



Original Research Article

A Study of Hematological Profile in HIV/AIDS

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ABSTRACT

Aims: To study the spectrum of hematological manifestations in patients with HIV /AIDS, and to correlate the hematologic manifestations with CD4 cell count and antiretroviral therapy (ART).

Methods: This prospective cross sectional study entitled “Hematological manifestations in patients with HIV/AIDS” was carried out in the Department of Medicine, Jawaharlal Nehru Medical College, Sawangi (Meghe); during the period of 2 years from August 2010 to July 2012. Only 100 confirmed cases of HIV/AIDS were included in the study. Complete confidentiality was observed regarding the identity of the subjects. Hemoglobin level, TLC, DLC, Absolute platelet count, CD4 counts, and bone marrow examination was carried out of each patients.

Results: 70 (70%) were males and 30 (30%) were females. The mean age in the present study was 36.93±9.21 years (38.14±8.99 years in males and 34.10±9.23 years in females). The most common presenting symptom was fever more than 1 month duration in 68%. Most common presenting sign was pallor in 67%. 42 (42%) were on ART while 58 (58%) were not on ART. microcytic hypochromic anemia was seen in 73% (73/100) of subjects. 19% (19/100) of the subjects had total leucocyte counts of less than 4000 cells/ μ l. 62% had CD4 count less than 200/ mm^3 . 12% subjects had CD4 cell counts less than 50 cells/ mm^3 . 72% (72/100) had hypercellular bone marrow. This was followed by a normocellular bone marrow picture in 17% (17/100) of the subjects and lastly hypocellular bone marrow picture in 11% (11/100) subjects. A significant positive co-relation was established between the hemoglobin levels and the CD4 cell counts of the 30 female subjects included in the study (Co-relation ‘r’ = 0.384, p-value = 0.036, significant, p<0.05). We found a significant positive co-relation between the total leucocyte count levels and the CD4 cell counts of the subjects included in the study (Co-relation ‘r’ = 0.239, p-value = 0.018, significant, p<0.05). There was found to be a statistical significant difference between the subjects who were not on ART and the subjects who were on ART with regards to the total leucocyte count (p = 0.04, Significant, p<0.05). But this co-relation was such that the subjects who were not on ART had a higher mean total leucocyte count than those who were on ART. Multivariate regression analysis Of Cd4 cell count with Age, Gender, Hemoglobin, Total Leucocyte Count and Absolute Platelet Count, we found that only hemoglobin and total leucocyte count were significantly affected by the CD4 cell counts (p<0.05). Thus, as the CD4 Cell counts increased, so did the hemoglobin levels and the total leucocyte counts. On multivariate regression analysis Of ART with Age, Gender, Hemoglobin, Total Leucocyte Count and Absolute Platelet Count, we found that only total leucocyte count was significantly affected by the ART (p<0.05).

Conclusion: Hematologic manifestations in HIV/AIDS are many. Apart from the disease proper a lot of other factors affect the hematologic profile. There is no fixed abnormality in the hematologic parameters. Age, gender, opportunistic infections, drugs and ART affects different facets of the blood, blood components and bone marrow.

Key words: HIV, AIDS, CD4, ART

INTRODUCTION

Human Immunodeficiency Virus (HIV) infection is a global pandemic, with cases reported from virtually every country across the globe. Currently, in Asia, there are about 4.9 million people living with HIV, with an estimated 2.5 million in India alone. [1] Of these, an estimated 39% are females and 3.5% are children. [2]

HIV infection is a multisystem disease, with hematological abnormalities amongst the most common clinicopathological manifestations of HIV infection. [3] HIV infection is associated often with a wide range of hematological abnormalities, including impaired hematopoiesis, immune mediated cytopenias and coagulopathies, particularly in the later part of the disease. [4, 5, 6] The consequences of these hematological problems are two-fold. First, they have major morbidity in themselves, adversely altering the patient's quality of life. Second, they hinder the treatment of both the primary viral infection and the secondary infections and neoplastic complications. The poor hematopoietic tolerance of the therapies often necessitates dose reductions, alterations of drug regimens, or interruption of therapies. The hematologic complications are better controlled, resulting in longer life spans.

In general, hematological abnormalities progress in frequency and severity with the progression of infection from the asymptomatic HIV carrier state to the later symptomatic stages of the disease. Approximately 15% of asymptomatic subjects infected with HIV have mild anemia. The prevalence of anemia increases to 30% to 40% in those with early disease

and 75% to 90% in those with AIDS. [7] These figures may be higher in HIV infected infants and children.

Granulocytopenias with or without lymphopenia occurs in approximately 8% of the asymptomatic HIV carriers and as many as 70% to 75% of children and adults with AIDS. [8, 9]

While anemia and granulocytopenia tend to occur concomitantly with a severity that parallels the course of the HIV infection, thrombocytopenia can occur independently of other cytopenias and at all stages of HIV infection. Isolated thrombocytopenia may be the first manifestation of HIV infection. We studied hematological manifestations in AIDS.

Aims and Objectives

1. To study the spectrum of hematological manifestations in patients with HIV/AIDS.
2. To study the co-relation between the hematological manifestations and the CD4 cell count.
3. To study the co-relation between the hematological manifestations and Anti Retroviral Therapy.

MATERIALS AND METHODS

The present study entitled "Hematological manifestations in patients with HIV/AIDS" was carried out in the Department of Medicine, Jawaharlal Nehru Medical College, Sawangi (Meghe); during the period of 2 years from August 2010 to July 2012.

The patients admitted to general medicine ward of Acharya Vinoba Bhave Rural Hospital with the diagnosis of immunocompromised host were included.

