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Prevalence of Anemia and Associated Risk Factors among Adult HIV Patients at the Anti-Retroviral Therapy Clinic at the University of Gondar Hospital, Gondar, Northwest Ethiopia

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Abstract

Background: Anemia is the most common hematologic abnormality in HIV patients. Anemia is a predictor of progression from HIV infection to AIDS or death; more than 70% of HIV patients develop anemia and thus requires blood transfusion.

Objective: To determine the prevalence of anemia and associated risk factors in HIV positive patients who visited the University of Gondar Hospital Anti- Retroviral Therapy (ART) clinic from November 2011 to May 2012.

Method: A cross sectional study was conducted in the University of Gondar Teaching Hospital ART clinic from November 2011 to May 2012. Three hundred and eighty four HIV positive patients were interviewed face to face. Blood samples were collected for hematological tests. Descriptive statistics and binary logistic regression analyse (SPSS version 16) were used.

Results: The mean age of our patients was 37 ± 9 years; 61% (233) were female, 39% (151) were males. 269 (70.1%) patients were anemic with mean of Hgb12.4 (± 2.06), MCV 102.39 (± 16.25) and MCH 31.97 (± 4.67). 189 (70.3%) of these patients were females; and 80 (29.7%) were males. Anemic individuals using Anti-retroviral therapy were high in numbers than non-users which indicate the drug is one factor for being anemic.

Conclusion: Mild to moderate anemia was common in the study population. Treatment for anemia along with the Anti-retroviral therapy (alone for HAART naïve patients) may decrease the prevalence of anemia and the affect Anti-retroviral therapy on red blood cells.

Keywords: Anemia; HIV/AIDS; ART; HAART

Introduction

Anemia is the most common hematological disorder. We define anemia to be when hemoglobin (HGB) and hematocrit (HCT) levels are below the normal reference range according to WHO criteria. In males anemia is diagnosed when HGB is <13 g/dl and HCT is <39% whereas female anemia is when HGB is <12 g/dl and HCT is <36% [1]. Twenty percent of all hospital admissions among the elderly are due to anemia [2].

Anemia may be caused by nutrient deficiencies (iron, folic acid and vitamin B12), sickle cell disease, AIDS, malaria, hookworm infection, and other infections [3]. 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 [4].

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 RBC production, increased RBC destruction and ineffective RBC production [5,6]. Although HIV associated anemia is multifactorial, the principal factors are infiltration of the bone marrow by neoplasm or infection, myelo-suppressive medications such as Zidovidine, HIV infection itself, decreased production of endogenous erythropoietin, hemolytic anemia that may result from RBC auto-antibodies or may also develop as a consequence of the use of various medications [5,7]. The association between anemia and decreased survival has been found to be independent of CD4 T-lymphocyte count and plasma RNA concentration [3,8]. HIV infected people who recover from anemia have better survival rates than those who do not recover from anemia. Some studies have showed that soluble factors like HIV proteins and cytokines may inhibit the growth of hematopoietic cells in the bone marrow [9-11].

Treatment of anemia in HIV infected individuals may require the reduction of antiretroviral therapy and anti- opportunistic strategies [4]. Since antiretroviral therapy has become more and more effective and has dramatically increased life expectancy in ADIS patients, its use should not be limited because of anemia. Thus, there is a need to develop potent therapeutic strategies against anemia that can support effective HIV treatment either directly by increased survival or indirectly by avoiding dose reduction of ART [12].

In more than 32,000 individuals with HIV, the yearly incidence of developing-anemia increased with disease progression. From 3% of all individuals with asymptomatic HIV infection, 12% of asymptomatic

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patients with CD4 cell count <200/ml and 37% of patients with AIDS related illness. Anemia is associated with increased morbidity and mortality in both children and adults with HIV infection. Furthermore, mortality rates fell in those who recovered from anemia to a level comparable to patients who were not anemic; this effect was independent of the CD4 cell count [13,14]. In another study involving more than 1000 HIV-infected Tanzanian women, anemia was associated with increased AIDS-related and all-cause mortality, independent of baseline CD4 count, World Health Organization clinical stage, patient age, and body mass index [15].

