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Research Article

## Assessment of haematological parameters in HIV patients attending Kabutare district Hospital

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### Abstract

**Background:** Human Immunodeficiency virus (HIV) infection is characterized by progressive weakening of the immune system attributed to the decrease in the number of circulating CD4<sup>+</sup> T-helper cells. This predisposes HIV patients to a variety of opportunistic infections and neoplastic disorders. also lead to defective hematopoiesis and a decrease in cell lineage. Haematological parameters including red blood cells, white blood cells, platelet and hemoglobin are widely used clinical indicators of health and disease.

**Aim:** The aim of this study was to assess haematological parameters in HIV patients attending Kabutare District hospital.

**Methodology:** This study was a cross-sectional study conducted to assess haematological parameters in HIV patients attending Kabutare District hospital. Venous blood sample were collected for complete blood count which was determined using sysmex 500i machine automation analyser.

**Results:** A total of 80 HIV infected patient participated. 7.5% of the study participants were proven to have white blood cells below the normal range as it was below 4.26.25% of patients were found below the normal range of red blood cells. Hemoglobin and hematocrit levels of 35% patients were found to below their normal ranges. 10% of patient were found to have low platelet and 23.5% were found to have low levels of lymphocytes. Association between CD4 counts and hemoglobin levels was significant with p value of 0.000 as it is less than confidence level of 0.05.

**Conclusion:** This study concluded that haematological parameters are affected by HIV infection and there is association between CD4 counts and hemoglobin concentration levels. I would recommend health practioners to also consider complete blood count as prognostic test of HIV as it is clinical health indicator and diseases.

**Keywords:** Haematological parameters, Human Immunodeficiency virus, CD4 counts, acquired immunodeficiency syndrome.

## INTRODUCTION

HIV infection is known to have a significant impact on various haematological parameters, contributing to a range of abnormalities that can affect patient health and prognosis. Among the most notable effects of HIV on haematological parameters are alterations in red blood cell (RBC) counts, white blood cell (WBC) counts, and platelet counts, as well as changes in bone marrow function and the risk of haematological malignancies. Anemia is a common haematological complication of HIV infection, with studies reporting prevalence rates ranging from 30% to 95% among HIV-positive individuals<sup>1</sup>. Multiple factors contribute to the development of anemia in HIV, including chronic inflammation, nutritional deficiencies, opportunistic infections, and the use of certain antiretroviral medications<sup>2</sup>. In particular, the nucleoside reverse transcriptase inhibitor zidovudine has been associated with bone marrow suppression and the development of anemia in HIV patients<sup>3</sup>. Anemia in HIV is associated with increased morbidity and mortality, as well as reduced quality of life, making it an important consideration in the management of HIV-infected individuals<sup>4</sup>.

HIV infection also affects white blood cell counts, particularly CD4<sup>+</sup> T lymphocytes, which are targeted and depleted by the virus. The decline in CD4<sup>+</sup> T cell count serves as a key marker of disease progression in HIV infection and is used to guide treatment decisions<sup>5</sup>. Additionally, HIV-associated lymphopenia extends to other lymphocyte subsets, including CD8<sup>+</sup> T cells, B cells, and natural killer (NK) cells, further compromising immune function and increasing susceptibility to opportunistic infections<sup>6</sup>. Lymphopenia in HIV may result from a combination of direct viral cytopathic effects, impaired lymphocyte production, and accelerated lymphocyte turnover, highlighting the complex interplay between HIV and the immune system<sup>7</sup>.

Thrombocytopenia, characterized by low platelet counts, is another haematological abnormality associated with HIV infection. The prevalence of thrombocytopenia in HIV-infected individuals ranges from 5% to 40%, with multiple mechanisms contributing to its pathogenesis<sup>8</sup>. Immune-mediated platelet destruction, decreased platelet production, and splenic sequestration have all been implicated in HIV-associated thrombocytopenia, which can lead to an increased risk of bleeding and other complications<sup>9</sup>. Moreover, HIV infection is

associated with a prothrombotic state, characterized by alterations in coagulation factors and increased risk of venous thromboembolism<sup>10</sup>. These haematological complications further underscore the multifaceted nature of HIV-related pathology and the need for comprehensive management strategies.

In addition to peripheral blood abnormalities, HIV infection can also affect bone marrow function, leading to dysplastic changes and cytopenias. HIV-associated bone marrow abnormalities include hypocellularity, megakaryocytic hyperplasia, and dyserythropoiesis, which may mimic features of myelodysplastic syndrome (MDS) or acute myeloid leukemia (AML)<sup>11</sup>. These changes are thought to result from direct viral effects on hematopoietic progenitor cells, immune-mediated destruction, and dysregulation of cytokine signaling pathways<sup>12</sup>. Furthermore, HIV infection is associated with an increased risk of haematological malignancies, including non-Hodgkin lymphoma (NHL), Hodgkin lymphoma (HL), and Kaposi sarcoma (KS), further complicating the haematological landscape in HIV-infected individuals<sup>13</sup>.

In conclusion, HIV infection exerts a profound impact on haematological parameters, leading to a range of abnormalities that can affect patient outcomes and complicate clinical management. Anemia, lymphopenia, thrombocytopenia, bone marrow dysfunction, and the risk of haematological malignancies are all important considerations in the care of HIV-infected individuals. Further research is needed to better understand the underlying mechanisms of these haematological complications and to develop targeted interventions to improve patient outcomes. Hence, this present study is designed to assess the haematological parameters among HIV patients attending Kabutare District Hospital.

