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Study of haematological changes in HIV patients in correlation with CD4 cell count at tertiary care hospital, Gujarat, India

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Abstract

Introduction: Acquired immunodeficiency syndrome (AIDS) was first recognized in 1981 and human immunodeficiency virus (HIV) was identified in 1983[1]. HIV continues to be a serious health issue in most parts of the world. In India there were an estimated 23.19 lac individuals living with HIV/AIDS by the end of 2020 with an adult prevalence of 0.22%[2]. HIV infection is characterized by progressive decrease in the number of circulating CD4+ T-helper cells. **Aim:** The objectives in this study were to study haematological changes in HIV patients and to correlate them with CD4 cell counts. **Materials and methods:** This was an observational study carried out at the Department of Pathology, at Gujarat Adani Institute of Medical Sciences, Bhuj from September 2021 to October 2021. Total 320 HIV positive patient were evaluated for various hematological parameters. **Results:** We studied 320 cases out of which 195 (60.93%) were male and 125 (39.07%) were females. The majority of 110(34.38%) cases were in the age group of 31-40 years.From 320 cases, 43 (13.44%) patients have CD4 <200, 112(35.00%) patients have CD4 200-500 and 165(51.56%) have CD4 >500. In present study, 25 patients have leucopenia (WBC count <=4000) among them 10(40.00%) have CD4 count <200/cumm and 7(28.00%) have CD4 count >500/cumm and 295 patients have leucocytosis (WBC count >4000) among them 158(53.55%) have CD4 count >500/cumm and 33(11.18%) have CD4 count <200/cumm. **Conclusions:** Hematologicalchanges are common in HIV patients. Cytopenia especially normocytic normochromic anemia is the most frequent finding followed by leukopenia. There is a significant correlation between CD4 count and leukopenia. This might be the cause of opportunistic infection in the HIV patient. That is the importance of observation of haematological parameters in HIV patient and to correct them to reduce mortality and morbidity.
Keywords: HIV, CD4 cell count, Haematological abnormalities,Anemia

Introduction

Acquired immunodeficiency syndrome (AIDS) was first recognized in 1981 and human immunodeficiency virus (HIV) was identified in 1983[1]. HIV continues to be a serious health issue in most parts of the world. In India there were an estimated 23.19 lac individuals living with HIV/AIDS by the end of 2020 with an adult prevalence of 0.22%.[2]Human Immunodeficiency virus (HIV) infection is characterized by progressive weakening of the immune system attributed to the decrease in the number of circulating CD4+ T-helper cells. This predisposes HIV patients to a variety of opportunistic infections and neoplastic disorders. The most severe phase of HIV infection leads to Acquired Immunodeficiency Syndrome (AIDS) where the CD4+ cell count drops below 200/mm3. It is marked by the appearance of particular opportunistic infections[3]. HIV infection is associated with a wide range of haematological abnormalities, which are amongst the most common complications of HIV and are seen throughout the course of the infection. These abnormalities may be anemia, leucocyte disorders, thrombocytopenia or pancytopenia. The most prevalent haematologicaldisorder observed in children and adults with HIV infection is anemia.

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Incidences of anemia are particularly high in patients with late stages of the disease and a reduced CD4 cell count. Anemia has been linked with the advancement of the disease and increase in mortality[4,5,6]. Leucopenia is also a common occurrence, especially in patients with advanced stages of the disease[8-10]. Neutropenia has been observed in all stages of the disease. Lymphopenia primarily involves CD4 T-helper cells and is considered the classic hallmark of the disease. Lymphopenia worsens with the progression of the disease[7]. Thrombocytopenia is found in all the stages of HIV; the prevalence being highest in the late stages of disease and with low CD4 cell counts[8,9,10,11].

Materials and Methods

The present study is an analytical observational study carried out at Gujarat Adani Institute of Medical sciences from September to October 2021. Total 320 HIV positive patient were evaluated for various hematological parameters. The study was conducted after obtaining permissions from the institutional ethics committee.

Aims and Objectives

The objectives in this study were to study haematological changes in HIV patients and to correlate them with CD4 cell counts.

