

ORIGINAL RESEARCH**A HOSPITAL BASED STUDY ON OPPORTUNISTIC PULMONARY INFECTIONS IN HUMAN IMMUNODEFICIENCY VIRUS (HIV) POSITIVE PATIENT IN RELATION TO CD4 COUNT AND ITS THERAPEUTIC OUTCOME****Umesh Prasad¹, Vidya Nand²****Authors' Affiliations:** ¹Associate Professor, Department of Medicine, Rajendra Institute of Medical Science, Ranchi; ² Assistant Professor, Department of Medicine, Rohilkhand Medical College & Hospital, Bareilly, UP**Correspondence:** Dr. Vidya Nand, email: drvidyanand@gmail.com**ABSTRACT**

Introduction: Pulmonary disease is one of the frequent complications of HIV infection. This study is carried to identify the opportunistic pathogens associated with pulmonary infection in HIV patients, To study association of various symptoms in HIV patients with opportunistic pulmonary infection, To study clinical findings associated with pulmonary opportunistic infection in HIV patients, To study radiological (chest X-ray) findings associated with opportunistic pulmonary infections in HIV patients and to study the association between the opportunistic pulmonary infection in HIV patients and CD4 cell counts.

Methods: Study was conducted in those patients admitted in the Department of Medicine and patients attending ART centre, RIMS, Ranchi, satisfying following criteria- Elisa positive for HIV with sign, symptom and investigation supporting the patients, categorization as AIDS, Patients who were more than 14 years of age. Both sexes were included.

Results: out of 100 patient of HIV , that majority of patients with pulmonary infection belongs to age group 21-40 years which is about 43/64 (67.1%), of which 39 were male and 4 were female. The prominent symptom were cough 31 (48.43%), fever 26 (32.81%), dyspnea 22(34.37%), and the most common OPI is tuberculosis which is common in CD4 count <400 and it comprises 45.3%.

Conclusions: Opportunistic pulmonary infection is common in HIV patients especially with low CD4 counts. The present study design prospectively identifies the spectrum of pathogen causing Opportunistic pulmonary infections in HIV patients with relation to CD4 count, their clinical features and various radiological features associated with them and their therapeutic outcome.

Key words: opportunistic pulmonary infection, HIV, CD4 count, Therapeutic outcome

INTRODUCTION

Acquired immune deficiency syndrome (AIDS) was first recognized in the United States (U.S.) in the summer of 1981¹, when the U.S. centre for Disease Control and Prevention (CDC) reported the unexplained occurrence of Pneumocystis jiroveci pneumonia² in five previously healthy homosexual men in Los Angeles and of Kaposi Sarcoma^{3,4} (KS) with or without Pneumocystis jiroveci pneumonia (PCP) in 26 previously healthy homosexual men in New York and Los Angeles.

The emerging endemic of Acquired Immunodeficiency Syndrome has resulted in the existence of many immunocompromised patients. Pulmonary disease is one of the frequent complications of HIV infection. The most common manifestation of pulmonary disease is pneu-

monia. The two most common causes of pneumonia are bacterial infections and the unicellular fungus PCP infection⁵. Other major causes of pulmonary infiltrates include mycobacterial infections⁶, other fungal infections, nonspecific interstitial pneumonitis, KS and lymphoma⁷. Approximately 25% of cases of HIV associated pneumocystis pneumonia occur in patients who are unaware of their HIV status. The risk is greatest among those who have experienced a previous bout of PCP and those who have CD4+ T cell count of <200/ μ L⁸.

Worldwide, approximately one third of all AIDS-related death is associated with Tuberculosis. HIV infection increases the risk of developing active tuberculosis by factor of 100.

Fungal infections of the lung, in addition to pneumocystitis, can be seen in patients with AIDS. Over half of patients are fungemic and 90% of patients have concomitant CNS infections. Most patients with this condition have CD4 counts <200/ μ L.

OBJECTIVES

To identify the opportunistic pathogens associated with pulmonary infection in HIV patients, To study association of various symptoms in HIV patients with opportunistic pulmonary infection, To study clinical findings associated with pulmonary opportunistic infection in HIV patients, To study radiological (chest X-ray) findings associated with opportunistic pulmonary infections in HIV patients and to study the association between the opportunistic pulmonary infection in HIV patients and CD4 cell counts.

MATERIAL AND METHODS

Study was conducted in those patients admitted in the Department of Medicine and patients attending ART centre, RIMS, Ranchi, from June 2010 to September 2011, after approval from college ethical committee and written consent from patients satisfying following criteria:

Inclusion Criteria: Elisa positive for HIV with sign, symptom and investigation supporting the patients,

categorization as AIDS. Patients who were more than 14 years of age. Both sexes were included.

