Prevalence and Factors of Anaemia Among Adults Living with HIV on Haart in a Tertiary Health Institution in North Central Nigeria

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ABSTRACT

Anaemia is a prevalent haematologic disorder among adults living with HIV (ALWHIV), persisting despite the use of highly active antiretroviral therapy (HAART). Studies in Nigeria have reported high anaemia prevalence rates among HIV patients. Identifying the factors associated with and understanding the prevalence of anaemia in HIV patients can inform strategies to reduce its incidence and improve patient outcomes.

This study was conducted at Bingham University Teaching Hospital in Jos, Nigeria. Data from 425 HIV-positive patients on first-line HAART treatment for at least six months were analyzed. WHO criteria were used to define and categorize anaemia, viral load and CD4 count classifications to stage HIV infection.

The study participants had a mean age of 48±7.8years. Overall anemia prevalence was 32.2%, with 19.1%, 11.5% and 1.6% of participants having mild, moderate and severe anemia respectively. Participants with lower CD4 counts (<200 cells/µL), undetectable viral loads and those with unsuppressed viral loads had higher percentages of anaemia. There was no statistically significant association between anaemia and Age, CD 4 count, Viral Load, and Gender.

Anemia is a significant health concern among ALWHIV despite being on HAART. It requires regular monitoring in these patients for better clinical outcomes and better quality of life.

Keywords: Anaemia, HIV, North central, Prevalence, HAART, BHUTH, Factors.

INTRODUCTION

Anaemia is a common and frequent heamatologic disorder in patients with Human immunodeficiency virus (HIV) infection (Gedefaw et al, 2013; Meidani et al., 2012). Despite the use of highly active antiretroviral therapy (HAART) which is considered a gold standard for the treatment of the disease (Okechukwu et al., 2010), the prevalence of the disease and its corresponding haematogical complications such as anaemia has remained high and a cause for concern in the public health space.

In Nigeria, for example, several studies have recorded a high prevalence of anaemia in HIV patients and even in those who are on HAART. Nnamani et al., (2021) in a study on the prevalence of anaemia in HIV patients in Southeastern Nigeria reported a high prevalence of 76.3% of anaemia in this Cohort which was even higher in the female participants recruited for the study which recorded a prevalence of 79.9%. This is consistent with an earlier study by Bisong et al., (2017) in the south-south region of the country which recorded a prevalence

of 76% and a higher prevalence among the females recruited in the study as well. A 64% prevalence of anaemia was also recorded by Peenap and Abubakar (2015) in a similar study.

There is however, a wide variation in the prevalence of anaemia among HIV patients to which the initiation of HAART is a contributing factor among other factors such as sex, age, CD4 count, Viral load and the HAART regimen a patient is placed on (Ahumareze et al., (2016); Ohihoin et al., (2014) and Mata-Marín et al., (2010). While Nnamani et al (2021) in their study discovered that there is no significant difference between HIV patients on HAART and those, not on it. Asefa et al., (2015) in a retrospective study has a contrary report where there was a significant decrease in the overall prevalence after the initiation of HAART.

The pathophysiology of HIV- associated anemia may involve three basic mechanisms: decreased RBC production, increased RBC destruction, and ineffective RBC production. Infiltrations of the bone marrow by neoplasm or infection, use of myelosuppressive medications, a decrease in the production of endogenous erythropoietin, hemolysis that may result from RBC autoantibodies and HIV infection itself are some of the causes of anemia in HIV positive people (Volberding et al., 2004). Medications used in the treatment of HIV infections have been reported to contribute to the reduction of haemoglobin as well as bone marrow suppression (Volberding et al., 2004) which subsequently could influence the development of anaemia in HIV Patients.

While anemia may manifest as a mere laboratory abnormality in some individuals, others may experience typical symptoms (e.g., fatigue, dyspnea, reduced exercise tolerance) and even more serious complications that can lead to poor quality of life, reduced chances of survival, and reduced functionality. It is also a common cause of morbidity and mortality among patients. Identifying and understanding the risk factors and the prevalence of this common complication among this cohort will therefore be of help in developing strategies necessary to reduce its incidence. This study aims to assess the magnitude and severity of anemia in adult patients on HAART at Bingham University Teaching Hospital (BHUTH) and to determine the association of anemia with independent factors.

MATERIALS AND METHODS

This is a hospital based cross-sectional retrospective study. Records from patients' data were used. These were from patients who attended the ART Clinic of the Bingham University Teaching Hospital between January and December 2020. Participants were randomly selected, and a total of 425 patients met the inclusion criteria. Participants included were HIV positive, aged 18 years and above and were on treatment with first-line HAART for at least 6 months. Those who had a history of blood transfusion in the past 1 year, those with Chronic disease (CRF, Liver failure, PUD, Hematologic disorders) and Pregnant women were excluded.