Results

During the study period 320 HIV patients were referred to the hematology laboratory. The majority of 110(34.38%) cases were in the age group of 31-40 years followed by 88 (27.50%) in 41-50 years,

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65 (20.31%) in >50 years, 40 (12.50%) in 21-30 years, 17 (5.31%) in <=20 years. There were 195 (60.93%) males and 125 (39.07% females among them most common age group affected in male and female were 31-40 years.(Table 1)

Table 1 - Age and sex wise distribution of patient

Age	Male	Female	No. of Patients	Percentage
<=20	11	06	17	5.31%
21-30	24	16	40	12.50%
31-40	71	39	110	34.38%
41-50	58	30	88	27.50%
>50	31	34	65	20.31%
Total	195	125	320	

Study shows there were 43 (13.44%) patients have CD4 <200, 112(35.00%) patients have CD4 200-500 and 165(51.56%) have CD4 >500. (Table 2)

Table 2 - CD4 count wise distribution of patient

CD4 Count	No. of Patients	Percentage
<200	43	13.44%
200-500	112	35.00%
>500	165	51.56%

In the present study, 121 (37.81%) patients had hemoglobin less than 12 g/dl, 78 (24.38%) had hemoglobin between 10-12g/dl and 38 (11.88%) cases had hemoglobin between 7-10 g/dl and 5 (1.56%) cases had hemoglobin <7 g/dl. (Table 3)

Table 3 - Hemoglobin wise distribution of patient percentage

Hemoglobin (gm%)	No. of Patients	Percentage
>12	199	62.19%
10-12	78	24.38%
7-9.9	38	11.88%
<7	05	1.56%

Anemia was seen in 210 (37.81%) cases. The most common morphological type of anemia was normocytic normochromic in 76 (62.80%) cases followed by microcytic hypochromic anemia in 23 (19.00%) cases, macrocytic anemia in 20 (16.52%) cases and dimorphic anemia in 3 (2.47%) cases. (Table 4)

Table 4 - Morphological classification of anemia percentage

Morphological types of anemia	No. of patients	Percentage
Normocytic normochromic	76	62.80%
Microcytic hypochromic	23	19.00%
Macrocytic	20	16.52%
Dimorphic	03	2.47%

In the present study, majority of the patients 19 (97.06%) had a normal leucocyte count. Leucopenia in the present study was seen in 19 (5.94%) of patients. (Table 5)

Table 5 – Total WBC count wise distribution of HIV positive patients

Total WBC Count	No. of Patients	Percentage
<=4000	25	7.81%
>4000	295	92.19%

Majority of the patients 317 (99.06%) had a normal absolute neutrophil count and 3 (0.94%) patients has absolute neutrophil count <=500. (Table 6)

Table 6 - Absolute neutrophil count wise distribution of patient

Absolute Neutrophil Count	No. of Patients	Percentage
>=500	310	96.88%
<500	10	3.13%

In the present study, majority of the patients 313 (97.81%) had a normal absolute lymphocyte count and 7 (2.19%) patients have absolute lymphocyte count <=800. (Table 7)

Table 7 - Absolute lymphocyte count wise distribution of patient

Absolute Lymphocyte Count	No. of patients	Percentage
<=800	30	9.38%
>800	290	90.63%

In the present study, majority of the patients 276 (86.25%) had a normal platelet count. Thrombocytopenia seen in 10 (3.13%) of patients and thrombocytosis in 34 (10.63%) of patients. (Table 8)

Table 8 – Platelet count wise distribution of patient

Platelet Count	No. of patients	Percentage
<1.5 L	40	12.50%
1.5-4 L	246	76.88%
>4 L	34	10.63%

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In present study, 199 patients havehemoglobin >12 gm% among them 108(54.27%)have CD4 count >500/cumm and 24(12.06%) have CD4 count <200/cumm; 80 patients have hemoglobin between 10-12 gm% among them 34(42.50%) have CD4 count between 200-500/cumm and 13(16.25%) have CD4 count <200/cumm; 36 patients have hemoglobin between 7-9.9 gm% among them 23(63.88%) have CD4 count >500/cumm and 4(11.11%) have CD4 count <200/cumm and 5 patients have hemoglobin <7 gm% among them 1(20.00%) has CD4 count >500/cumm and 2(40.00%) have CD4 count <200/cumm. (Table 9)

Table 9 - Correlation between hemoglobin and CD4 count

Hemoglobin (gm%)	<200/cumm	200-500/cumm	>500/cumm	Total
>12	24(12.06%)	67(33.66%)	108(54.27%)	**199**
10-12	13(16.25%)	34(42.5%)	33(41.25%)	**80**
7-9.9	4(11.11%)	9(25.00%)	23(63.88%)	**36**
<7	2(40.00%)	2(40.00%)	1(20.00%)	**5**
Total	**43**	**112**	**165**	**320**