Exclusion Criteria: Patients with haematological malignancy, Patients of chronic renal failure on dialysis/planned for renal transplant or on high dose steroids or poorly controlled Diabetes mellitus patients, Patients on Immunosuppressive therapy, Patients of Autoimmune disease taking immunosuppressive drugs.

Study measure: All the 100 patients selected for study was subjected to detailed history, clinical examination, microscopic Elisa of HIV, CD4 cell count (by flow cytometry method), TC, DC (manual by slide and cell counter method), ESR (wintrobe’s method), Hb% (cyanmethemoglobin method), sputum for acid fast bacilli, radiological investigation (chest x-ray), examinations and culture in specific media etc. The data obtained was subjected to statistical analysis.

OBSERVATION

Present study was conducted in the Department of Medicine in collaboration with Department of Microbiology, Rajendra Institute of Medical Sciences, Ranchi. The duration of study was fifteen months from June 2010 to September 2011.

We selected 100 HIV positive patients purposively from wards of medicine and ART centre with findings suggestive of lower respiratory tract infection.

Table 1: Age and sex distribution of cases in different groups

Age group (years)	Male	Female	Total	Male with pulmonary symptoms	Female with pulmonary symptoms	Patients with pulmonary infection
14-20	6	3	9 (9%)	4	0	4(6.2%)
21-30	19	5	24 (24%)	15	2	17(26.5%)
31-40	25	3	28 (28%)	24	2	26(40.6%)
41-50	18	3	21 (21%)	10	2	12(18.7%)
51-60	13	2	15 (15%)	4	0	4(6.2%)
>60	3	0	3 (3%)	1	0	1(1.5%)
Total	84	16	100 (100%)	58	6	64(100%)

From the table-1 it can be seen that out of 100 patients, 9 (9%) patients were in age group 14-20 years, 24 (24%) between 21-30 years, 28(28%) between 31-40 years, 21(21%) between 41-50 years, 15 (15%) between 51-60 years age and 3 (3%) were >60 yrs of age. Out of 100, 84 were male and 16 were female.

From table-1 we also observed that majority of patients with pulmonary infection belongs to age group 21-40 years which is about 43/64 (67.1%), of which 39 were male and 4 were female. Pulmonary infection in age groups between 14-20 yrs and 51-60 years and >60 years were 9(14.0%), which is less as compared to age groups 21-40 years.

Table 2: Incidence of the sign and symptoms in HIV patients

Sign and Symptom	Pulmonary infection positive (%)
Cough	31 (48.43)
Expectoration	21 (32.81)
Fever	26 (40.62)
Dyspnea	22 (34.37)
Chest pain	10 (15.62)
Clubbing	7 (10.93)
Cyanosis	13 (20.31)
Crepitation	19 (29.68)
Rhonchi	4 (6.25)
Bronchial breath sound	12 (18.75)

It has been observed that prominent symptoms were cough 31 (48.43%), fever 26 (32.81%), dyspnea 22(34.37%), expectoration 21(32.81%) and chest pain 10(15.62%). Among the signs, crepitations were seen in

19(29.68%), cyanosis 13 (20.31%), bronchial breath sound 12 (18.75%) rhonchi in 4(6.25%).

Table 3: Relation of CD4 count and OPIs

CD4 Count	OPIs	Case of OPIs	%	
<400	Tuberculosis	29	45.3%	
<250	M. catarrhalis, Staphylococcus, Streptococcus pneumoniae	3 11 10	36.8%	
<200	Pseudomonas	4		6.25%
<100	H. influenza	7		10.9%
Total		64	100%	

From the above mentioned table it is clear that most common OPI is tuberculosis which is common in CD4 count <400 and it comprises 45.3%. In CD4 count <250 M. catarrhalis, Staphylococcus, and Streptococcus pneumoniae are common which comprise 36.8%. In CD4 count <200 pseudomonas is common and it comprise 6.25% and in CD4 count <100 H. influenzae is commonly found and comprise 10.9%.

Table 4: Comparison of normal and abnormal x-ray chest in HIV patients

Opportunistic pulmonary infection	Normal X-ray	Abnormal X-ray	Total
Sputum Positive	6	56	62
Sputum Negative	30	8	38
Total	36	64	100

On comparison of normal and abnormal chest X-ray with sputum positive or negative for opportunistic pulmonary infection, sputum positive with normal X-ray were 6 and with abnormal X-ray were 56. Sputum negative for opportunistic pulmonary infection with normal x-ray were 30 and with abnormal X-ray were 8. So total normal x-ray were 36 and that of abnormal one were 64 and total sputum positive were 62 and negative were 38.

