Original Article

Evaluation of CD4 count and correlation with development of opportunistic infection among HIV seropositives

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ABSTRACT

Background: Opportunistic infections have been the important indicators to suspect and diagnose the HIV seropositives. CD4 count has been used an important tool to monitor the treatment and progression of disease. **Methods:** This study was done to study the pattern or common presentations of opportunistic infections among HIV seropositive patients and their relationship with CD4 counts. **Results:** Tuberculosis and candidiasis were the most common opportunistic infections in HIV infected patients followed by herpes, diarrhoea, acute respiratory infection, papular pruritic eruptions, seborrhoeic dermatitis, cryptococcal meningitis, and hepatitis B and C co-infection. Decrease in CD4 count is an important predictor to progression of the disease. **Conclusions:** This gives a representation of opportunistic infections in HIV seropositive patients in low prevalence state like Jharkhand.

Keywords: Candidiasis, CD4count, HIV/AIDS, Opportunistic infections, Tuberculosis

With the history of HIV/AIDS in India spanning well over two and half decades, the number of people living with HIV/AIDS (PLHA) has substantially increased over the years. Up to January 2012, 4,86,173 PLHA on ART were reported (NACP- 2011-12) [1]. Acquired Immunodeficiency Syndrome (AIDS) is a fatal illness caused by a retrovirus, a member of Lentivirus genus known as the Human immunodeficiency virus (HIV) that breaks down the body's immune system, infects CD4+ cells initially and progressively leads to AIDS [2]. The unique feature in the pathogenesis of HIV/AIDS is that the primary target cell for HIV is immune cells bearing CD4+ markers at their surface.

HIV infects CD4+ cells and can be directly cytotoxic. Other complex mechanisms; however, appear important in explaining the progressive depletion of this key cellular element of immunity [3-4]. With the infection of HIV, there is a gradual decrease of human immune cells bearing CD 4, (an antigen receptor, which is the most important i.e. T-helper cells), B-Lymphocyte, macrophage and natural killer cells leading to the development of wide varieties of opportunistic infections (OIs), i.e. severe infections induced by agents that rarely cause serious disease in immune competent individual. In this way, AIDS related mortality and morbidity, which is significantly higher in number as compared to other diseases, is actually due to OIs rather than HIV itself. The CD4 cells co-ordinate a number of immunological functions and as these cells are decreased (due to HIV), the risk and severity of OIs increases, resulting in death of patients. So, CD 4 count is an important parameter to initiate OIs prophylaxis e.g. co-trimoxazole preventive therapy (CPT) before the agent deteriorates the body and conversely, observation of specific OIs gives the predictive value of CD 4 count in blood suggesting the initiation of treatment.

Common OIs affecting HIV positive patients are tuberculosis (pulmonary and extra-pulmonary), candidiasis, herpes, diarrhoea, acute respiratory tract infections, cryptococcal meningitis, papular pruritic eruptions, seborrhoeic dermatitis and many more. In fact, the presence of OI contributes a major role in determination of clinical staging. We planned this study to evaluate CD4 count and its correlation with OIs among HIV positive patients.

MATERIALS AND METHODS

This study was conducted amongst patients attending Antiretroviral Treatment Centre (ART centre) and Department of Microbiology, Rajendra institute of Medical Sciences (RIMS), Ranchi after obtaining approval from institutional ethics committee. Study was conducted from April 2013 to September 2014 in HIV positive patients attending the institute. HIV positives above 18 months of age from inpatient and outpatient department were included in the study after taking consent. A detailed clinical evaluation (history and clinical examination) of all the recruited subjects was done and relevant laboratory investigations were sent. Mandatory investigations included ELISA (double sandwich ELISA-SD HIV1/2 ELISA 3.0) test and rapid kit test for HIV and CD4 counts (using Partec CD4 easy count kit and Partec flow cytometry instrument).

Statistical analysis: All collected data were entered manually into Excel sheets. The statistical analysis was performed using SPSS software. Value of chi-square, Degree of freedom, p-value were determined and p value <0.05 was considered as statistically significant. Mean, median, mode and standard deviation were also estimated.

