biochem and ADA (Adenosine Deaminase) for all patients.
9) HRCT thorax in suspected patient in whom digital chest X-ray (PA view) is normal.
10) FNAC (Fine needle aspiration cytology) of lymph nodes in patients present with lymphadenopathy.
11) Markers of acute inflammations as CRP (C – Reactive Protein), ESR (Erythrocyte sedimentation rate).
Statistical Methods
The data was encoded in MS Excel and analysed using SPSS 23. The distribution of disease was expressed in proportion to know the difference in distribution.

Observations and Results
In present study 77% were tuberculosis patient, followed by 20% were bacterial pneumonia patient followed by 3% were pneumocystis jirovecii pneumonia.

Digital Chest X- Ray Findings
In present study, tuberculosis patients with following chest x ray findings are seen- Consolidations in 36.6% patient, pleural effusion 26.66% patients, Fibronodular infiltrate 7.8% patients, cavitory lesion in 7.8 % patients, miliary tuberculosis in 13.33%,bilateral extensive tuberculosis 5%, Pneumothorax in 1.6% patients statistically this is significant.
In present study all pneumocystis jiroveci affected patients have ground glass haziness on digital chest x ray out of which 33.33% patients had 1 zone involvement and 66.66% patient had >1 zone involvement.

HRCT Thorax Findings
In present study HRCT thorax was done in suspected cases whose digital chest X-ray was normal, to rule out, pulmonary involvement, pleural effusion, suspected pneumocystis jirovecii pneumonia. In present study HRCT was done for 34 patients. Consolidation seen in 56% patient. Out of 5 patients of pneumocystis jiroveci pneumonia, HRCT thorax showed ground glass Haziness in 100% patient who were suspected of pneumocystis jiroveci pneumonia. HRCT thorax showed mediastinal lymphadenopathy in (17.64%) patients, fibronodular infiltrates in (14.70%) patients, consolidation in (55.88%) patients, Pneumothorax in (11.76%) patients.

Discussion
Pulmonary system is most common system involved in PLHIV. In HIV patients decreased immunity make patients more prone for infection. Low CD4 count is responsible for opportunistic Infections in PLHIV. Present cross sectional study was conducted in UPUMS (Uttar Pradesh university of medical sciences) Saifai, Etawah. India, with 60 HIV positive patients in specified duration of time with pulmonary involvement who fulfil exclusion and inclusion criterion, after taking written informed consent from patients.
All relevant laboratory investigations including digital x ray chest, HRCT thorax, sputum for AFB, sputum for gram staining day 1 and day 2, pleuralfluid study, Sputum for GMS stain for pneumocystis jiroveci infection, sputum for PAS, sputum for culture sensitivity, FNAC of lymphnode, complete blood count, liver function test, renal function test, erythrocyte sedimentation rate were performed .In present study HRCT thorax was done only in patient who were suspected for pneumocystis jirovecii pneumonia, cases of pleural effusion and patients who was clinically suspected to have pulmonary involvement but chest x-ray was normal.
In present study incidence of tuberculosis was highest 80%, followed by bacterial pneumonia 15%, followed by pneumocystis jirovecii pneumonia 5%. Mycobacterial avium complex infection is rare now days because of use of HAART as mentioned in pie chart.
Table 1 Disease wise distribution of study population

These findings are similar to the study conducted by Asmita A. Mehata et al. in which 72% patient had tuberculosis, 22% patient had bacterial
pneumonia. 6% patient had Pneumocystis jirovecii pneumonia, 2% patients had cryptogenic meningitis with pulmonary infiltrates.

In our study in bacterial pneumonia cases 15% patients had CD4 count >500 cells/μl, 44.4% patients had CD4 count 201-500 cells/μl, 33.33% patients had CD4 count 151-200 cells/μl, 11.11% patients had CD4 count 101-150 cells/μl, 11.11% patients had CD4 count <50 cells/μl. Chi square test applied to it p<0.01 indicates this findings highly significant.

Similar findings found in study conducted by Toshniwal SP et al9 in which 17.64% patients had CD4 count >500 cells/μl, 50.9% patients had CD4 count 200-500 cells/μl, 31.37% patients had CD4 count <200 cells/μl.

Table 2 Co-relation between cd4 count and incidence of diseases

| CD4 Count (cells/μl) | Bacterial pneumonia Pt.(%) | Tuberculosis Pt.(%) | PJP Pt.(%) |
|----------------------|---------------------------|--------------------|-----------|
| >500                 | 15                        | 4.16               | 0         |
| 201-500              | 44.4                      | 37.5               | 0         |
| 151-200              | 33.33                     | 16.66              | 0         |
| 101-150              | 11.11                     | 20.83              | 33.33     |
| 51-100               | 0                         | 12.5               | 0         |
| <50                  | 11.11                     | 8.33               | 66.66     |

In our study in 4.16% tuberculosis patients have CD4 count >500 micro lit, 37.5% tuberculosis patients had CD4 count 201-500 cells/μl, 16.66 % tuberculosis patients had CD4 count 151-200 cells /μl, 20.83% tuberculosis patients had CD4 count 101-150 cells/μl, 12.5% tuberculosis patients had CD4 count 51-100 cells/μl, 8.33% tuberculosis patients had CD4 count <50/μl. Chi square test applied p<0.01indicates it is highly significant.