DISCUSSION

Pulmonary infections are the most common opportunistic infection affecting HIV patients. The subject of pulmonary infection is assuming an added importance because the number of immunocompromised patients is increasing due to HIV. Prevention strategies for pulmonary infections and diagnostic methods have evolved and patient's outcome has improved. This study involved hundred HIV positive patients who came to medicine department and ART centre. Incidence of opportunistic pulmonary infection is more in HIV patients than normal individuals⁹, especially with CD4 counts less than four hundred. According to Robert E. Hirschtick, Jeffrey Glassroth, incidence of bacterial pneumonia is 5.5 per person, per year in HIV patients whereas it is 0.9 per person in normal individuals.

While the rate of OPI in HIV patients has dramatically decreased under antiretroviral therapy^{10,11}, we are seeing more patients with pulmonary infections who are not taking ART or who are neglecting ART. Among the opportunistic pulmonary infections that occur in HIV patients, tuberculosis and bacterial pneumonias are most common. Both account for sixty four percent of pulmonary infection and is associated with high morbidity and mortality. Rapid and accurate diagnosis of pulmonary infection is important, not only because of the high morbidity and mortality associated with infection but also because of low CD4 counts.

The sputum microscopy and culture sensitivity and chest radiograph are an essential tool for diagnosing the opportunistic pulmonary infections. However radiography is seldom inadequate because it's findings are seldom specific for the detection of a particular pathogen. It is necessary to go beyond the radiologic finding and incorporate knowledge of which pathogens are likely to affect patients in a particular clinical setting. The setting compromise specific epidemiologic and environmental exposure, CD4 counts and the duration and severity of the disease are also to be taken with account.

This study involved 100 randomly selected HIV patients with suspected pulmonary infection. Sputum has been examined for microscopy and culture sensitivity and chest radiography as been done to find out opportunistic pulmonary infections.

Most of the patients came from Hazaribagh, Dumka and Ranchi and 95% of patients were from low socio-economic status and 80% patients gave history of visiting metropolitan cities with history of contact and 10% patients gave history of blood transfusion earlier.

We observed that majority of patients with pulmonary infection belongs to age group 21-40 yrs which is about 43/64 (67.1%), of which 39 were male and 4 were female. Pulmonary infection in age groups between 14-20 years and 51-60 years and >60 years were 9(17.3%), which is less as compared to age groups 21-40 years.

It has been observed that prominent symptom were cough 31 (48.43%), fever 26 (32.81%), dyspnea 22 (34.37%), expectoration 21(32.43%) and chest pain 10 (15.62%). Among the signs, crepitations were seen in 19 (29.68%), cyanosis 13 (20.31%), bronchial breath sound 12 (18.75%) rhonchi in 4 (6.25%).

The opportunistic pulmonary infections common are tuberculosis, staphylococcus aureus, streptococcus pneumonia, Moraxella catarrhalis, hemophilus influenza, and pseudomonas, of these infections most common is tuberculosis.

In CD4 count <400, Tuberculosis was more common which comprises 45.3%, H. influenza comprises 10.9%, M. catarrhalis comprise 4.6%, Staphylococcus comprise 11% and S. pneumoniae comprises 10% and pseudomonas 6.25%. Rimland *et al* studied 230 patients. A causative organism was identified in 67%. PCP was diagnosed in 36%. There were 81 cases of bacterial pneumonia, 34.5% due to *Streptococcus pneumoniae* and 28.4%

due to *Haemophilus influenzae*. Atypical organisms were identified in only 3.7% and only in the presence of another organism. In the 33% of cases with no specific organism, the authors suspected a probable bacterial etiology in 95%. *Mycobacterium tuberculosis* accounted for 6.2% and Alagiriswami, presented a case report and review of influenza complicating HIV infection. The patient in that report had a CD4 count of 97/ μ L. He also found that Tuberculosis is most common in patients with CD4 count <400/ μ L. Madeddu, Giordano and other studied on 236 HIV patients that *Streptococcus pneumoniae* is the most common causative agent and is frequently associated with bacteriemic disease even in low-risk patients according to pneumonia severity index.

