Hematological outline in HIV infection in relation to CD4 cell count, a hospital based study

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Abstract

Background and objectives: HIV infection is accompanied by distinct haematological changes that impair the health and treatment of patients. Varieties of hematological manifestations are seen at every stage of HIV/AIDS and often pose a great challenge in the comprehensive management. These hematological changes can be a sign of the underlying immune status of the individual and can cause symptoms that are severe and complicate the quality of life of these patients. The purpose of this study was to understand the hematological parameters along with the CD4 cell count of HIV infected patients. In view of this, the objectives of the study were to estimate CD4 counts and hematological parameters of HIV patients and to compare them.

Methods: The purpose of this study was to understand the hematological parameters along with the CD4 cell count of HIV infected patients. In view of this, the objectives of the study were to estimate CD4 counts and hematological parameters of HIV patients and to compare them. Subjects for the study were the reports of hundred HIV patients who are not on anti retroviral therapy, registered in the ART centre. Hematological parameters and CD4 cell counts were studied.

Results: Among the 100 HIV infected patients, 65% of them showed anemia. The most common type of anemia was normocytic normochromic. 38% had leucopenia, 22% had Neutropenia and 23% had lymphopenia. Thrombocytopenia was reported in 15% of the cases. 25% of patients had CD4 cell count below 200 cells /cmm,

Conclusion: Haematological abnormalities are regularly seen in HIV infected individuals. Normocytic normochromic anemia is frequented encountered in HIV infection. In the present study, hemoglobin, total leukocyte count, platelet count, absolute neutrophil count and absolute lymphocyte count were dependent on the CD4 cell counts. Therefore the Hematological parameters can be used to analyze the immune status of such individuals. As a result these values can be used to evaluate the disease progression. Patients with HIV infection should be investigated and treated for the hematological abnormalities to decrease the morbidity.

Key words: HIV, CD4 cells, Total leukocyte count, Neutropenia, Lymphopenia, Thrombocytopenia

Introduction

Acquired immunodeficiency syndrome (AIDS) is known to be caused by lymphotropic retrovirus was first recognized in 1981. HIV infection and AIDS affects almost all the countries of the world[1]. HIV infection commonly affects the hematopoietic system. The common manifestations include anemia, leucopenia and thrombocytopenia, hemophagocytic syndrome and lymphoma. These manifestations can occur as a result of primary HIV infection, opportunistic infections, and malignancies and as a result of anti-retroviral therapy[1&2]. HIV infection is accompanied by distinct hematological changes that impair the health and treatment of patients[3]. Varieties of hematological manifestations are seen at every stage of HIV/AIDS and often pose a great challenge in the comprehensive management. These hematological changes can be a sign of the underlying immune status of the individual and can cause symptoms that are severe and complicate the quality of life of these patients[4]. It is well known that the prognosis of patients with HIV infection can be predicted by the CD4 count and HIV RNA concentration[5]. Since various hematological abnormalities are observed in patients infected with HIV they may serve as an alternate marker to predict the prognosis especially in those places where the financial resources are limited[5,6&7]. Most of the available data for hematological manifestations are from the western countries, though many studies have been reported from India[8].

Chamarajanagar is located in southernmost part of Karnataka. The population of Chamarajanagar is 10.20 Lakhs with a sex ratio of 989 females for every 1,000 males, and a female literacy rate of 54.32% with an overall literacy rate of 61.12% (Census 2011). The purpose of this study was to understand the hematological parameters along with the CD4 cell count of HIV infected patients. In view of this, the objectives of the study were to estimate CD4 counts

and hematological parameters of HIV patients and to compare them.

Materials and Methods

This was a cross sectional study on secondary data maintained in the hematology laboratory for the period of 6 months from March 2015 to October 2015. Permission was obtained from the authorities to collect the secondary data therefore there were no ethical issues. Subjects for the study were the reports of HIV patients who were not on anti retroviral therapy, registered in the ART centre during the period mentioned above. According to 2012 ICTC (Integrated Counseling and Testing Centre)data for Chamarajanagar district, the HIV prevalence was low among male (2.13%) and female (1.70%) attendees. With level of significance 5% and absolute allowable error 5% using "The confidence interval approach" the inflated sample size for male and female were 34 and 27 respectively and the total sample size was 61. However all the available patients' reports (i.e.100), above 21 completed years of age, in the ART centre during the period of the data collection were selected. The P value for age and sex, i.e. 0.057 suggests that the case sheets of patients have been randomly distributed across the age and sex. The investigation reports from the patients were entered in excel-sheet because of its ease of use. Objectives were analyzed using the statistical techniques such as frequency, chi-square test statistic, its p-value using standard statistical tool called R software.

Results

The present study, showed 65% of patients with anemia comprising 43% of females followed by 22% of males. 82% had normal range of platelet count with 36 males and 46 females. Thrombocytopenia was seen in 15% of the patients and Thrombocytosis was noted in 3%. Leucopenia was seen in 38% patients of which 21 were females and 17 were males. 75% of patients had CD4 counts >200 cells / cmm where as 25% had <200/ cmm indicating severe immune deficiency. However 37% of females have CD4 >200/ cmm counts followed by males with 35%. These statistics indicate that CD4 count status of females and males are almost similar with respect to important hematological parameters (Table 1). 42% of patients' with normal total leukocyte count showed CD4 count >200/ cmm cells. However, 8% of the patients had leucopenia with CD4 counts <200 cells /cmm. 41% of patients had normal neutrophils counts with CD4 cell count of >200 cells/cmm. Patients with neutropenia and CD4 cell count <200 cells/ cmm were seen in 7% of patients. These patients had risk of developing infections. 19% of patients had neutrophilia. Patients with lymphopenia and CD4 cell count <200 cells/ cmm were seen in 5% of patients and lymphocytosis was seen in 23% of the patients. (Table 2) It was also observed that haemoglobin, platelet count, total leukocyte count, neutrophils; lymphocytes were in association with CD4 count (Table 3).

