


# Anemia And Associated Factors Among Adult People Living With HIV/AIDS Receiving Anti-Retroviral Therapy At Gedeo Zone, SNNPR, Ethiopia, 2018

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**Background:** Anemia is one of the most common blood abnormalities in people with HIV. The incidence of anemia ranges from 10% in people who have no HIV symptoms to 92% among individuals who have advanced AIDS. Anemia which is also one of the major challenges among HIV patients can lead to impaired physical functioning, psychological distress, poor quality of life, accelerated disease progression, and shorter life expectancy. There are different reports that show a large number of patients with both anemia and HIV/AIDS in Ethiopia. However, the burden of anemia among those HIV/AIDS patients receiving ART is not fully understood in Gedeo zone health institutions. Hence, this study is designed to assess the prevalence of anemia and associated factors among adult HIV/AIDS clients receiving ART at Gedeo zone health institutions, SNNPR, Ethiopia.

**Methods:** An institution-based cross-sectional study was conducted in Gedeo zone health institutions from November 21 2017 to January 30, 2018. The systematic random sampling technique was used to recruit the study participants. The hematocrit level was used to determine anemic status. Data were entered into EPI info version 7 and transferred to STATA version 12.0 for analysis. In order to identify factors associated with anemia, a multivariable logistic regression analysis was employed.

**Result:** A total of 422 patients were included with a mean age of 33.85 (SD = ±9. 12) years. The prevalence of anemia was 34.8% (95% CI 30.1–39.8), while about 7.4%, 14.3%, and 13.1% of the patients had severe, moderate, and mild anemia, respectively. The mean hemoglobin was 14.6 (SD=±10. 8), (95% CI 13.6\_15.8). INH/Isoniazid prophylaxis (OR =1.8 [95% CI: 1.1, 2.9]) and bedridden functional status (OR =5.48 [95% CI: 1.25, 23.8]) were determinants of anemia in this study.

**Conclusion:** In this study, a large number of patients had anemia (34.8%) with the majority of them having a moderate form. Functional status and using INH prophylaxis were determinant factors of anemia.

**Keywords:** hematocrit level, prevalence, anemia, HIV/AIDS

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## Introduction

Anemia is the most common hematological disorder. We define anemia to be when hemoglobin (Hb) and hematocrit (HCT) levels are below the normal reference range according to WHO criteria. In males, anemia is diagnosed when Hb is <13 g/dL and HCT is <39%, whereas in females, anemia is when Hb is <12 g/dL and

HCT is <36%.<sup>1</sup> Twenty percent of all hospital admissions among the elderly are due to anemia.<sup>2</sup>

Anemia may be caused by nutrient deficiencies (iron, folic acid and vitamin B12), sickle cell disease, AIDS, malaria, hookworm infection, and other infections.<sup>3</sup> Anemia is one of the most common blood abnormalities in people with HIV. The incidence of anemia ranges from 10% in people who have no HIV symptoms to 92% in individuals who have advanced AIDS.<sup>4</sup>

The hematological manifestations of HIV infection are complications of the disease which may be clinically important in patients. An obvious cause of anemia in patients with HIV infection is blood loss. Other than blood loss, HIV-associated anemia may cause decreased red blood cell/RBC production, increased RBC destruction and ineffective RBC production.<sup>5,6,7</sup>

Anemia which is also one of the major challenges among HIV patients can lead to impaired physical functioning, psychological distress, poor quality of life, accelerated disease progression, and shorter life expectancy.<sup>5</sup> Although anemia can occur at any stage of HIV infection, its severity is correlated with progression of the HIV disease stage. A study conducted in the very early years of HIV discovery shows the overall prevalence of anemia to be about 28% among people with HIV infection in the pre-AIDS stage of the disease, whereas it could reach as high as 71% in the advanced or AIDS stage of the HIV disease.<sup>9</sup>