Polsky B, Gold JW, Whimbey E, Dryjanski J and other studied that, eighteen episodes of community-acquired bacterial pneumonia were diagnosed in 13 patients among 336 with the acquired immunodeficiency syndrome (AIDS) cared for at Memorial Sloan-Kettering Cancer Center since 1979. Bacterial pathogens isolated in 16 of 18 episodes were *Haemophilus influenzae* in 8, *Streptococcus pneumoniae* in 6, group B streptococcus in 1 and *Branhamella catarrhalis* in 1. On comparison of normal and abnormal chest X-ray with sputum positive or negative for opportunistic pulmonary infection sputum positive with normal X-ray were 6 and with abnormal X-ray were 56, sputum negative for opportunistic pulmonary infection with normal X-ray were 30 and with abnormal X-ray were 8. So total normal X-ray was 36 and that of abnormal one were 64 and total sputum positive were 62 and negative were 38. 55% patients had bilateral distribution and 45% had unilateral distribution with 67% had focal involvement and 33% and extensive lesions.

All OPIs are treated after drug sensitivity testing and reviewed after two to three weeks with microscopy and culture sensitivity of sputum and a chest X-ray, and therapeutic outcome was 70% and after second line of treatment it was 100%. Eight patients died during the course of study and all eight were of tuberculosis, with mortality rate 12.5% in OPI positive patients.

CONCLUSION

Opportunistic pulmonary infection is common in HIV patients especially with low CD4 counts. The present study design prospectively identifies the spectrum of pathogen causing Opportunistic pulmonary infections in HIV patients with relation to CD4 count, their clinical features and various radiological features associated with them and their therapeutic outcome. In this study total hundred HIV positive patients purposively se-

lected. Incidence of opportunistic pulmonary infection is more in HIV patients than normal individuals, especially with CD4 counts less than four hundred. Most of the patients are from low socioeconomic status and 80% patients gave history of visiting metropolitan cities with history of contact and 10% patients gave history of blood transfusion earlier. majority of patients with pulmonary infection belongs to age group 21-40 years. prominent symptom were cough, fever and dyspnea. Among the signs, common were crepitations, cyanosis and bronchial breath sound. It is clear that most common OPI is tuberculosis which is common in CD4 count <400. In CD4 count <250 *M. catarrhalis*, staphylococcus, and *Streptococcus pneumoniae* and common. In CD4 count <200 *pseudomonas* is common and in CD4 count <100 *H. influenzae* is commonly found and it is in line with Alagiriswami and Raju T John., Hansen NI, Glasroth and Browdy BL.

REFERENCES

1. Dollin (edited by) Gerald L. Mandell, John E. Bennett, Raphael (2010) Mandell, Douglas and Bennetts Principles and practice of infectious disease (7th ed) Philadelphia.
2. Gottlieb MS(2006) *Pneumocystis pneumonia* – Los Angeles 1981, Am J Public Health 96(6): 980-1.discussion 982-3.
3. Friedman – Kien AE, (October 1981) Disseminated Kaposi sarcoma syndrome in young homosexual men. J Am Acad Dermatol 5(4) 468-71.
4. Hymes KB, cheung T, Greene JB et al (September 1981) “Kaposi sarcoma in homosexual man – a report of eight cases” lancet 2 (8247); 598-600.
5. Huang L, Cattamanchi A, Davis,JL; Den boon S, Kovacs J, Meshnick S, Miller RF, Walzer PD, Worodria W, Masur H; Pneumonias (IHOP) study, lung HIV study (2011 june) HIV associated pneumocystis pneumonia.
6. “Global tuberculosis control 2009” retrieved November 1,2011.
7. Ho.Yen C and Chang F (June 1,2008) “Gastrointestinal malignancy in HIV/AIDS. The AIDS Reader.
8. Feldman C (2005) “pneumonia associated with HIV infection” curr opin. Infect. Dis. 18(2) 165-170.
9. Diaz ,PT, Wewers,MD, Pacht,E, Drake,J, Nagraja,HN, and Danton ,TL; Respiratory symptoms among HIV seropositive individuals, chest 2003, 123(6):1977-1982.
10. Park ,DR; Sherbin,VL; Goodman,MS; Pacifico,AD; Rubnfeld, GD; Polissar,NL; and Root,RK. The etiology of community acquired pneumonia at an urban public hospital; influence of HIV infection and initial study of illness. J. infect. Dis. 2001; 184 (3); 268-277.
11. Rimland ,D; Navin,TR; Lennox,JL; Jernigan,JA; Kaplan,J; Erdman,D; Morrison,CJ; and Wahlquist,SP; Prospective study of etiologic agent of community acquired pneumonia in patient with HIV infection.AIDS 2002; 16(1); 85-95.