Only confirmed cases of HIV/AIDS were included in the study.

Inclusion Criteria

1. All newly diagnosed patients.
2. Previously diagnosed asymptomatic patients not on any treatment.
3. Previously diagnosed patients who are on Anti Retroviral Therapy.
4. Patients giving consent for the study.

Exclusion Criteria

Patients not giving consent for the study were excluded from the study.

Type of Study

The present study is a prospective cross sectional study.

Confidentiality Clause

Complete confidentiality was observed regarding the identity of the subjects by concealing the names and addresses of the subjects from the study performa. The record of the names and addresses was maintained separately.

METHODS

The present study included 100 cases of HIV/AIDS. The cases were included irrespective of duration of illness. All cases were examined in details to find out any evidence of hematological manifestations of HIV/AIDS. The detailed systemic examination was carried out for respiratory, cardiovascular, abdominal and central nervous system.

The diagnosis of HIV/AIDS was established according to NACO guidelines in all cases by carrying out blood test. It included COMBAIDS-RS screening test, NanoHIV1/2 Triline and Pareekshak spot test. [10]

All the cases included in the study were then subjected for investigations. Hemoglobin estimation was done by Drabkin’s method. [11] Anemia was graded into severity according to the WHO Classification. [12] The Total Leucocyte Count was performed in all cases by using the Neubauer Chamber. The Differential Leucocyte Count estimation was performed manually. Slides were prepared and air dried, stained by using Leishman’s stain, then fixed by using the Leishman Buffer and finally seen under the microscope (MAGNUS MLX Microscope). Absolute Platelet Count was performed in all the cases using the ABX Micros 60 Cell Counter.

All the subjects included in the study were subjected to Bone Marrow Examination. Bone Marrow Aspiration was done from the posterior iliac spine, for cytology pattern of all three cell lines. The CD4 T Cell Count was carried in all cases using flow cytometry by BD FACS count. [13]

RESULT AND OBSERVATION

Table 1: Distribution of Subjects According To The Type of Anemia

Type Of Anemia	Males (n = 70)		Females (n = 30)		Total (n =100)	
	Number	%	Number	%	Number	%
Microcytic Hypochromic	53	75.71	20	66.67	73	73.00
Normocytic Normochromic	12	17.14	05	16.67	17	17.00
Dimorphic	05	7.14	05	16.67	10	10.00
χ^2 -value	0.02					
p-value	0.86, Not Significant,p>0.05					

Table 2: Distribution of subjects according to Total Leucocyte Count

TLC Cells/ μ l	Males (n = 70)		Females (n = 30)		Total (n = 100)	
	Number	%	Number	%	Number	%
< 4000	13	18.57	06	20.00	19	19
4000 – 11000	54	77.14	21	70.00	75	75
>11000	03	4.29	03	10.00	06	06
Mean \pm SD	5682.85 \pm 2584.41		6810.00 \pm 3347.60		6147.00 \pm 2850.99	
χ^2 -value	1.30					
p-value	0.51, Not Significant, p>0.05					

Table 3: Hemoglobin Levels In Relation To CD4 Cell Count In Males

Hemoglobin (gm %)	CD4 (cells/mm ³)				
	>200	151-200	101-150	50-100	<50
\geq 13	03	01	00	00	00
10-12.9	04	02	06	03	01
7-9.9	12	07	04	07	04
<7	05	02	01	04	04
Mean Hb% \pm SD (gm%)	8.87 \pm 2.59	9.03 \pm 1.74	9.52 \pm 2.21	7.85 \pm 2.11	7.46 \pm 1.61
χ^2 - value	13.82				
p-value	0.31, Not Significant, p>0.05				
Correlation 'r'	0.190				
p-value	0.116, Non Significant, p>0.05				

Table 4: Hemoglobin Levels In Relation To CD4 Cell Count In Females

Hemoglobin (gm%)	CD4 (cells/mm ³)				
	>200	151-200	101-150	50-100	<50
\geq 12	02	00	00	00	01
10-11.9	03	00	00	00	00
7-9.9	07	02	02	01	01
<7	02	01	02	05	01
Mean Hb% \pm SD (gm%)	9.36 \pm 2.01	7.70 \pm 2.06	6.62 \pm 1.14	6.45 \pm 1.40	9.03 \pm 3.32
χ^2 -value	13.92				
p-value	0.30, Not Significant, p>0.05				
Correlation 'r'	0.384				
p-value	0.036, Significant, p<0.05				

Leukocyte Count and Cd4 Count

Table 5: Total Leukocyte Count In Relation To CD4 Count

Total Leukocyte Count (cells/ μ l)	CD4 (cells/mm ³)				
	>200	151-200	101-150	50-100	<50
>11,000	04	00	01	00	01
4,000-11,000	27	15	11	14	08
<4,000	07	00	02	07	03
Mean \pm SD (cells/ μ l)	6671.05 \pm 3394.42	6073.33 \pm 2074.14	6126.66 \pm 2641.82	5460 \pm 2378.50	5750 \pm 2877.65
χ^2 -value	10.77				
p-value	0.21, Not significant, p>0.05				
Correlation 'r'	0.239				
p-value	0.018, Significant, p<0.05				

Table 6: Absolute Platelet Count In Relation To Cd4 Count

Absolute Platelet Count (/mm ³)	CD4 (cells/mm ³)				
	>200	151-200	101-150	50-100	<50
>1,50,000	27	13	13	12	10
1,00,000-1,50,000	07	02	02	02	01
50,000-1,00,000	03	00	00	04	01
<50,000	01	00	00	02	00
Mean ± SD (lacs/mm ³)	2.37±1.26	2.91±1.16	3.02±1.46	2.14±1.74	2.35±0.89
χ ² -value	12.92				
p-value	0.37, Not significant, p>0.05				
Correlation 'r'	0.013				
p-value	0.901, Not Significant, p>0.05				