According to reports, the prevalence of anemia among adult HIV patients taking ART ranges between 23% and 50% globally<sup>4,6,10</sup> and between 24% and 58% in Africa.<sup>11,12</sup> Generally, the prevalence of anemia tends to be higher in ART-naïve patients compared to ART users.<sup>18,19</sup> In Ethiopia, the prevalence of anemia among ART-naïve adult HIV patients was reported to reach up to 35%.<sup>13</sup> A study done 3 years ago in the southwest part of Ethiopia has shown the prevalence of anemia to be 29.9% and 16.2% among ART-naïve and ART-experienced HIV patients, respectively.<sup>14</sup>

There are different reports that show a large number of both HIV/AIDS and anemia in Ethiopia. However, the burden of anemia among people living with HIV/AIDS and receiving ART is not fully understood in Gedeo zone health institutions. Hence, this study is designed to assess the prevalence of anemia and associated factors among adult HIV/AIDS clients receiving ART at Gedeo zone health institutions, SNNPR, Ethiopia.

## Materials And Methods

### Study Setting And Design

Multicenter institution-based cross-sectional study was conducted in selected governmental health institutions in Gedeo zone, SNNP regional state of Ethiopia from March to April, 2018. The zone has 8 werdas and 2 city administrations. There are 38 health centers in the zone and 4 hospitals, including Dilla University Referral Hospital, but only the 7 health centers and 4 hospitals have ART services.

### Study Population

The study population for this study was all HIV-positive adults aged 15 years and above who ever started first-line ART at the selected health institutions between February 2010 and 2017 in Gedeo zone, SNNP, Ethiopia. All HIV-positive adults (age  $\geq 15$  years) on ART for at least 6 months were included, because adequate exposure to treatment is considered if the patient takes the drug for at least 6 months. It is also related to the time in which the treatment started to suppress the virus and the immunity becomes reconstituted. Patients who have less than two follow-up CD4 counts, transferred in and who had incomplete information about the outcome variable were excluded. The sample size was 422; it was calculated using sample size calculation formula taking confidence level=95%, power=80%, prevalence of anemia among HIV patients=52.3%<sup>15</sup> and by adding 10% non-response rate.

### Data Collection Instruments And Procedure

Socio-demographic details such as age, gender, residence, employment status, level of education and marital status were collected using interviewer-administered questionnaire. A standardized data extraction checklist was prepared by the investigators in English and was collected from patient chart and log book. The 2011 World Health Organization (WHO) report on the Hb concentration level to diagnose anemia was used in the hospital.<sup>16</sup> Accordingly, anemia for males is defined as the Hb concentration <13 g/dL (11.0–12.9 g/dL=mild; 8.0–10.9 g/dL moderate, and <8.0 g/dL=severe), whereas anemia for females is defined as Hb <12.0 (11.0–11.9 g/dL=mild, 8.0–10.9 g/dL=moderate, and <8.0 g/dL=severe). Five BSC nurses who had experience in working at the ART clinic participated in the data collection process after

one-day training and were supervised by 4 supervisors. The data clerks and card room workers supported them by identifying the cards of patients.

## Data Processing And Analysis

Data were entered into EPI info version 7 and transferred to STATA version 12.0 for analysis. Descriptive and summary statistics were carried out. The data analysis ranged from the basic description of outcomes to the identification of statistically significant associations. Accordingly, simple frequencies, measure of central tendencies and measure of dispersions were computed. Bivariate analysis and multiple logistic models were used to show the relationship between anemia and various associated factors. Finally, all explanatory variables that were significantly associated with the outcome variable in the bivariate analyses ( $P < 0.25$ ) were entered into the multivariable logistic regression model to identify independent predictors of anemia. The adjusted odds ratio (AOR) with 95% confidence interval (CI) was calculated to show the strength of association. In multivariable analysis, variables with a P-value of  $< 0.05$  were considered as statistically significant.

