Comparison Between CD4 Count, Haematological Manifestations and Respiratory Tract Infections in HIV Seropositive Individuals

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ABSTRACT

Introduction: Acquired immunodeficiency syndrome(AIDS) originates due to Human immunodeficiency virus (HIV) infect infection. If proper precaution is not taken, it can lead to continuous failure of patients immune system further leading to opportunistic infections which may be life –threatening. This study was conceived with the aim to study the comparison between CD4 count, hematological manifestations and respiratory tract infections amongst HIV seropositive individuals.

Material and Methods: Present study was done on 100 patients aged between 20-50 years. On the basis of CD4 count (obtained through hematology analyzer and flow cytometry) as part of the initial evaluation, patients were divided into four groups. Detailed history, symptoms, general and systemic examination was done. HIV status was confirmed by enzyme linked immune sorbent assay (ELISA) test with two different antigens.

Results: There is a strong relation between CD4 count and the hematological features in HIV seropositive individuals. Mean age of patients was 34.56 ± 9.04 years. Out of 100 patients, 62% patients had mean corpuscular volume (MCV) within normal range (80-99 fl).Mean corpuscular hemoglobin (MCH) was 28.4 pg. Leucopenia and Lymphopenia was seen in 20.8% and 65% cases respectively. Thrombocytopenia, severe anemia and pulmonary manifestations were seen in 19%, 76% and 55% cases respectively. Majority of the cases of pneumocystis carnii pneumonia and mycobacterium avium complex (MAC) cases were reported in patients with CD 4 count <200cells/mm^3.

Conclusion: Opportunistic pulmonary infections arise more frequently in HIV patients with lower CD4 counts, indicating a strong relation between CD4 count and respiratory complications in HIV patients. Thus, high level of clinical suspicion is required for diagnosis of respiratory complications in HIV individuals.

Keywords: seropositive, HIV, CD4 count, ELISA, AIDS

INTRODUCTION

AIDS was first recognized in 1981 and HIV in 1983. Globally the phenomenon of HIV/AIDS is best viewed as a pandemic affecting nearly all the countries of the world. In India**,** an estimated number of people living with HIV were 2.08 million in 2011with an adult prevalence of0.29**%,** home to the world's third-largest population suffering from AIDS.[1] HIV is transmitted primarily via unprotected sexual intercourse (including anal and oral sex), contaminated blood transfusions, hypodermic needles and from mother to child during pregnancy, delivery, or breastfeeding.[2]

Low literacy level among population and wide labor migration are the few factors which have led in deficiency of gender disparity and awareness regarding the disease especially in rural population.[3]

Infection with HIV primarily involves a subgroup of T-lymphocytes (CD4+ve), but other cell types are also invaded by the virus, thus the most important biomarkers of disease stage and progression in patients with an HIV infection are the CD4 count and HIV RNA concentration.[4] CD4 cell count is an excellent indicator of an HIV-infected patient's risk of developing opportunistic pulmonary infections presumably because it reflects stage of HIV disease and degree of immune compromise.[5] HIV-related illness typically develops at or below a characteristic CD4 cell count range; knowledge of an HIV-infected patient's CD4 cell count can be extremely useful in defining the possible diagnoses and assessing relationship between them.

This study was conceived with the aim to study the correlation between CD4 count and haematological manifestations and respiratory tract infections amongst HIV seropositive individuals.

MATERIAL AND METHODS

An observational cross-sectional study was done on 100 patients attending antiretroviral therapy center and outpatient department from January 2014 to June 2015 in Department of Medicine, BRD Medical College and Nehru Chikitsalya Gorakhpur.

All the patients of age group 20-50 years with ELISA positive HIV were included in the study while patients on highly active anti retroviral therapy (HAART), patients with known hematological disorder, patients with other co-morbid illness and pregnant females were excluded from the study.

A written informed consent from all patients and institutional ethics committee approval was obtained before starting the study and complete confidentiality was observed regarding the identity of the subjects.

CD4 count was done as part of the initial evaluation for patients. Patients were divided into four groups, Group A (CD4 count >500 cells/ µl), Group B (CD4 count 500-350 cells/ µl), Group C(CD4 count 350-200 cells/µl) and Group D (CD4 count <200 cells/µl).