RESULTS

Total number of cases included in present study was 169, out of which 49 (29%) cases were asymptomatic and 120 (71%) cases presented with OIs. In the present study, majority of patients were in the age group between 31 to 40 years. Eighty percent (80%) of the patients were males and 20% were females. Most of the patients were married and unemployed and were from rural background (76%). Demographic profile of the recruited patients has been presented in table 1. The most common route of transmission was heterosexual intercourse (in 85% of cases) followed by mother to child (vertical) transmission in 11% of cases, and blood transfusion by 3%.

Table 1 - Socio-demographic characteristics of subjects

Characteristics	Number (%) of Patients		
	Male	Female	Total
Age group (Years)			
1.5 – 10	9 (56%)	7(44%)	16(10%)
11 – 20	5 (56%)	4(44%)	9 (5%)
21 – 30	16(43%)	21(56%)	37(22%)
31 – 40	42(62%)	26(38%)	68(40%)
41 – 50	19(59%)	13(41%)	32(19%)
51 – 60	5(71%)	2(29%)	7(4%)
Marital status			
Married	74(60%)	49(40%)	123(72.8%)
Unmarried	19(63%)	11(37%)	30 (17.7%)
Widow	3 (20%)	12(80%)	15 (8.9%)
Divorced	-	1(100%)	1 (0.6%)
Education			
Illiterate	10(26%)	28(74%)	38 (23%)
Primary	27(63%)	16(37%)	43 (25%)
Secondary	37(65%)	20(35%)	57 (34%)
College and above	22(71%)	9 (29%)	31 (18%)
Occupation			
Unemployed	27(31%)	60(69%)	87 (51%)
Farmer	6 (60%)	4 (40%)	10 (6%)
Govt. Service	10(83%)	2 (17%)	12 (7%)
Teacher	2 (67%)	1 (33%)	3 (2%)
Private Service	13(76%)	4 (24%)	17 (10%)
Small business	18(90%)	2 (10%)	20 (12%)
Driver	15	--	15 (9%)
Labour	3	--	3 (2%)
Student	2	--	2 (1%)
Background			
Rural	69(54%)	59(46%)	128(76%)
Urban	24(59%)	17(41%)	41 (24%)
Mode of transmission			
Heterosexual	81(57%)	62(43%)	143(85%)
IV drug use	1	--	1 (0.5%)
Mother to Child	10(53%)	9(47%)	19(11%)
Blood transfusion	3(60%)	2(40%)	5(3%)
Unknown	1	--	1(0.5%)
Total	**96(57%)**	**73(43%)**	**169(100%)**

Table 2 – Distribution of opportunistic infections according to CD4+ counts

Opportunistic Infections		Number (%) of Patients			x^2	Df	P Value
CD4 Count	**Mean CD4 count**	**Present**	**Absent**	**Total**			
Tuberculosis							
< 200	113.43 ±92.57	26 (24 %)	83 (76%)	109 (65%)	8.239	2	0.0163
200-500		4 (8%)	45 (92%)	49 (29%)			
>500		0	11 (100%)	11 (6%)			
Total		30 (17.7%)	139 (82.3%)	169 (100%)			
Candidiasis							
200	128.53±177.05	23 (21%)	86 (79%)	109 (65%)	7.880	2	0.019
200-500		2 (4%)	47 (96%)	49 (29%)			
>500		1 (9%)	10 (91%)	11 (6%)			
Total		26 (15%)	143 (85%)	169 (100%)			
Herpes							
< 200	155.91±121.89	10 (9%)	99 (91%)	109 (65%)	2.228	2	0.328
200-500		2 (4%)	47 (96%)	49 (29%)			
>500		0	11 (100%)	11 (6%)			
Total		12 (7.1%)	157 (92.9%)	169 (100%)			
Non-specific Diarrhea							
< 200	110.37±81.09	11 (10%)	98 (90%)	109 (65%)	2.700	2	0.259
200-500		2 (4%)	47 (96%)	49 (29%)			
>500		0 (0%)	11 (100%)	11 (6%)			
Total		13 (7.69%)	156 (92.3%)	169 (100%)			
Acute Respiratory Infections							
< 200	112.64±82.18	19 (17 %)	90 (83%)	109 (65%)	5.579	2	0.061
200-500		3 (6%)	46 (94%)	49 (29%)			
>500		0 (0%)	11 (100%)	11 (6%)			
Total		22 (13%)	147 (87%)	169 (100%)			
Cryptococcal meningitis							
< 200	24.02±7.07	2 (1.83%)	107 (98.16%)	109	1.114	2	0.573
200-500		0	49 (100%)	49 (100%)			
>500		0	11 (100%)	11 (100%)			
Total		2 (1.2%)	167 (98.8%)	169 (100%)			