Table 7: Relation between Total Leukocyte Count and ART

Total Leukocyte Count (cells/μl)	Patients On ART (n = 42)	Patients Not On ART (n = 58)
>11000	00	06
4000– 11000	31	44
<4000	11	08
Mean ± SD	5392.85±2157.39	6693.10±3169.69
χ ² -value	8.32	
p-value	0.04, Significant, p<0.05	

Table 8: Relation between Absolute Platelet Counts and ART

Absolute Platelet Count (/mm ³)	Patients on ART (n = 42)	Patients not on ART (n = 58)
>1,50,000	32	43
1,00,000-1,50,000	05	09
50,000-1,00,000	04	04
<50,000	01	02
Mean ± SD (lacs/mm ³)	2.62 ± 1.54	2.41 ± 1.22
χ ² -value	0.54	
p-value	0.90, Not Significant, p>0.05	

Table 9: Multivariate Regression Analysis of Cd4 Count with Age, Gender, Hb%, TLC, APC**One Way ANOVA**

Source of variation	Sum of Squares	Df	Mean Square	F	p-value
Regression	254753.95	5	50950.79	3.73	0.004, Significant, p<0.05
Residual	1283205.08	94	13651.11		
Total	1537959.04	99			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	9.95	80.28		-	-
Age	-2.05	1.33	-0.15	1.53	0.128 NS, p>0.05
Gender	42.97	26.36	0.15	1.63	0.106 NS, p>0.05
Hb%	15.36	5.36	0.27	2.86	0.005 S, p<0.05
TLC	0.008	0.00	0.19	2.00	0.048 S, p<0.05
APC	2.31	8.88	0.02	0.26	0.795 NS, p>0.05

R= 0.40, R²=0.16

Table 10: Multivariate Regression Analysis of ART with Age, Gender, Hb%, TLC, APC**One Way ANOVA**

Source of variation	Sum of Squares	Df	Mean Square	F	p-value
Regression	2.457	5	.491	2.109	0.071
Residual	21.903	94	.233		Not Significant, p>0.05
Total	24.360	99			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
(Constant)	0.943	0.332		-	-
Age	0.008	0.006	0.149	1.453	0.150 NS, p>0.05
Gender	0.171	0.109	0.159	1.572	0.119 NS, p>0.05
Hb%	-0.0006	0.022	-0.003	0.030	0.976 NS, p>0.05
TLC	0.00004	0.000	0.233	2.319	0.023 S, p<0.05
APC	-0.05	0.037	-0.138	1.366	0.175 NS, p>0.05

$$R = 0.31, R^2 = 0.10$$

A total of 100 cases of HIV infected subjects admitted to Acharya Vinoba Bhawe Rural Hospital who met the inclusion criteria were studied. 70 (70%) were males and 30 (30%) were females. The ratio of males to females was 2.33:1. The mean age in the present study was 36.93±9.21 years (38.14±8.99 years in males and 34.10±9.23 years in females). As per sex wise distribution, majority of the males were in the age group 31-40 years (48.57%) while majority of the females were in the age group 21-30 years (43.33%). Overall, majority of the patients were in the age group 31-40 years (43%). The most common presenting symptom was fever more than 1 month duration in 68% (68/100); next common was cough in 41% (41/100), weight loss in 35% (35/100), dyspnoea in 23% (23/100), fatigue in 17% (17/100), diarrhoea more than 1 month duration in 14% (14/100) and abdominal pain in 12% (12/100). 11% (11/100) subjects presented with dysphagia and odynophagia while headache was present in 5% (5/100) of the subjects. Most common presenting sign was pallor in 67% (67/100) followed by lymphadenopathy in 32% (32/100) and oral thrush in 22% (22/100) of the cases.

Out of the 100 subjects, 42 (42%) were on ART while 58 (58%) were not on ART. Further, out of 70 males, 33 (47.14%) were on ART while 37 (52.85%) were not on ART. Out of 30 females, 9 (30%) were on ART while 21 (70%) were not on ART.

The mean hemoglobin level in the males was 8.62±2.25 gm% and in the females was 8.21±2.25 gm%.

Out of 100 subjects studied in the present study, microcytic hypochromic anemia was seen in 73% (73/100) of subjects. Next common finding was normocytic normochromic anemia in 17% (17/100) while dimorphic blood picture was seen in 10% (10/100) of the subjects.

Out of the total, 75.71% (53/70) of the males while 66.67% (20/30) of the females had a microcytic hypochromic blood picture on peripheral smear. Normocytic normochromic picture was seen in 17.14% (12/70) males and 16.67% (05/30) females while dimorphic picture was seen in 7.14% (05/70) males and 16.67% (05/30) females.

In the present study, majority of the subjects, that is, 75% (75/100) had a total leucocyte count in the range of 4000-11000 cells/μl. 19% (19/100) of the subjects had total leucocyte counts of less than 4000

cells/ μl while 6% (6/100) had total leucocyte counts of more than 11000 cells/ μl .

Further, 77.14% (54/70) of the males and 70% (21/30) of the females had a total leucocyte count in the range of 4000-11000 cells/ μl . 18.57% (13/70) males and 20% (6/30) females had total leucocyte counts of less than 4000 cells/ μl while 4.29% (3/70) males and 10% (3/30) females had total leucocyte counts of more than 11000 cells/ μl .