## Results

### Socio-Demographic And Clinical Characteristics

In this study, a total of 422 patients were included. The majority of the patients (56.7%) were females and 42.3% of the study participants were in the age group of 40–49 years with a mean age of 33.85 (SD = ±9. 12) years. Most of the study participants (68.8%) functional status was working (Table 1).

### Prevalence Of Anemia

The prevalence of anemia was 34.8% (95% CI 30.1–39.8) while about 7.4%, 14.3%, and 13.1% of the patients had severe, moderate, and mild prevalence of anemia, respectively. The mean hemoglobin was 14.6 (SD=±10. 8), (95% CI 13.6–15.8). Among those anemic patients, 55% were females, the majority (80%) used 1E drug regimen, 40% were in the age group of 40–49 years, the majority (70%) of them had poor adherence to ART, 48% had opportunistic infections and 47.6% used isoniazid prophylaxis.

### Factors Associated With Anemia

In the bivariate logistic regression type of regimen, occupation, educational status, INH, opportunistic infection, functional status, BMI (malnutrition) and adherence were statistically significant factors of anemia in adult

**Table 1** Socio-Demographic And Clinical Characteristics Of Adult HIV Patients On First-line ART In Gedeo Zone 2018

Variable	Category	Frequency	Percent
Age	<30 years	131	31.5
	30–39 years	176	42.3
	40–49 years	80	19.2
	>50 years	29	7
Educational status	No formal education	112	26.5
	Primary	151	35.8
	Secondary and above	132	31.3
		44	10.48
Occurrence OI	Yes	202	48.6
	No	198	47.6
Occupation	Unemployed	289	68.5
	Employed	36	8.5
	Merchant	36	8.5
CD4(cells/mm <sup>3</sup> )	<200	181	43.5
	200–499	155	37.3
	>500	80	19.2
Functional status	Working	340	66.80
	Ambulatory	145	28.49
	Bedridden	23	4.52
WHO stage	Stage 1	122	24.06
	Stage 2	91	17.95
	Stage 3	265	52.27
	Stage 4	28	5.52

HIV-infected patients on first-line ART. In the multivariable logistic regression, Using INH and bedridden functional status were statistically determinants of anemia (Table 2).

## Discussion

The prevalence of anemia in this study was 34.8% (95% CI 30.1–39.8). This is within the range of different studies conducted on the prevalence of anemia among adult HIV patients taking ART (23% and 50% globally and 24% and 58% in Africa).<sup>11,12</sup> In general, the prevalence of anemia tends to be higher in ART-naïve patients compared to ART users. In another study in Ethiopia, the prevalence of anemia among ART-naïve adult HIV patients was reported to reach up to 35%.<sup>17</sup> The incidence of anemia ranges from 10% in people who have no HIV symptoms to 92% in individuals who have advanced AIDS.<sup>4</sup> A study conducted in the very early years of HIV discovery had shown the overall prevalence of anemia to be about 28% among

**Table 2** Bivariate And Multivariable Logistic Regression Analysis Of Anemia And Associated Factors Among Adult People Living With HIV/AIDS Receiving Anti-Retroviral Therapy At Gedeo Zone, SNNPR, Ethiopia, 2018

Variable			Crude OR (95% CI)	Adjusted OR (95% CI)
	Not Anemic	Anemic		
INH given				
No	93	69	1	1
Yes	175	70	1.85(1. 25, 2.5)	1.8(1.1, 2.9)*
Opportunistic infection				
No	135	68	1	1
Yes	132	71	1.99(0.7, 5.5)	1.34(0.2, 10.4)
Adherence				
Good	194	103	0.51(0.20, 1.31)	0.56(0.2, 1.8)
Poor	70	33	1	1
Functional status				
Working	206	85	1	1
Ambulatory	58	57	1.14(0.4,3.7)	2.7(0.63, 11)
Bedridden	11	5	2.75(0.83, 9)	5.48(1.25, 23.8)*
BMI(malnutrition)				
Not malnourished	221	106	1	1
Malnourished	54	41	2.2(0.96, 5.1)	1.65(0.95, 2.85)
Regimen*				
Ib, Ia & Ic	13	5	0.24(0.03, 2.13)	2.4(0.2,3.45)
Id	9	6	0.95(0.3,3.1)	0.9(0.3,2.7)
Ie	225	117	0.76(0.4,0.96)	3.2(0.30,34.4)
If	27	19	1	1