## METHODOLOGY

### Study area

This cross-sectional study was carried out at Kabutare district hospital located in Huye district, southern province. It is a district hospital, which serves big number of people different health centers of Huye district.

### Study design

This was a cross-sectional study and was carried out to assess haematological parameters in HIV patients attending Kabutare district hospital in September 2022. It was conducted in the field of hematology service.

### Study population and sample size

The study population were HIV patients of all ages attended Kabutare district hospital in ARV department during the period of conducting the study. Sample size was 80 patients under HAART.

### Sample collection and processing

In cross sectional study, 5ml of venous blood were collected in EDTA tube by venipuncture from each patient under HAART and transferred to hematology service for haematological parameters analysis during the period of study. The samples were analyzed using sysmex 500i for FBC and the CD4 were taken from the patient’s file. The data were recorded using a data collection form for analysis

### Data analysis

Data collected were analyzed using descriptive statistical package for the social sciences (SPSS) version 22 software. The presentation of the results was done using tables. Descriptive statistics was to calculate the frequency and percentages. Chi square tests was performed to find whether there is association between hemoglobin levels and CD4 count.

## RESULTS AND DISCUSSION

### Socio demographic characteristics

A total of 80 HIV-infected individuals on HAART were included in the study. Their ages ranged from 18 to 58 years with a mean age of 36.56. The majority 28(35%) of the age groups were between 41 years to 50 years. Out of the 80 patients, 57 (71.25%) were females and 23 (28.75%) were males. Table 1 below summarizes the social demographic characteristics of population,

**Table 1: socio-demographic characteristics of study participants**

Age	Sex	HIV positive	Total
[11-20]	Female	3 (3.75%)	4 (5%)
	Male	1 (1.25%)	
[21-30]	Female	12 (15%)	20 (25%)
	Male	8 (10%)	
[31-40]	Female	19 (23.75%)	25(31.25%)
	Male	6 (7.5%)	
[41-50]	Female	22 (27.5%)	28 (35%)
	Male	6 (7.5%)	
[51-60]	Female	1 (1.25%)	3 (3.75%)
	Male	2 (2.5%)	
Total	Female	57(71.25%)	80(100%)
	Male	23(28.75%)	

### Levels of selected haematological parameters in HIV patients attending Kabutare district hospital

In the present study, the levels of selected haematological parameters were determined in the study population as shown in table 1. 7.5% of the study participants were proven to have

white blood cells below the normal range as it was below 4. 26.25% of patients were found below the normal range of red blood cells. Hemoglobin and hematocrit levels of 35% patients were found to below their normal ranges. 10% of patient were found to have low platelet and 23.5% were found to have low levels of lymphocytes.

**Table 2: Haematological parameters among HIV patients on HAART**

PARAMETERS	GENDER	NORMAL	TOTAL	ABNORMAL	TOTAL
WBC	F	52 (65%)	92.5%	5(6.25%)	7.5%
	M	22 (27.5%)		1(1.25%)	
RBC	F	42(52.5%)	74.25%	15(18.75%)	26.25%
	M	17(21.75%)		6(7.5%)	
HGB	F	36(45%)	65%	21(26.25%)	35%
	M	16(20%)		7(8.75%)	
HCT	F	36(45%)	65%	21(26.25%)	35%
	M	16(20%)		7(8.75%)	
PLT	F	52(65%)	90	5(6.25%)	10%
	M	20(25%)		3(3.75%)	
LYMPH	F	47(58.75%)	76.25%	10(12.5%)	23.5%
	M	14(17.5%)		9(11.25%)	

The study conducted on haematological abnormalities on HIV infected patients shown high a decrease in hemoglobin concentration and a decrease in other parameters and the pathogenesis of decrease in those haematological parameters is not fully understood but it is assumed to be multifactorial. A decrease can occur at any stage of a disease with progression<sup>14</sup>.

These findings of present study are in line with those of another study which studied the haematological of profile in HIV patients, in their study also found a decrease in red blood cells,

white blood cells, platelet and hemoglobin on patients under HAART<sup>15</sup> and this the same as the results in the present study.

### Association between hemoglobin levels and CD4 counts

In 80 HIV patient on HAART, Patients were divided into 3 groups 16 were found to have CD4 counts less than 200cumm and low hemoglobin levels, 46 found to have CD4 count between 200-500cumm 11 were found to have low hemoglobin levels and 35 were found to have normal hemoglobin levels. 16 were found to have above 500cumm and normal hemoglobin level.

**Table 3: Association between hemoglobin levels and CD4 count**

		HGB LEVELS		Total	Chi square	df	P-value
		LOW	NORMAL				
CD4 of HIV patient	<200	16	0	16	43.211	4	0.000
	200-500	11	35	46			
	>500	0	16	16			
	100	1	0	1			
	460	0	1	1			
Total		28	52	80			

The association between Hemoglobin levels and CD4 count was statistically significant with a p-value of 0.000 which is less than confidence level (0.005). The findings of this study are in line with where the group of patients with low CD4 counts presented a significantly increased rate of hemoglobin concentration compared to patients from the group with high CD4 counts<sup>14</sup>.

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### Conflict of interests

Authors declare no conflict of interests

## Ethical consideration

Each participant was informed about the research objectives, methods, and techniques in detail. Data were collected ensuring the privacy and confidentiality. Ethical approval for the study was obtained from both ethical committees of Kabutare district hospital and INES Ruhengeri.

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