The mean total leucocyte count was 6147.00 ± 2850.99 cells/ μl (5682.85 ± 2584.41 cells/ μl in males and 6810.00 ± 3347.60 cells/ μl in females)

Out of the 100 subjects 38% had CD4 cell count of more than 200 cells/ mm^3 . This was followed by 20% (20/100) subjects who had CD4 cell counts in the range 50-100 cells/ mm^3 . 15% subjects had CD4 cell counts in the range 151-200 cells/ mm^3 and another 15% had CD4 cell counts in the range 101-150 cells/ mm^3 . Lastly, 12% subjects had CD4 cell counts less than 50 cells/ mm^3 .

In the sex-wise distribution, majority of the males, that is, 34.29% (24/70) had CD4 cell counts more than 200 cells/ mm^3 . Majority of the females, that is, 46.67% (14/30) also had CD4 cell counts more than 200 cells/ mm^3 , followed by 20% (14/70) males as also 20% (06/30) females who had CD4 cell counts in the range 51-100 cells/ mm^3 . 17.14% (12/70) males had CD4 cell counts in the range 151-200 cells/ mm^3 while 10% (03/30) females had CD4 cell counts in this range. 15.71% (11/70) males had CD4 cell counts in the range 101-150 cells/ mm^3 while 13.33% (04/30) females had CD4 cell counts in this range. Lastly, 12.86% (09/70) males while 10% (03/30) females had CD4 cell counts less than 50 cells/ mm^3 .

The mean CD4 cell count was 178.64 ± 124.63 cells/ mm^3 (162.62 ± 102.16

cells/ mm^3 in males and 216.00 ± 161.66 cells/ mm^3 in females).

Out of the total 100 subjects who were subjected to bone marrow examination, majority, that is, 72% (72/100) had hypercellular bone marrow. This was followed by a normocellular bone marrow picture in 17% (17/100) of the subjects and lastly hypocellular bone marrow picture in 11% (11/100) subjects.

As per sex-wise distribution, majority of the males, that is, 71.43% (50/70), as well as majority of the females, that is, 73.33% (22/30) had a hypercellular bone marrow.

In the present study, out of the total 04 male subjects with hemoglobin of 13 gm% or more, 03 had CD4 cell counts more than 200 cells/ mm^3 while 01 had CD4 cell counts in the range 151-200 cells/ mm^3 .

Out of the total 16 males with hemoglobin levels in the range 10-12.9 gm%, 04 had CD4 cell counts more than 200 cells/ mm^3 , 02 had CD4 cell counts in the range 151-200 cells/ mm^3 , 06 had CD4 cell counts in the range 101-150 cells/ mm^3 , 03 had CD4 cell counts in the range 50-100 cells/ mm^3 and 01 had CD4 cell counts of less than 50 cells/ mm^3 .

Out of the total 34 males with hemoglobin levels in the range 7-9.9 gm%, 12 had CD4 cell counts more than 200 cells/ mm^3 , 07 had CD4 cell counts in the range 151-200 cells/ mm^3 , 04 had CD4 cell counts in the range 101-150 cells/ mm^3 , 07 had CD4 cell counts in the range 50-100 cells/ mm^3 and 04 had CD4 cell counts of less than 50 cells/ mm^3 .

Out of the total 16 males with hemoglobin levels of < 7 gm%, 05 had CD4 cell counts more than 200 cells/ mm^3 , 02 had CD4 cell counts in the range 151-200 cells/ mm^3 , 01 had CD4 cell counts in the range 101-150 cells/ mm^3 , 04 had CD4 cell counts in the range 50-100 cells/ mm^3 and

another 04 had CD4 cell counts of less than 50 cells/mm³.

The mean hemoglobin level in the males with CD4 cell counts of more than 200 cells/mm³ was 8.87±2.59 gm%. The mean hemoglobin level in the males with CD4 cell counts in the range of 151-200 cells/mm³ was 9.03±1.74 gm%. The mean hemoglobin level in the males with CD4 cell counts in the range of 101-150 cells/mm³ was 9.52±2.21 gm%. The mean hemoglobin level in the males with CD4 cell counts in the range of 50-100 cells/mm³ was 7.85±2.11 gm%. Lastly, the mean hemoglobin level in the males with CD4 cell counts of less than 50 cells/mm³ was 7.46±1.61 gm%.

In the present study, a positive co-relation was established between the hemoglobin levels and the CD4 cell counts of the male subjects included in the study, though this co-relation was not significant (Co-relation 'r' = 0.190, p-value 0.116, non significant, p>0.05).

In the present study, out of the total 03 female subjects with hemoglobin levels of 12 gm% or more, 02 had CD4 cell counts more than 200 cells/mm³ while 01 had CD4 cell counts of less than 50 cells/mm³.

Out of the total 03 females with hemoglobin levels in the range 10-11.9 gm%, all the 03 had CD4 cell counts more than 200 cells/mm³.

Out of the total 13 females with hemoglobin levels in the range 7-9.9 gm %, 07 had CD4 cell counts more than 200 cells/mm³, 02 had CD4 cell counts in the range 151-200 cells/mm³, another 02 had CD4 cell counts in the range 101-150 cells/mm³, 01 had CD4 cell counts in the range 50-100 cells/mm³ and another 01 had CD4 cell counts of less than 50 cells/mm³.

Out of the total 11 females with hemoglobin levels of < 7 gm%, 02 had CD4 cell counts more than 200 cells/mm³, 01 had CD4 cell counts in the range 151-200

cells/mm³, 02 had CD4 cell counts in the range 101-150 cells/mm³, 05 had CD4 cell counts in the range 50-100 cells/mm³ and 01 had CD4 cell counts of less than 50 cells/mm³.