This findings similar to the study conducted by Halgarkar CS et al.10 except instead of getting maximum number of tuberculosis seen in patients having CD4 count 201-500 cell/μl here they get in patients having CD4 count 151-199 cells/μl. In this study 19.35% patients had CD4 count 201-500 cell/μl, 48.38% patients had CD4 count 151-200 cell/μl, 17.74% patients had CD4 count 101-150 cell/μl, 11.29% patients had CD4 count 51-100 cell/μl, 3.22% patients had CD4 count<50 cells/μl.

As immunity decreases incidence of tuberculosis also increases. CD4 T lymphocyte counts an important biomarker that provides assessment of immune system status of HIV infected patients while pneumocystis jiroveci pneumonia is most common complications of AIDS. In present study in Pneumocystis jirovecii pneumonia (PJP) 0% patients had CD4 count >150 cells /μl, 33.33% patients with pneumocystis jirovecii infection had CD4 count 101-150 cell/μl, 66.66% patients with pneumocystis jirovecii infection had CD4 count <50 cell/μl.

Table 3 Chest X-ray finding in study population

| CXR Finding              | Number of Pt.(%) |
|-------------------------|------------------|
| Consolidation            | 36.66            |
| Pleural effusion         | 26.66            |
| Miliary TB               | 13.33            |
| Cavitary lesion          | 7.8              |
| Fibronodular infiltrate  | 7.8              |
| Bilateral extensive TB   | 5                |
| Pneumothorax             | 1.6              |

In present study prevalence of consolidations is maximum (36.66%) followed by pleural effusion (26.66%), miliary tuberculosis (13.33%) cavitatory lesion (7.8%), fibro nodular infiltrate (7.8%), bilateral extensive tuberculosis 5% and Pneumothorax (1.6%) less frequently. Chi square test applied p=0.02 indicate this finding are highly specific.

Similar findings seen in study conducted by A. Ahidjo A et al.11 In which consolidation in 25% patient, pleural effusion in 16.7% patient, 20% patient had miliary tuberculosis.

Table 4 co-relation between chest xray finding in pneumocystis jirovecii pneumonia patients

| CXR Finding | PJP pt.(%) |
|-------------|-----------|
| 1 Zone      | 33.33     |
| >1 Zone     | 66.66     |
| Upper Zone  | 33.33     |
| Middle Zone | 0         |
| Lower Zone  | 66.66     |
In present study about all patients with ground glass haziness on chest x ray 66.66% patient has more than 1 zone involvement and 33.33% patient has 1 zone involvement. In present study prevalence of upper zone, middle zone, lower zone are 33.33%, 0%, 66.66% respectively. Ground glass haziness indicates early stage of pulmonary alveolar infiltration of pneumocystis jirovecii. This one of the marker of AIDS. Chi square test applied. p>0.01.

Table 5 HRCT finding in Tuberculosis and PLHIV patients.

| HRCT Finding             | TB Pt.(%) |
|-------------------------|-----------|
| Consolidation           | 56        |
| Mediastinal Lymphadenopathy | 53      |
| Fibronodular infiltrate | 40        |
| Cavitary lesion         | 16        |
| Pneumothorax            | 12        |

In present study prevalence of consolidation, mediastinal lymphadenopathy, fibro nodular infiltrate, cavitory lesion, Pneumothorax in tubercular patient are 56%, 53%, 40%, 16%, 12% respectively. Chi square test applied which comes out to be highly significant (p<0.01). Similar findings were observed in study carried out by Pu-xuan liu et al in which 56% patient had ground glass haziness, consolidations in 12% patient, 20% patient had lung cyst, mixed lesion in 6% patient.

Summary and Conclusion
Present study is cross sectional study with 60 HIV positive patients admitted in UPUMS Saifai hospital during time period December 2018-January 2019 on OPD and IPD basis. This study is done to know pulmonary complications among PLHIV.

Following observation were noted and conclusions were drawn.

1) In present study prevalence of tuberculosis was maximum inpatients followed by bacterial pneumonia and pneumocystis jirovecii pneumonia respectively.
2) In present study prevalence of bacterial pneumonia was maximum in patients having CD4 count >200 cells/micro lit, prevalence of tuberculosis is maximum inpatient having CD4 count between 201-500/micro lit, prevalence of pneumocystis jirovecii pneumonia is maximum in patient having CD4 count <50/micro lit.
3) In pneumocystis jirovecii pneumonia maximum patients had ground glass haziness. On chest X-ray, prevalence of lower zone involvement was maximum followed by upper zone and more than one zone involvement in digital chest x ray was significant finding.
4) In pulmonary tuberculosis patients with HIV most common finding was consolidation followed by pleural effusion, military TB, Cavitary lesion, fibro nodular infiltrate, bilateral extensive tuberculosis, pneumothorax on chest X-ray.
5) In pulmonary tuberculosis patients with HIV most common HRCT findings was also consolidation followed by mediastinal lymphadenopathy, fibro nodular infiltrate, cavitory lesion, Pneumothorax.

Limitations of Study
1) Small sample population.
2) We could not follow up our discharged patients.

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