Tuberculosis and candidiasis were found to be the commonest OIs in HIV positive patients. Distribution of OIs as per mean CD4+ has been given in table 2. Significant association (p value < 0.05) was observed between CD4 count and incidence of tuberculosis. Most of the tuberculosis cases were seen in patients with CD4 count <200/ml (Table 3). Co-infection of hepatitis B and hepatitis C was seen in 4 (2.4%) and 1 (0.6 %) cases respectively.

Table 3: Tuberculosis in correlation with CD4 count

Type of Tuberculosis	Number	CD4 counts		
		<200	200-500	>500
Pulmonary TB (Smear Positive + Smear Negative)	16	15	1	-
Smear Negative Extra Pulmonary TB	14	12	2	-
Total	30	27	3	-

DISCUSSION

In the present study, majority of patients were in the age group between 31 to 40 years. Eighty percent (80%) of the patients were males and 20% were females; this is similar to the results of the Indian surveillance by UNAIDS [5]. In our study, 73% of the patients were married and 18% were unmarried; 9% of patients were widows/widowers or divorced, which was similar to the study done by Sharma et al, where 74 % of the patients were married [6]. Educational status of patients in present study was similar to the study done by Krishnan et al showing need of awareness even among educated persons [7].

In the present study, the most common route of transmission was found to be heterosexual. This finding is in accordance with other studies done in India. In our study, TB was the most common OI which is comparable to other Indian studies such as Ghate et al (29%), Subhash et al (25.4 %), Krishnan et al in Kerala (20.3%), Gautam in Maharashtra (21.56%), Ghiya et al in Gujrat (49.2%) and Kamath et al (18.86%) [8-13]. The maximum number of cases of TB was seen in patients with CD4 count <200 cells/µl followed by in patients with CD4 count of 200-500 cells/µl. The observation was similar to study by Kumaraswamy et al where TB was more frequent in at CD4 Count <300 cells/µl [14].

Other major OI in the present study was candidiasis seen in 15% of the total cases. Present study was similar to study done by Dhungel et al [15] and Moore et al [16] but differs from other studies. This difference may be explained by either under-reporting of cases or most of the patients were already on co-trimoxazole prophylaxis and antiretroviral therapy, which suppresses appearance of other OIs.

In our study, incidence of diarrhoea was 13(7.69%) and this lower incidence of diarrhoeal infection can be explained by under reporting of diarrhoea cases and patient already on co-trimoxazole prophylaxis antiretroviral therapy and over the counter-medication for diarrhoea. Number of cases of acute respiratory tract infection was 22 (13.01%). In our study, *Pseudomonas aeruginosa* (36%) was the commonest bacterial respiratory pathogen followed by *Staphylococcus aureus* (27%), *Klebsiella spp.*(23%) and *Escherichia coli* (14%). Agrawal et al in their study at Amritsar reported *Mycobacterium tuberculosis* (15.15%) as the commonest respiratory pathogen followed by *Klebsiella spp.*(11%), *Pseudomonas spp.* (6%) and *Staphylococcus aureus* (6%) [17]. Shailja et al reported *Mycobacterium tuberculosis* (28%) followed by *Klebsiella pneumonia* (10%), *Streptococcus pneumonia* (8%) and *Staphylococcus aureus* (4%) [18]. This difference may be due to geographical differences and also possible hospital acquired superadded infections.

CONCLUSIONS

Opportunistic infections continues to be one of the most universal complication of HIV infected patients and the public health efforts to curb HIV infection should be in limelight. There was male preponderance and maximum patients were from sexually active group between 21-40 years. Hence, focus should be on this age group for prevention of transmission of HIV. This study depicts a very broad range of co-infections associated with HIV infection and could be used in very resource limited settings. Early diagnosis of opportunistic infections and prompt treatment definitely contribute to increased life expectancy among infected patients delaying the progression to AIDS.

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