The mean hemoglobin level in the females with CD4 cell counts of more than 200 cells/mm³ was 9.36±2.01 gm%. The mean hemoglobin level in the females with CD4 cell counts in the range of 151-200 cells/mm³ was 7.70±2.06 gm%. The mean hemoglobin level in the females with CD4 cell counts in the range of 101-150 cells/mm³ was 6.62±1.14 gm%. The mean hemoglobin level in the females with CD4 cell counts in the range of 50-100 cells/mm³ was 6.45±1.40 gm%. Lastly, the mean hemoglobin level in the females with CD4 cell counts of less than 50 cells/mm³ was 9.03±3.32 gm%.

In the present study, a significant positive co-relation was established between the hemoglobin levels and the CD4 cell counts of the female subjects included in the study (Co-relation 'r' = 0.384, p-value = 0.036, significant, p<0.05).

Total Leukocyte Count and Cd4 Count

In the present study, out of the total 06 subjects with total leucocyte count of more than 11000 cells/μl, 04 had CD4 cell counts of more than 200 cells/mm³, 01 had CD4 cell counts in the range 101-150 cells/mm³, while another 01 subject had CD4 cell counts less than 50 cells/mm³.

Out of the total 75 subjects who had total leucocyte counts in the range 4000-11000 cells/μl, 27 had CD4 cell counts of more than 200 cells/mm³, 15 had CD4 cell counts in the range 151-200 cells/mm³, 11 had CD4 cell counts in the range 101-150 cells/mm³, 14 had CD4 cell counts in the range 51-100 cells/mm³, and lastly 08 subjects had CD4 cell counts of less than 50 cells/mm³.

Out of the total 19 subjects who had total leucocyte counts of less than 4000 cells/ μ l, 07 had CD4 cell counts of more than 200 cells/ mm^3 , 02 had CD4 cell counts in the range 101-150 cells/ mm^3 , 07 had CD4 cell counts in the range 51-100 cells/ mm^3 , and lastly 03 subjects had CD4 cell counts of less than 50 cells/ mm^3 .

The mean total leucocyte count level in the subjects with CD4 cell counts of more than 200 cells/ mm^3 was 6671.05 ± 3394.42 cells/ μ l. The mean total leucocyte count level in the subjects with CD4 cell counts in the range of 151-200 cells/ mm^3 was 6073.33 ± 2074.14 cells/ μ l. The mean total leucocyte count level in the subjects with CD4 cell counts in the range of 101-150 cells/ mm^3 was 6126.66 ± 2641.82 cells/ μ l. The mean total leucocyte count level in the subjects with CD4 cell counts in the range of 50-100 cells/ mm^3 was 5460 ± 2378.50 cells/ μ l. Lastly, the mean total leucocyte count level in the subjects with CD4 cell counts of less than 50 cells/ mm^3 was 5750 ± 2877.65 cells/ μ l.

In the present study, a significant positive co-relation was established between the total leucocyte count levels and the CD4 cell counts of the subjects included in the study (Co-relation 'r' = 0.239, p-value = 0.018, significant, $p < 0.05$).

In the present study, out of the total 75 subjects with absolute platelet count of more than 1.5 lacs/ mm^3 , 27 had CD4 cell counts more than 200 cells/ mm^3 , 13 had CD4 cell counts in the range 151-200 cells/ mm^3 , another 13 had CD4 cell counts in the range 101-150 cells/ mm^3 , 12 had CD4 cell counts in the range 50-100 cells/ mm^3 and 10 had CD4 cell counts of less than 50 cells/ mm^3 .

Out of the total 14 subjects with absolute platelet count in the range 1.0-1.5 lacs/ mm^3 , 07 had CD4 cell counts more than 200 cells/ mm^3 , 02 had CD4 cell counts in the range 151-200 cells/ mm^3 , another 02 had

CD4 cell counts in the range 101-150 cells/ mm^3 , another 02 had CD4 cell counts in the range 50-100 cells/ mm^3 and 01 had CD4 cell counts of less than 50 cells/ mm^3 .

Out of the total 08 subjects with absolute platelet count in the range 50000-100000/ mm^3 , 03 had CD4 cell counts more than 200 cells/ mm^3 , 04 had CD4 cell counts in the range 50-100 cells/ mm^3 and 01 had CD4 cell counts of less than 50 cells/ mm^3 .

Out of the total 03 subjects with absolute platelet count less than 50000/ mm^3 , 01 had CD4 cell counts more than 200 cells/ mm^3 and 02 had CD4 cell counts in the range 50-100 cells/ mm^3 .

The mean absolute platelet count level in the subjects with CD4 cell counts of more than 200 cells/ mm^3 was 2.37 ± 1.26 lacs/ mm^3 . The mean absolute platelet count level in the subjects with CD4 cell counts in the range of 151-200 cells/ mm^3 was 2.91 ± 1.16 lacs/ mm^3 . The mean absolute platelet count level in the subjects with CD4 cell counts in the range of 101-150 cells/ mm^3 was 3.02 ± 1.46 lacs/ mm^3 . The mean absolute platelet count level in the subjects with CD4 cell counts in the range of 50-100 cells/ mm^3 was 2.14 ± 1.74 lacs/ mm^3 . Lastly, the mean absolute platelet count level in the subjects with CD4 cell counts less than 50 cells/ mm^3 was 2.35 ± 0.89 lacs/ mm^3 .

In the present study, a positive co-relation was established between the absolute platelet count levels and the CD4 cell counts of the subjects included in the study though this co-relation was not significant (Co-relation 'r' = 0.013, p-value = 0.901, non significant, $p > 0.05$).