Dependent variable: Anaemia

Independent variables: Age, Gender, CD4 count, Viral load

Participants' hematological and immunological (CD4+ T cells, viral load) values were carefully extracted from patients' folders and from the HIV management data base. Absolute counts of CD4 lymphocytes were assayed using the CyFlow counter (SYSMEX EUROPE SE. Norderstedt, Germany). Haematological parameters such as haemoglobin (Hb) were determined using the automated blood analyzer BC-5300 mindray system (SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD, CHINA.

Anaemia is defined as the reduction in haemoglobin concentration in blood that is below the normal for age and sex in the same environment. According to the WHO criteria for adult males, anaemia is haemoglobin (Hb) concentration less than 13 g/dl, while for adult females, the value is less than 12 g/dl. Mild anaemia was defined as a Hb level of 11-12.9 g/dl for men and 11-11.9 g/dl for women. Moderate anaemia was defined as a Hb of 8.0-10.9 g/dl for both men and women while Severe anaemia was defined as a Hb level of less than 8 g/dl for both adult males and females. (WHO, 2024) Viral Load (VL) as defined by WHO Classification: Undetectable: A VL less than 50 or 20 copies/mL. Suppressed: A VL less than 1000 copies/mL. Unsuppressed: A VL of 1000 copies/mL or greater. (WHO, 2023) The WHO also classifies CD4 counts as:

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Normal CD4 count: 500 cells/mm³ or above. HIV Infection (Stage 2): CD4 count 350–499 cells/µL. (Stage 3): CD4 count 200–349 cells/µL. AIDS (Stage 4): CD4 count less than 200 cells/µL. The ages were also classified as Adult: 19-43 years, Middle Age: 44-59 years. Elderly: 60-74 years. Senile: 75-90 years.

Data was entered and analyzed by using SPSS version 26. Descriptive statistics were determined for continuous variables during analysis. Proportions and percentages were calculated for categorical variables. For all statistical comparisons of the groups, the Pearson Chi-square test was used and a P-value < 0.05 was considered statistically significant.

Ethical clearance for the study was obtained from the Ethical committee of the Bingham University Teaching Hospital, Jos.

RESULT

The age of the study population was between 22 and 88 years with a mean age (48± 9.7) years. Adult:136 (32.0%), Middle Age: 228 (53.6%), Elderly: 55 (12.9%), Senile: 6 (1.4%)

Among the 425 participants, 137 had anaemia giving a prevalence of 32.2%. The prevalence of mild, moderate and severe anaemia was 19.1%, 11.5% and 1.6%, respectively. There were 117 males (27.5%) and 308 females (72.5%). About 33.3% of male patients and 32.1% of female patients were anaemic.

Participants with CD4 count of ≥500 cells/µL were 252(59.3%). 32.9% of them had anaemia. Those with CD4 count of 350–499 cells/µL were 90 (21.2%). Anaemia in this group was 26.6% Those who had CD4 count of 200–349 cells/µL were 58 (13.6%) and anaemia in this group was 32.7% while 25 (5.9%) had a CD4 count less than 200 cells/µL with 48% of them being anaemic.

A total of 365 (85.9%) participants had an Undetectable viral load with 32.3% being anaemic. 39 (9.2%) were suppressed with 28.2% of them being anaemic. 20 (4.7%) of the participants were Unsuppressed with 45% being anaemic.

Bivariate logistic regression was applied which showed no statistically significant association between anemia and Age, CD 4 count, Viral Load, and Gender (Table 3)

Table 1 Independent variables with percentages.

VARIABLES	CLASSIFICATION	FREQUENCY	PERCENTAGES %
VIRAL LOAD (VL)	Undetectable VL	366	86.1
	Suppressed VL	39	9.2
	Unsuppressed VL	20	4.7
	TOTAL	425	100.0
CD4 COUNT	≥500 cells/µL	252	59.3
	350–499 cells/µL	90	21.2
	200–349 cells/µL	58	13.6
	<200 cells/µL	25	5.9
	TOTAL	425	100.0
AGE	Adult	137	32.2
	Middle age	228	53.6
	Elderly	55	12.9

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	Senile	5	1.2
	TOTAL	425	100.0

Table 2. Descriptive proportions of factors with anaemia

VARIABLES	CLASSIFICATION	NORMAL	MILD ANAEMIA	MODERATE ANAEMIA	SEVERE ANAEMIA	TOTAL
VIRAL LOAD	Undetectable VL	248	70	43	5	
	Suppressed VL	28	7	3	1	
	Unsuppressed VL	11	5	3	1	
						425
CD4 COUNT	≥500 cells/µL	169	53	28	2	
	350–499 cells/µL	66	16	6	2	
	200–349 cells/µL	39	7	10	2	
	<200 cells/µL	13	6	5	1	
						425
AGE	Adult	91	28	16	2	
	Middle age	158	38	27	5	
	Elderly	34	15	6	0	
	Senile	4	1	0	0	
						425

Table 3. Association of factors with anemia

	Unstandard Coefficient		Std. Coeff		
	B	Std. Error	Beta	T	Sig.
Viral load	.043	.076	.028	.572	.538
Gender	-.083	.087	-.048	-.947	.344
CD4	.069	.041	.084	1.682	.094
Age	-.005	.056	-.004	-.084	.933

DISCUSSION

Among the participants, the mean age was (48± 9.7) years while the age class most affected with HIV was the middle-aged group who made up more than half of the sample size.