Diagnosis was done on complaints such as weight loss, persistent diarrhea, chronic cough, unexplained fever and prolonged enlargement of glands, generalized body ache, recur-

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rent infections, rashes and sores in mouth, anus and genitals. Patients were studied for detailed history, symptoms, general and systemic examination (especially for hematological and respiratory involvement) and other investigations (for CD4 cell count, Hg, RBC morphology, Leukocyte count, Platelet count, Chest X-ray, sputum and pulmonary diagnosis).

HIV status was confirmed by ELISA test with two different antigens. Absolute CD4 counts were obtained through hematology analyzer and flow cytometry in which reagent BD Multitest CD3/CD4/CD8/CD45 was employed. Peripheral blood cell counts were performed using an ABX Pentra 120 DX automated hematology analyzer for hemoglobin concentration, MCV, mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), total and differential leukocyte count, absolute lymphocyte count and platelet counts.

Three sputum samples (first spot, early morning and second spot) were collected which further smeared and stained by grams stain and Ziehl Nelson stain, early morning sputum was inoculated into Lowenstein Jenson media and followed by chest X-ray examination.

STATISTICAL ANALYSIS

Data were presented as mean with standard deviation (SD) using IBM SPSS version 20. All hypotheses were constructed two tailed and $p<0.05$ was considered significant.

RESULTS

In the present study, age of the patients ranged from 20 to50 years with mean age of 34.56 ±9.04 years. Out of 100 patients, 64% were males while 36% were females with male to female ratio of 1.7:1. Out of 100 patients, 3% patients belong to group A while group B had 21% patients, whereas in group C and group D, 45% and 31% patients were present respectively.

Out of 100 patients, 29 (40.2%) patients had cough and expectoration whereas, 12(16.6%) had cough without expectoration and 8 (11.1%) patients showed symptoms of hemoptysis, 14 (19.4%) patients had symptom of breathlessness and 9 patients (12.5%) had chest pain.

Out of 100 patients; 44% were showing symptoms of normal vesicular breath sound whereas, 32% were having bronchial breath sound. Twelve percent patients showed symptom of coarse crept and 5% had symptom of wheeze While 4% had bronchial breath sounds with crept and 3% showed wheeze with crept.

Chest X-ray of patients showed that, 45% patients were normal. Also, 33%, 9%, 1%, 5%, 3%, 1%, 1%, 1% and 1% had pleural effusion, reticulonodular shadow and milliary mottling respectively. Cardiomegaly, pneumothorax and pulmonary fibrosis were found in 1% of patients.

Sputum examination of 14 patients showed that, 10 (71.43%) patients showed positive results while 4 (28.57%) patients showed negative results. Whereas in case of Acid fast bacilli staining, 12 (85.71%) cultures were positive and 3 (21.43%) were negative. In sputum culture, none of the organism was found in group A,while in group B only one (7.14%) patient was infected with *Strep.pneumoniae*,in group C, 2 (14.28%) patients have infection of *Strep.pneumoniae* and 2 (14.28%) had*Staph.aureus* whereas, in group D all patients were infected; 3 (21.43%)patients were infected with *Strep. Pneumonia*, 2 (14.28%) had infection of *Staph. aureus*, 2 (14.28%) were infected with *Pseudomonas aero and* 1 (7.14%) patient got infection of *Haemophilus influenza* and 1 (7.14%) was infected with *Klebsiella*.

DISCUSSION

Recognizing the hematological and respiratory features of HIV infection is very important with the continuing rise in the prevalence of HIV infection particularly in a developing country like India.

The majority of the patients (48%) were in the age group of

Group	Hg	RBC	MCV	MCH	MCHC	TLC	ALC	Platelets
A	11.0± 0.7	4.0±0.7	90±3	35±5	34±4	8915±321	2811±132	2.8±0.43
B	10.4±0.6	3.7±0.6	88±4	30±8	32±5	7654±802	2465±168	2.6±0.21
C	8.5±0.9	3.3±0.9	83±6	29±3	30±5	6722±711	1614±156	2.3±0.41
D	6.3±1.0	2.9±0.5	80±4	27±4	29±6	5209±519	1289±213	2.17±0.59

Group A: (CD4 count >500 cells/ µl), Group B: (CD4 count 500-350 cells/µl), Group C: (CD4 count 350-200 cells/µl) and Group D (CD4 count <200 cells/µl). Data is expressed as mean±SD. Hg; Hemoglobin (g/dl), RBC; Red blood corpuscles (million/mm^3), MCV; Mean corpuscular volume (fl), MCH; Mean corpuscular Hemoglobin (pg), MCHC; Mean corpuscular hemoglobin concentration (g/dl), TLC; Total leukocyte count (cells/dl), ALC; Absolute lymphocyte count (cells/dl), Platelets in lakhs.