Hemoglobin and ART

In the present study, out of the total 33 male subjects who were on ART, 02 (06.06%) males had hemoglobin levels of 13 gm% or more, 06 (18.18%) had hemoglobin levels in the range of 10-12.9 gm%, 16

(48.48%) had hemoglobin levels in the range of 7-9.9 gm% while 09 (27.27%) males had hemoglobin levels of less than 7 gm%.

Out of the total 37 male subjects who were not on ART, 02 (05.40%) males had hemoglobin levels of 13 gm% or more, 10 (27.02%) had hemoglobin levels in the range of 10-12.9 gm%, 18 (48.64%) had hemoglobin levels in the range of 7-9.9 gm% while 07 (18.91%) males had hemoglobin levels of less than 7 gm%.

The mean hemoglobin level in the male subjects who were on ART was 8.39 ± 2.41 gm% while the mean hemoglobin level in the male subjects not on ART was 8.82 ± 2.10 gm%.

In the present study there was found to be no statistical significant difference between the male subjects who were on ART and the subjects who were not on ART with regards to the hemoglobin levels ($p = 0.76$, Not Significant, $p > 0.05$).

In the present study, out of the total 09 female subjects who were on ART, 02 (22.22%) females had hemoglobin levels of 12 gm% or more, 01 (11.11%) had hemoglobin levels in the range of 10-11.9 gm%, 02 (22.22%) had hemoglobin levels in the range of 7-9.9 gm% while 04 (44.44%) females had hemoglobin levels of less than 7 gm%.

Out of the total 21 female subjects who were not on ART, 01 (04.76%) females had hemoglobin levels of 12 gm% or more, 02 (09.52%) had hemoglobin levels in the range of 10-11.9 gm%, 11 (52.38%) had hemoglobin levels in the range of 7-9.9 gm% while 07 (33.33%) females had hemoglobin levels of less than 7 gm%.

The mean hemoglobin level in the female subjects who were on ART was 8.55 ± 2.93 gm% while the mean hemoglobin level in the female subjects not on ART was 8.07 ± 1.96 gm%.

In the present study there was found to be no statistical significant difference between the female subjects who were on ART and the female subjects who were not on ART with regards to the hemoglobin levels ($p = 0.32$, Not Significant, $p > 0.05$).

In the present study, out of the total 42 subjects who were on ART, 31 (73.80%) subjects had absolute leucocyte counts in the range 4000-11000 cells/ μ l, while 11 (26.19%) subjects had absolute leucocyte counts less than 4000 cells/ μ l.

Out of the total 58 subjects who were not on ART, 06 (10.34%) subjects had absolute leucocyte counts more than 11000 cells/ μ l, 44 (75.86%) subjects had absolute leucocyte counts in the range 4000-11000 cells/ μ l, while 08 (13.79%) subjects had absolute leucocyte counts less than 4000 cells/ μ l.

The mean total leucocyte count in the subjects who were on ART was 5392.85 ± 2157.39 cells/ μ l while the mean total leucocyte count in subjects not on ART was 6693.10 ± 3169.69 cells/ μ l.

In the present study there was found to be a statistical significant difference between the subjects who were on ART and the subjects who were not on ART with regards to the total leucocyte count ($p = 0.04$, Significant, $p < 0.05$).

The present study, out of the total 42 subjects who were on ART, 32 (76.19%) subjects had absolute platelet counts more than 1.5 lacs/mm^3 , 05 (11.90%) subjects had absolute platelet counts in the range 1.0-1.5 lacs/mm^3 , 04 (09.52%) subjects had absolute platelet counts in the range 50000-100000/ mm^3 and lastly, 01 (02.38%) subject had absolute platelet counts less than $50000/\text{mm}^3$.

Out of the total 58 subjects who were not on ART, 43 (74.13%) subjects had absolute platelet counts more than 1.5 lacs/mm^3 , 09 (15.51%) subjects had absolute platelet counts in the range 1.0-1.5

lacs/mm³, 04 (06.89%) subjects had absolute platelet counts in the range 50000-100000/mm³ and lastly, 02 (03.44%) subjects had absolute platelet counts less than 50000/mm³.

The mean absolute platelet count in the subjects who were on ART was 2.62 ± 1.54 lacs/mm³ while the mean absolute platelet count in the subjects who were not on ART was 2.41 ± 1.22 lacs/mm³.

In the present study there was found to be no statistical significant difference between the subjects who were on ART and the subjects who were not on ART with regards to the absolute platelet count (p = 0.90, Not Significant, p>0.05).

Bone Marrow and Art

In the present study, out of the total 42 subjects who were on ART, 27 (64.28%) subjects had hypercellular bone marrow, 10 (23.80%) subjects had normocellular bone marrow while 05 (14.28%) subjects had hypocellular bone marrow.

Out of the total 58 subjects who were not on ART, 45 (77.58%) subjects had hypercellular bone marrow, 07 (12.06%) subjects had normocellular bone marrow while 06 (10.34%) subjects had hypocellular bone marrow.

In the present study there was no statistical significant difference between the subjects who were on ART and the subjects who were not on ART with regards to the cellularity of the bone marrow (p = 0.26, Not significant, p>0.05).