Table 1: Haematological Parameter with Gender

Parameter	Values	Female	Male	Total
Hemoglobin	Normal Range	9 4.651	26 5.038	35
	Anemia	43 2.504	22 2.713	65
Platelet count	Thrombocytopenia	5 1.0051	10 1.0889	15
	Normal Range	46 0.2648	36 0.2868	82
	Thrombocytosis	1 0.2010	2 0.2178	3
Total Leukocyte count	Leucopenia	21 0.07781	17 0.08430	38
	Normal Range	31 0.01634	31 0.01770	62
CD4	<200cells/cmm	15 0.0133	13 0.0144	25
	>200cells/cmm	37 0.002	35 0.0056	75

Table 2: Haematolgical Parametre with Cd4 Count

Parameter	Values	<200	>200	Total
Hemoglobin	Anemia	19 0.3516	46 0.1368	65
	Normal range	9 0.06531	26 0.2540	8
Platelet count	Thrombocytopenia	4 0.00735	11 0.002838	15
	Normal range	23 0.00134	59 0.00051	82
	Thrombocytosis*	1	2	3
Total leukocyte count	Leucopenia	8 0.655	30 0.2547	38
	Normal range	20 0.4015	42 0.1561	62
Neutrophils	Neutropenia	7 0.0487	16 0.01894	23
	Normal range	17 0.03557	41 0.01383	48
	Neutrophilia	4 0.32752	15 0.12737	19
Lymphocytes	Lymphopenia	5 0.2184	17 0.0849	22
	Normal range	18 0.4390	37 0.1707	55
	Lymphocytosis	5 0.322	18 0.1252	23

Note* Trombocytosis is very less and hence do not provide sufficient information for association as a result we are not considering it for further analysis.

Table 3: Chi Square Significance Table

Parametre	Total Leukocyte Count	Neutrophils	Lymphocytes	Platelets	Haemoglobin
CD4	CHI -1.467 DF -1 P-VALUE -0.226	Chi = 0.572 DF = 2 P-Value = 0.751	Chi = 1.360 DF = 2 P-Value = 0.507	Chi = 0.012 DF = 1 P-Value = 0.913	Chi = 0.140 DF = 1 P-Value = 0.709

Discussion

It is known that HIV affects the hematopoietic system and therefore hematological complications are common[1]. It has been reported that the pathogenesis of these complications are not absolutely implicit, but are understood to be multifactorial[9]. The prevalence and severity of anemia are associated with the advancement of HIV infection[8]. In the present study anemia was seen in 65% of the patients. The most common type of anemia noted was normocytic normochromic. In earlier study anemia was seen in 45.34% of cases with normocytic normochromic anemia being the predominant type[2]. Anemia is a significant feature in understanding the clinical path of HIVinfected individuals[10]. Incidence of anemia was strongly and consistently associated with progression of HIV disease as measured by diagnosis of AIDS defining opportunistic illness and measurement of CD4 count <200 cells/cmm. This association is most likely explained by the increasing viral burden as HIV disease progresses, which leads to cytokine mediated myelosuppression and anemia[8]. The hemoglobin level provides prognostic information independent of that provided by CD4 count[5]. In the study by SS Parinitha and MH Kulkarini anemia was reported in 84% of the cases[1]. A similar observation of 85% of cases was made in an earlier study[1]. Previous studies reported anemia in 89% and 82.4% of the cases respectively[11,12]. However an earlier study reported anaemia in 64.2% cases[13]. This finding was similar to the present study

In the present study, thrombocytopenia was reported in 15% of the patients. Normal platelet counts

were encountered in 82% of the patients. Earlier study showed 4.65% of patients with thrombocytopenia[2]

In the study done by SS Parinitha and MH Kulkarini thrombocytopenia was reported in 18% of the cases[1]. Earlier studies reported similar findings with thrombocytopenia in 13% of cases respectively[14,15]. These findings were similar to our study. However another previous study reported thrombocytopenia in 45% cases, which is more when compared to our study[12].

In the present study 62% of the patients showed normal leucocyte counts and in the study by SS Parinitha and MH Kulkarini, 70.4% of cases had a normal leucocyte count[1]. Similarly 75.6% of cases with normal leukocyte count were reported by an earlier study[14]. 38% of cases in the present study showed leucopenia. Parinitha and MH Kulkarini also reported in 52 (20.8%) cases of leucopenia[1].

In the present study, Neutropenia was seen in 23% of patients. Neutropenia is common and its incidence rises from 13% to 44% with disease progression from HIV to AIDS[8].

The present study showed lymphopenia in 22% of the cases. Earlier studies reported lymphopenia in 65.2% and 70% of cases respectively[1&16]. Another study reported lymphopenia in 25.6% of the cases [11] .This finding correlated with our study. Earlier study reported anemia, leucopenia and lymphopenia increased with reducing CD4 cell counts[1].

Haemoglobin, total leukocyte count, platelet count, absolute neutrophils count and absolute lymphocyte counts were statistically significant, indicating the occurrence of these parameters as dependent of disease progression.

Conclusion

Haematological abnormalities are regularly seen in HIV infected individuals. Normocytic normochromic anemia is frequented encountered in HIV infection. In the present study, hemoglobin, total leukocyte count, platelet count, absolute neutrophil count and absolute lymphocyte count were dependent on the CD4 cell counts. Therefore the Hematological parameters can be used to analyze the immune status of such individuals. As a result these values can be used to evaluate the disease progression. Patients with HIV infection should be investigated and treated for the hematological abnormalities to decrease the morbidity.

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