Table-1: Showing observations of different parameters in all the groups

Pulmonary diagnosis	N	Group A	Group B	Group C	Group D
Pyogenic pneumonia	14	1 (7.14)	2 (14.2)	4 (28.5)	7 (50)
Tuberculosis	29	1 (3.44)	3 (10.3)	10 (34.4)	14 (48.27)
Fungal pneumonia	4	0	0	0	3 (75)
PCP	5	0	0	1 (20)	4 (80)
Pneumothorax	1	0	0	0	1 (100)
FPP	1	0	0	0	1 (100)
MAC	1	0	0	0	1 (100)

Data is expressed as no of patients (%), PCP; pneumocystis carnii pneumonia, MAC; mycobacterium avium complex, FPP; Fungal and pyogenic pneumonia, N; no of patients

Table 2: Showing findings of Pulmonary Diagnosis of HIV patients

30 to 40 years, with mean of 34.56 ± 9.04 years. This was in accordance with the study done by Patwardhan et al.There was male predominance, with a male to female ratio of 1.7:1 which was comparable with the study done by Chandrakar J et al.[6,7]

The Hb level ranged from 3.3to 16.3g/dl with the mean being 9.9 ± 1.09 g/dl, as also reported by Kaloutsi et al in the range of 3.8 to 17.3g/dl and a mean of 10.8 g/dl which was in favour of our study.[8] However Treacy et al reported a higher mean of 11.34 g/dl compared to the present study.[9]

Present study indicates a strong relation between CD4 count and the haematological features in HIV seropositive individuals; also that only Hb and total leucocyte count were significantly affected by the CD4 cell counts. Thus, as the CD4 cell counts decreased, so did the hemoglobin (Hb) levels and the total leukocyte counts.

Mean RBC count was 3.15 ±0.84 million/mm^3. Tripathi et al reported a RBC count of 3.09±0.36 million/mm^3 among 55 AIDS patients.[10]

MCV in the present study was 87.3 fl. Tripathi et al reported 81.81fl in majority of the patients.[10] In the present study, 62% had MCV within normal range (80–99 fl) indicating normocytic nature of RBCs.

In present study, MCH was 28.4 pg. Almost similar observation was made by Tripathi et al with aMCV of 27.59 fl.[10] MCHC ranged from 25.9gm/dl to 36.2gm/dl with the mean being 32.5±1.74 gm/dl. Sixty seven percent cases had MCHC between 31.5 to 34.5gm/dl indicating normochromasia in the majority of patients.

TLC in the study population was 5627±657cells/mm^3. A similar observation was made by Patwardhan et al in 378 cases. Leucopenia was seen in 20.8% cases.[6]

Lymphopenia (absolute lymphocyte count less than 1500 cells/mm^3) was seen in 65% cases. Treacy et al reported lymphopenia in 14 cases.[9] However Tripathi et al observed a lower number of lymphopenia cases (25.6%).[10]

In the present study thrombocytopenia was seen in 19% cases. This had been reported by Patwardhan et al in 13% cases.[6]

Haematological parameters were compared infour groups. The number of cases with anaemia, leucopenia, and lymphopenia increased with reducing CD4 cell counts. Mean TLC and ALC was lower with reducing CD4 cell counts. These parameters showed significant difference between three groups with differing CD4 cell counts ($p<0.05$). This indicates a higher occurrence of anaemia, lymphopenia and leucopenia with progression of disease. Though there was a difference in mean platelet count between three groups, it was not statistically significant, indicating occurrence of thrombocytopenia independent of disease progression ($p>0.05$).

Both opportunistic infections and dyserythropoesis also led to certain abnormalities in hematological profile of patients.11 Symptoms of severe anaemia was reported in about 76% patients with MAC diasease.[12] In HIV-infected patients, studies have also reported chronic pure red cell aplasia with parvovirus B19 infection.[13]

Above finding are sufficient to confirm that hemoglobin concentration might be the authentic biomarker for the diagnosis of HIV infection in a patient and could guide therapeutic options for patients with anemia.

In this study, the pulmonary manifestations were seen in 55% cases with tuberculosis 52.72% as commonest manifestation.