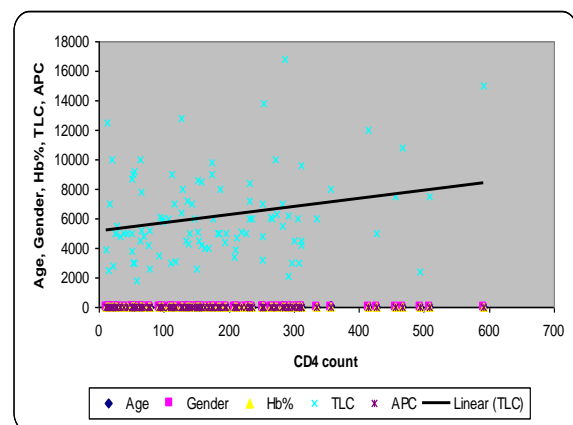
In the present study, out of the total 42 subjects who were on ART, 08 (19.04%) subjects had CD4 counts more than 200 cells/mm³, another 08 (19.04%) subjects had CD4 counts in the range 151-200 cells/mm³, 07 (16.66%) subjects had CD4 counts in the range 101-150 cells/mm³, 15 (35.71%) subjects had CD4 counts in the range 50-100 cells/cumm and 04 (09.52%) subjects had CD4 counts less than 50 cells/mm³.

Out of the total 58 subjects who were not on ART, 30 (51.72%) subjects had CD4 counts more than 200 cells/mm³, 07 (12.06%) subjects had CD4 counts in the range 151-200 cells/mm³, 08 (13.79%) subjects had CD4 counts in the range 101-150 cells/mm³, 05 (08.62%) subjects had CD4 counts in the range 50-100 cells/mm³ and 08 (13.79%) subjects had CD4 counts less than 50 cells/mm³.

The mean CD4 in the subjects who were on ART was 142.23 ± 112.11 cells/cumm while the mean CD4 count in the subjects who were not on ART was 205.00 ± 127.50 cells/cumm.

In the present study we found a statistically significant difference between the subjects who were not on ART and the subjects who were on ART with regards to the CD4 cell count (p = 0.001, Significant, p<0.05).

In the present study, on multivariate regression analysis of CD4 cell counts with age, gender, hemoglobin levels, total leucocyte counts and absolute platelet counts, it was observed that hemoglobin levels and total leucocyte count were significantly affected by the CD 4 cell counts (p<0.05).



In the present study, on multivariate regression analysis of ART with age, gender, hemoglobin levels, total leucocyte

counts and absolute platelet counts, it was observed that total leucocyte count were significantly affected by the ART ($p < 0.05$)

DISCUSSION

The observations made in 100 cases of HIV infected subjects admitted to Acharya Vinoba Bhave Rural Hospital, Sawangi (Meghe), Wardha are discussed and compared with other studies.

We noted that fever more than 1 month was the most common presenting symptom constituting 68% followed by cough which was found in 41% and weight loss in 35% of the subjects like in some studies. [14, 15, 16]

The general physical examination in our study population showed pallor in 67% cases, followed by lymphadenopathy in 32% cases.

Andrew et al, [17] noticed clinical signs which include lymphadenopathy in 51% cases and pallor in 40% cases.85

Anti Retroviral Therapy

In the present study, we divided the total number of subjects, that is, 100, into two groups. First group comprised of the subjects who were on Anti Retroviral Therapy while the second group comprised of the subjects who were not on Anti Retroviral Therapy.

Out of the 100 subjects, 42 (33 males and 9 females) belonged to the first group while 58 (37 males and 21 females) belonged to the second group.

The majority of patients not being on ART in our study can be explained on the fact that many of these subjects had CD4 cell counts more than 200 cell/mm^3 and hence they were not started on ART. Also many of our subjects were found to have co-existing tuberculosis and were started on Anti Tubercular Drugs because of which Anti Retroviral Therapy was not started to these subjects. Also our study was a single contact study and the newly diagnosed

subjects were yet to be started on Anti Retroviral Therapy.

In our study, we defined anemia according to the WHO Criteria as hemoglobin levels of $< 13 \text{ gm\%}$ in males and $< 12 \text{ gm\%}$ in females. Severe anemia was defined as hemoglobin less than 7 gm\% . We found that out of the 70 males studied, 94.28% (66/70) had anemia and 22.86% (16/70) had severe anemia. The mean hemoglobin was $8.62 \pm 2.25 \text{ gm\%}$. In case of the 30 female subjects studied, 90% (27/30) had anemia and 36.67% (11/30) had severe anemia. The mean hemoglobin level in females was $8.21 \pm 2.25 \text{ gm\%}$. Overall, the prevalence of anemia was 93% (93/100) in the study population with severe anemia being present in 27% (27/100) of the subjects. The mean hemoglobin level overall was $8.50 \pm 2.24 \text{ gm\%}$.

The higher incidence of anemia in our study can be explained on the basis of the fact that most of our study population comprised of rural population and many of these subjects had pre-existing underlying nutritional anemia. This led to an increased proportion of subjects who were found to have anemia.

In our study, out of 100 subjects studied, microcytic hypochromic anemia was the most common finding seen in 73% (73/100) of the subjects. Next common finding was normocytic normochromic anemia in 17% (17/100) while dimorphic blood picture was seen in 10% (10/100) of the subjects. Only a small proportion, that is, 19% (19/100) of the subjects had total leucocyte counts of less than 4000 cells/\mu l while 6% (6/100) had total leucocyte counts of more than $11000 \text{ cells/\mu l}$. The mean total leucocyte count was $6147.00 \pm 2850.99 \text{ cells/\mu l}$ ($5682.85 \pm 2584.41 \text{ cells/\mu l}$ in males and $6810.00 \pm 3347.60 \text{ cells/\mu l}$ in females). Our results were comparable to those of a previous study undertaken in India by Dikshit et. al. [18]

25% (25/100) of the subjects had absolute platelet counts of less than 1.50 lacs/mm^3 .