In present study, 25 patients have leucopenia (WBC count <=4000) among them 10(40.00%) have CD4 count <200/cumm and 7(28.00%) have CD4 count >500/cumm and 295 patients haveleucocytosis (WBC count >4000) among them 158(53.55%) have CD4 count >500/cumm and 33(11.18%) have CD4 count <200/cumm.(Table 10)

Table 10 – Correlation between total WBC count and CD4 count

WBC Count	<200/cumm	200-500/cumm	>500/cumm	Total
<=4000	10(40.00%)	8(32.00%)	7(28.00%)	**25**
>4000	33(11.18%)	104(35.25%)	158(53.55%)	**295**
Total	**43**	**112**	**165**	**320**

In present study, 310 patients have absolute neutrophil count >=500 among them 164(52.90%) have CD4 count >500/cumm and 37(11.93%)have CD4 count <200/cumm and 10 patients haveabsolute neutrophil count <500 among them 6(60.00%)have CD4 count <200/cumm and 1(10.00%) has CD4 count >500/cumm.(Table 11)

Table 11 – Correlation between absolute neutrophil count and CD4 count

Absolute neutrophil count	<200/cumm	200-500/cumm	>500/cumm	Total
>=500	37(11.93%)	109(35.16%)	164(52.90%)	**310**
<500	6(60.00%)	3(30.00%)	1(10.00%)	**10**
Total	**43**	**112**	**165**	**320**

In present study, 290 patients have absolute lymphocyte count >=800 among them 163(66.55%) have CD4 count >500/cumm and 32(11.03%) have CD4 count <200/cumm and 30 patients have absolute lymphocyte count <800 among them 17(56.66%) have CD4 count between 200-500/cumm and 2(6.66%) have CD4 count >500/cumm. (Table 12)

Table 12 – Correlation between absolute lymphocyte count and CD4 count

Absolute lymphocyte count	<200/cumm	200-500/cumm	>500/cumm	Total
>=800	32(11.03%)	95(32.75%)	163(66.55%)	**290**
<800	11(36.66%)	17(56.66%)	2(6.66%)	**30**
Total	**43**	**112**	**165**	**320**

In present study, 40 patients have platelet count <1.5L among them 20(50.00%) have CD4 count between 200-500/cumm and 6(15.00%)have CD4 count >500/cumm; 246 patients haveplatelet count between 1.5-4 L among them 135(54.87%) have CD4 count between >500/cumm and 27(10.97%) have CD4 count <200/cumm and34 patients have platelet count >4 L among them 24(70.58%) have CD4 count between >500/cumm and 2(5.88%) have CD4 count <200/cumm. (Table 13)

Table 13 – Correlation between platelet count and CD4 count

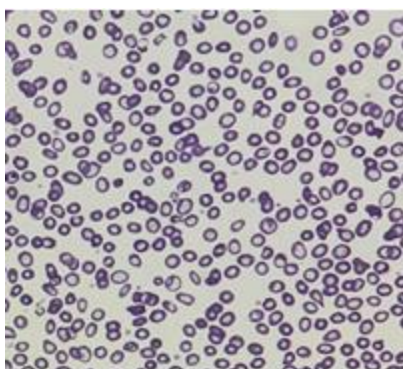| Platelet count	<200/cumm	200-500/cumm	>500/cumm	Total
<1.5 L	14(35.00%)	20(50.00%)	6(15.00%)	**40**
1.5-4 L	27(10.97%)	84(34.14%)	135(54.87%)	**246**
>4 L	2(5.88%)	8(23.52%)	24(70.58%)	**34**
Total	**43**	**112**	**165**	**320**

Fig-1 Microcytic severe hypochromic anemia   **Fig-2 Dimorphic anemia**

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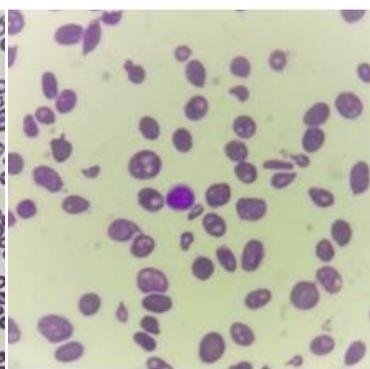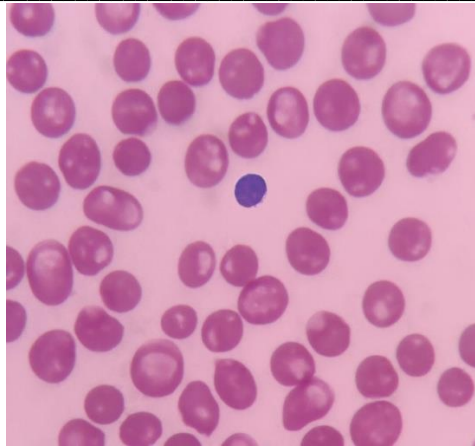www.ijhcr.com
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Fig-3 Macrocytic anemia