The prevalence of anaemia in this study was 32.2% with most patients presenting with mild to moderate anaemia. The prevalence of anaemia in our study is in line with findings from Rwanda (29%), Maunakeas et al., (2012), Central Ethiopia (33%) Wolde et al., (2014) and northwest, Ethiopia (35%) Ferede and Wondimeneh (2013). It is lower compared with the results of study from Northeastern Nigeria (57.5%) Denue, et al., (2013), Ethiopia (52.6%) Adane et al., (2012) and China (51.9%) Shen et al., (2013). The prevalence of anaemia in the current study was higher compared to two studies from Ethiopia done by Gedefaw et al. (2013)

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(23.1%) and Melese et al. (2017) (23%) respectively. This difference may be due to differences in ethnicity, geographical location, study designs, time of study or the use of different definitions of anaemia.

Patients with CD4 cells < 200 cells/mm^3 were more likely to be anemic compared to those with CD4 count ≥ 500 cells/mm^3. This is supported by studies done by Horton and Levin (2001) and Horton Asefa et al., (2015). Unlike most studies (Wolde et al., (2014); Harding et al., (2020); Zerihun et al.,(2019), this current study found no statistically significant association between the CD4 count and anaemia levels. This is in consonance with the study of Ramezani and his colleagues which was conducted in Iran that found no association between CD4 count and the development of anemia. Mugisha et al., (2008). Pennap and Abubakar, (2015) in their study, documented that not only was the association of anaemia with CD4 count not statistically significant, the association of anemia with age and gender, was also not statistically significant like the index study. Enawgaw et al., (2015) also found that CD4 count was not a significant risk factor for the development of anaemia. This study was carried out among children. However, compared with 32.9% of patients with CD4 count above 500 cell/mm3 who had anaemia, 48% of patients with CD4 count less than 200 cell/mm3 had anaemia. Lower CD4 means the progression of HIV disease with higher viral burden, which increased cytokine-mediated myelosuppression leading to anaemia. This is a major mechanism for anemia among HIV infected individuals by the disruption of bone marrow cytokine homeostasis causing the hemopoietic progenitor cells to be inadequate to respond for anemia. Kassebaum et al., (2014) Furthermore, decreased CD4 cells reduces the immunity of patients and exposes them to opportunistic infections that lead to the deficiency of micronutrients like iron. (Zerihun et al., 2019)

In this study, the viral load showed no statistically significant association with anaemia. However, among the unsuppressed participants with high viral loads, almost half of them were anaemic. It has been known that high viral loads can lead to increased cytokine production which leads to myelosuppression leading to anaemia.

The index study showed that the percentage of anaemia in both the males and females were about equal; male, 33.3%; female, 32.1%. Our analysis revealed no statistically significant association between sex and anemia. This finding is consistent with the study by Denue et al. (2013), which also reported no significant association between sex and anemia, despite a higher arithmetic prevalence of anemia among women compared to men. A plausible explanation for this observation may be that women of childbearing age are particularly vulnerable to iron-deficiency anemia due to menstrual blood loss and increased blood volume demands during pregnancy though pregnant women were excluded in the index study.

The levels of anaemia that yielded no statistically significant association with the variables could be because of the mandatory change for those on the Zidovudine-containing ART to HAART containing (Tenofovir disoproxil fumarate, Lamivudine, Dolutegravir (TLD). Zidovudine has been shown to be associated with anaemia in ALWHIV (Cohen et al., 1989 and Moyle et al., 2004) Zidovudine is a widely used drug that results in myelosuppression causing anemia. (Volberding et al., 2004) HARRT (TLD) was however not among the factors checked for association with anaemia in this study.

Limitation

This study is a retrospective study which is prone to Selection bias. Information bias, and Recall bias. A prospective study design is recommended to get strong evidence regarding causality. The generalizability of the research work is further reduced because of the non-contribution of the role of nutrition in the causation of anaemia

CONCLUSION

Anaemia is a common heamatologic disease among ALWHIV that can result to morbidities and mortalities. Therefore, it is recommended that a policy be put in place for routine and regular screening for anaemia so that

early diagnosis and treatment of anaemia is carried out in these patients.

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Competing interest

The authors declare no competing interests.

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