In our study, out of the 100 subjects, 38% (38/100) of the subjects had CD4 cell count of more than 200 cells/mm^3 . 62% (62/100) of the subjects had CD4 cell count of less than 200 cells/mm^3 . 12% subjects had CD4 cell counts less than 50 cells/mm^3 . The mean CD4 cell count was $178.64 \pm 124.63 \text{ cells/mm}^3$ ($162.62 \pm 102.16 \text{ cells/mm}^3$ in males and $216.00 \pm 161.66 \text{ cells/mm}^3$ in females). [19, 20] The higher incidence of patients with low CD4 cell counts (less than 200 cells/mm^3) in our study can be explained on the basis that most of our study population comprised of uneducated rural population who had little or no knowledge of their illness and hence presented late in the course of their disease.

72% (72/100) had hypercellular bone marrow. This was followed by a normocellular bone marrow picture in 17% (17/100) of the subjects and lastly hypocellular bone marrow picture in 11% (11/100) subjects. Though the results that we obtained showed a similar trend as observed in a few previous studies, yet the large proportion of subjects showing hypercellular bone marrow picture can be explained on the basis of the possibility of predominance of destruction of formed elements being the major factor at play for the bone marrow picture in our study population. [21, 22]

In our study, a positive co-relation was established between the hemoglobin levels and the CD4 cell counts of the 70 male subjects included in the study, though this co-relation was not found to be significant (Co-relation 'r' = 0.190, p-value 0.116, non significant, $p > 0.05$). A significant positive co-relation was established between the hemoglobin levels and the CD4 cell counts of the 30 female subjects included in the study (Co-relation

'r' = 0.384, p-value = 0.036, significant, $p < 0.05$). This implies that as the CD4 count in the study population increased, the hemoglobin levels also increased.

In the present study, we found a significant positive co-relation between the total leucocyte count levels and the CD4 cell counts of the subjects included in the study (Co-relation 'r' = 0.239, p-value = 0.018, significant, $p < 0.05$). This implies that as the CD4 levels increased, the total leucocyte count also followed a similar trend and showed a rise in the count. This is in accordance with the work of previous workers. [23]

In the present study, we were able to establish a positive co-relation between the absolute platelet count levels and the CD4 cell counts of the subjects included in the study though this co-relation was not significant (Co-relation 'r' = 0.013, p-value = 0.901, non significant, $p > 0.05$). This was in accordance with the results obtained in previous studies by various workers.

In our study, the mean hemoglobin level in the male subjects who were on ART was $8.39 \pm 2.41 \text{ gm\%}$ while the mean hemoglobin level in the male subjects not on ART was $8.82 \pm 2.10 \text{ gm\%}$. There was found to be no statistical significant difference between the male subjects who were on ART and those not on ART with regards to the hemoglobin. Thus, in our study we observed a different result as compared to those observed by different workers during earlier studies. This can be explained on the basis of the duration of ART being taken by our study population. Most of the subjects included in our study had a short duration of ART intake. Another reason for this was the presence of underlying nutritional anemia in most of the patients in the study population. levels ($p = 0.76$, Not Significant, $p > 0.05$). [24]

In our study, we found that the mean total leucocyte count in the subjects who were on ART was 5392.85 ± 2157.39 cells/ μ l while the mean total leucocyte count in subjects not on ART was 6693.10 ± 3169.69 cells/ μ l. There was found to be a statistical significant difference between the subjects who were not on ART and the subjects who were on ART with regards to the total leucocyte count ($p = 0.04$, Significant, $p < 0.05$). But this co-relation was such that the subjects who were not on ART had a higher mean total leucocyte count than those who were on ART. One possible explanation could be on the lines of the study by Felipe Garcia et al¹⁰³ who found a decrease in the mean total leucocyte count in the initial stage of the initiation of ART which gradually corrected itself over a period of time. Similarly, possibly the short duration of ART intake might be the factor responsible for this decrease in the mean total leucocyte count in the subjects started on ART. [25]

We found to be no statistical significant difference between the subjects who were on ART and the subjects who were not on ART with regards to the absolute platelet count ($p = 0.90$, Not Significant, $p > 0.05$). This can be explained on the basis of the short duration of ART intake in our study population. Most of our subjects were on ART since short period of time and this could have affected the results that we obtained in the study. Same for bone marrow this can be explained on the basis of short duration of ART intake in many of the subjects in our study population.

In our study, we observed that the subjects who were not on ART had a higher mean CD4 cell count as compared to those who were on ART (205.00 ± 127.50 cells/ mm^3 as compared to 142.23 ± 112.11 cells/ mm^3). Thus our findings were in contrast to the findings of previous workers. The explanation for this was that in our

study the patients who were started on ART were done so because of their low baseline CD4 cell counts. Hence most of the subjects who were started on ART had a lower baseline CD4 count as compared to those who were not started on ART. Also the short duration of ART intake was another factor that played a role in these results. Many of the subjects who were put on ART had very low baseline CD4 cell count and so, though they had some rise in the CD4 cell count, yet this rise was not on par with the subjects not on ART.

Multivariate regression analysis Of Cd4 cell count with Age, Gender, Hemoglobin, Total Leukocyte Count and Absolute Platelet Count, we found that only hemoglobin and total leukocyte count were significantly affected by the CD4 cell counts ($p < 0.05$). Thus, as the CD4 Cell counts increased, so did the hemoglobin levels and the total leucocyte counts.

On multivariate regression analysis Of ART with Age, Gender, Hemoglobin, Total Leukocyte Count and Absolute Platelet Count, we found that only total leucocyte count was significantly affected by the ART ($p < 0.05$). [26]

Thus, though our study is a step further in the evaluation of HIV and sheds new light on the effect of this killer disease on an individual, yet further studies are required to validate these findings and also to get a further insight on these aspects.

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