Discussion

Hematological complications are a common cause of mortality in HIV infected patients. Cytopenias are most frequent during the advanced stage of disease[12]. We evaluated various hematological manifestations on 320 consecutive HIV seropositive patients who presented to the Immunodeficiency clinic GKGH, Bhuj irrespective of their ART status. We also correlated the final hematological diagnosis of the patients with the CD4 count.

Our study showed a predominance of males (60.93%), with male: female ratio of 1.55:1. Male predominance was also observed by Dikshit et al., De Santis et al., and Parinithia and Kulkarni in 67.5%, 68%, and 61.6% of their cases, respectively[13,14,15].

The age of the patients ranged from 18 years to 74 years. The majority of 110 (34.38%) cases were in the age group of 31-40 years followed by 88 (27.50%) cases in 41-50 years age group. Our study results are similar to study from India conducted by Lalitjain et al. shows the majority of 59 (54.1%) cases were in the age group of 30 – 44 years[16].

Among 320 patients, 121(37.81%) were found to be anemic. Similar prevalence of anemia reported is in agreement with studies done by Mathews et al (40.1%), Patwardhan et al (30.8%)[17].

Among 121anemic patients, 76 patients (62.80%) had normocytic normochromic anemia, 23 patients (19.00%) had microcytic hypochromic anemia, 20 patients (16.52%) had macrocytic anemia and only 3 patients (2.47%) had dimorphic anemia. These findings ofanemiacorrelate with the studies done by Lalitjain et al[16].

In our study, leukopenia was observed in 7.81% patients; lymphopenia in 9.38%; neutropenia 3.13% of the cases. As a disparity, strong association of lymphopenia and neutropenia was not observed which differs from study done by Lalit Jain et al. and SS Parinitha et al. [15,16] Our study correlates with study done by DebarshiSaha at al[18].

Patients with thrombocytopenia in our study were 12.40% which is similar to that of DebarshiSahaet al[18].

The incidence of anemia was higher among patients who had CD4 lymphocyte count <200 cells/μL as compared to patients with CD4 lymphocyte count >200 cells/μL, showing an inverse correlation between anemiaand CD4 cell count. The overall picture of anemia correlates with the studies done by Sitalakshmi et al, and Tripathi et al[19,20].

In our study, patients with CD4 count <200 shows leucopenia in 23.25% cases, followed by CD4 count between 200-500 shows leucopenia in 7.14% cases, followed by CD4 count >500 shows leucopenia in 4.24% cases. In our study, patients with CD4 count <200 shows absolute lymphocyte count <800 in 23.25% cases, followed by CD4 count between 200-500 shows absolute lymphocyte count <800 in 7.14% cases, followed by CD4 count >500 shows absolute lymphocyte count <800 in 4.24% cases. In our study, patients with CD4 count <200 shows absolute neutrophilic count

<500 in 13.95% cases, followed by CD4 count between 200-500 shows absolute neutrophilic count <500 in 2.67% cases, followed by CD4 count >500 shows absolute neutrophilic count <500 in 0.90% cases. This study shows similar finding as done by SS Parinitha et al[15].

In our study, patients with CD4 count <200 shows thrombocytopenia in 16.27% cases, followed by CD4 count between 200-500 shows thrombocytopenia in 8.92% cases, followed by CD4 count >500 shows thrombocytopenia in 1.81% cases. These findings correlate with the studies done by Lalitjain et al[16].

Conclusions

Hematologicalchanges are common in HIV patients. Cytopenia especially normocytic normochromic anemia is the most frequent finding followed by leukopenia. There is a significant correlation between CD4 count and leukopenia. This might be the cause of opportunistic infection in the HIV patient. That is the importance of observation of haematological parameters in HIV patient and to correct them to reduce mortality and morbidity.

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