Tuberculosis included all the cases of recently diagnosed pulmonary TB (18%), military TB (5%) and tubercular pleural effusion (6%). A study done by Sham P Toshniwalincluded 147 patients of tuberculosis was also consistent with present study observation.[14]

Five cases of PCP had been reported, while only one case had been recorded for MAC. Majority of the cases of PCP and all of MAC cases were in group with CD 4 count< 200cells/mm^3, thus indicating significant relationship of these opportunistic infections with the decline in CD4 count ($p<0.05$). Study done by Kumaraswamy et alreported median CD4 count of patients with PCP of 142 cells /µl, consistent with present study.[15,16]

In India, the most common opportunistic infection among people with HIV infection is pulmonary tuberculosis.[17] TB is unique in that it can occur over a wide range of CD4 count, although it is more frequent at CD4 counts < 300/µl.[16]

CONCLUSION

There was a strong correlation between CD4 count and pattern of respiratory complications in HIV-seropositive patients. From present study it is clear that incidence of all disease expressions was increased with lower CD4 counts. Previous Studies also shown that there is a higher prevalence of diseases such as bacterial pneumonia and tuberculosis as the CD4 count level declines.

REFERENCES

1. World Health Organization. A Clinical Manual for Southeast Asia.Geneva: World Health Organization; 1996.
2. NACO annual report 2009-10 from:http://www.nacoonline.org/Quick_Links/Directory_of_HIV_Data/.
3. Hirschtick RE, Glassroth J, Jordan MC, Wilcosky TC, Wallace JM, Kvale PA, et al. Bacterial pneumonia in persons infected with the human immunodeficiency virus. Pulmonary Complications of HIV Infection Study Group. N Engl J Med 1995;333:845-51.
4. Coyle TE. Hematologic complications of human immunodeficiency virus infection and the acquired immunodeficiency syndrome. Med Clin North Am 1997;81:449–70.
5. Shankarnarayan S, Gagate A, Samani PH. Analytical Study of Clinical Case Profile of Opportunistic Infections in People Living with HIV/AIDS in Mumbai (abstract No. PeB-8215), XIV International AIDS conference 2012:7-12.
6. Patwardhan MS, Gowlikar AS, Abhyankar JR, Atre MC. Hematologic profile of HIV positive patients.Ind J PatholMicrobiol 2002;45:147–50.
7. Chandrakar J,Siddiqui RP, Singh M. Haematological Profile of HIV Seropositive Patients in Relation to CD4 Lymphocyte Count. Journal of Evidence based Medicine and Healthcare 2015;2:6399-405.
8. Kaloutsi V, Kohlmeyer U, Maschek H, Nafe R, Choritz H, Amor A. Comparison of bone marrow and hematologic findings in patients with human immunodeficiency virus infection and those with myelodysplastic

syndromes and infectious diseases. Am J ClinPathol 1994;101:123–9.
9. Treacy M, Lai L, Costello C, Clark A. Peripheral blood and bone marrow abnormalities in patients with HIV related disease. Br J Haematol 1987;65:289–94.
10. Tripathi AK, Kalra P, Misra R, Kumar A, Gupta N. Study of bone marrow abnormalities in patients with HIV disease. JAPI 2005;53:105–10.
11. Henry DH, Hoxie JA. In: Hematology basic principles and practice. Hematological manifestations of AIDS 2005;4:585–612.
12. Coyle TE. Hematologic complications of human immunodeficiency virus infection and the acquired immunodeficiency syndrome. Med Clin North Am 1997;81:449–70.
13. Bain BJ. Pathogenesis and pathophysiology of anemia in HIV infection.CurrOpinHematol 2009;6:8993.
14. Toshniwal SP, Mathapati SM, Kabara MV. Respiratory Complications in Human Immunodeficiency Virus-Seropositive Patients in Correlation to CD4 Count: An Observational Cross-Sectional Study. Int J Sci Stud2014;2:1-5.
15. Kumarasamy N, Solomon S, Flanigan TP. Natural history of human immunodeficiency virus disease in southern India. ClinInf Dis 2003;36:79-85.
16. Kumarasamy N, Vallabhaneni S, Flanigan TP, Meyer KH, Soloman S. Clinical profile of HIV in India. Indian J Med Res 2005;121:377-94.
17. Giri PA, Deshpande JD, Phalke DB. Prevelance of pulmonary tuberculosis among HIV positive patients attending antiretroviral therapy clinic. North Am J Med Sci 2013;5:367-70.

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