**Notes:** \*ART Regimen: Ia=d4T-3TC-NVP, Ib= d4T-3TC-EFV, Ic=AZT-3TC-NVP, Id=AZT-3TC-EFV, Ie=TDF-3TC-EFV, If=TDF+3TC+NVP.

**Abbreviations:** Drug names: d4T, Stavudine; 3TC, lamivudine; EFV, efavirenz; NVP, nevirapine; AZT, Zidovudine or azidothymidine; TDF, tenofovir disoproxil fumarate.

people with HIV infection in the pre-AIDS stage of the disease, whereas it could reach as high as 71% in the advanced or AIDS stage of the HIV disease.<sup>9</sup> The prevalence of anemia in this study was lower than the findings of studies conducted in China,<sup>15</sup> which was 39.2% and 52.3% in Arbaminch,<sup>15</sup> but it is higher than the studies conducted in Debretabor Hospital,<sup>17</sup> which was 23% and 16.2% in southwest Ethiopia.<sup>13</sup>

In this study, those patients who had bedridden functional status were 5.5 times more anemic than those who are working. INH users were 1.8 times more anemic. This finding is in line with a study conducted among adult HIV patients in Ethiopia: a hospital-based cross-sectional study.<sup>17</sup> This might be due to that INH causes vitB6 deficiency which leads to anemia due to malabsorption of nutrients.

## Conclusion

In this study, the prevalence of anemia was 34.8%. Functional status and INH were determinant factors of

anemia. Based on the results, we recommend hospitals establish and rapidly expand awareness and counseling program to facilitate and motivate HIV-infected patients to improve their adherence and nutritional intake. Moreover, health care providers managing HIV patients should treat INH side effects and should prescribe iron and vitB6 supplementation to those malnourished and anemic patients.

## Abbreviations

AIDS, acquired immune deficiency syndrome; ART, anti-retroviral therapy; BMI, body mass index; EDHS, Ethiopian demographic health survey; FMOH, Federal Ministry of Health; HAART, highly active antiretroviral therapy, HIV, human immune deficiency virus; HCT, hematocrit; Hb, hemoglobin; INH, isoniazid; RBC, red blood cell; PLWHA, patient living with human immune deficiency virus/AIDS; SNNP, Southern Nations Nationalities and peoples; SSA, sub-Saharan Africa; WHO, World Health Organization.

## Ethics Approval And Consent To Participate

Before starting the data collection, ethical clearance was secured from IRB of Dilla University, College of Health and Medical Science. A support letter was obtained from Gedeo Zone health department and ethical permission letter was also obtained from the hospital administration and the ART focal persons in the health institutions and this was approved by IRB of Dilla University. All participants provided verbal informed consent, and this was approved by IRB of Dilla University. There were no participants whose age is less than 18 years. Names and unique ART numbers of patients were not included during data collection. The information gathered was not accessible to anyone except the principal investigator and was kept locked with password and appropriate locks. Moreover, data collectors and supervisors were professionals who have experience of working in ART clinics.

## Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Acknowledgments

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## Author Contributions

WAZ was involved in conception of the study; WAZ, ATA and TST were significantly involved in the design, selection of articles, and manuscript preparation and revision. All authors contributed to data analysis, drafting or revising the article, gave final approval of the version to be published and agreed to be accountable for all aspects of the work.

## Disclosure

The authors report no conflicts of interest in this work.

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