HAART is generally accepted as a gold standard in management of HIV positive patients [16,17]. But the chance of developing new anemia or worsening anemia is high in patients taking HAART containing zidovudine [18,19]. Detailed studies on the prevalence of anemia in HIV positive patients on HAART and HAART naïve has been done in developed and developing countries. But in Ethiopia, there is little information. Despite the fact that anemia caused by HAART is a great concern to the public and the Health authorities.

Materials and Methods

Study design, period, and area: Institution based cross sectional study from November 2011 to May 2012 at the University of Gondar teaching hospital, Gondar, which is in Amhara Regional state, 741 km Northwest of Addis Ababa. The University of Gondar teaching hospital is one of the biggest tertiary level referral and teaching hospitals in the region. Many people from the surrounding zones and nearby regions visit the hospital. There is an operating room, 13 wards with 327 beds, and an outpatient department.

Sample size and data collection technique

Simple random sampling was used to select study participants from HIV positive individuals attending University of Gondar Hospital ART clinic. The first participant was selected randomly. Then we took every other person until the required sample size was obtained; considering 95% confidence interval, 5% margin of error and 50% proportion; 384 HIV positive individuals were selected.

Data collection: Socio-demographic variable and patient history was collected through face to face interview using structured and pre-tested questionnaires after the informed consent given to us. The questionnaire was in Amharic and translated back to English for the analysis of data. 3ml of blood was collected using an EDTA containing test tube.

Sample processing

Whole blood was mixed and analyzed by cell Dyn 1800 hematological analyzer to determine red blood cell count, hemoglobin concentration, Hematocrit, red cell indices, red cell distribution width. To classify the severity of anemia, we used WHO classification criteria. Briefly an Hgb value 10-12 g/dl is mild, 8-10 g/dl is moderate and below 8 g/dl is severe anemia regardless of age and sex.

Data quality control

The questionnaire was pretested on 25 patients at the ART clinic. Then, based on the information obtained from the pretest, the questionnaire was modified. Quality control for working equipment's and reagents were ensured using standard controls as well as standard operational procedures. The result of each and every test was properly recorded. Finally the questionnaires were check by investigators for their consistence and completeness.

Data analysis

The data were analyzed with SPSS version 16 statistical software. Frequencies, cross tabulation and Chi-squre (χ^2) were used to summarize descriptive statistics. Logistic regression assessed the association between dependent and independent variables. The data was presented using, tables and graphs. Variables which have significant association were identified on the basis of Odds Ratio (OR), with 95% CI and P-value<0.05.

Ethical consideration

This study was conducted after getting approval from the School of Biomedical and Laboratory Science research committee. Permission to conduct the study was also obtained from the Gondar University Hospital Human Research Ethics Committees. Informed consent was obtained from each study participant after the purpose and the objective of the study was informed. Participants were also informed that participation was voluntary and that they could withdraw from the study at any time if they were not comfortable. They were also informed that all data obtained from them were kept confidential by using codes instead of any personal identifiers and is meant only for the purpose of the study.

Results

Patient characteristics and prevalence of anemia

Of 384 subjects participated in the study with a mean age of 37 ± 9; 233 (60.7%) were female and 151 (39.3%) were males. 269 (70.1%) of the 384 subjects were anemic with mean Hgb value of 12.4 ± 2.02 SD (Figure 1). 189 (70.3%) of these were female and 80 (29.7%) were males (Table 1). The prevalence of anemia was 189/233(81%) among females and 80/151 (53%) among males (Table 2). 330 (85.9%) lived in Gondar city whereas 54(14.1%) were from rural areas. 298(86%) were HAART users whereas 86(22.4%) were HAART naïve with anemia prevalence of 204(75.8%) and 65(24.2%) respectively. Of the anemic individuals 6(1.6%), 57(14.8%), 206(53.6%) had severe, moderate and mild anemia respectively.

Associated risk factors for anemia

In this study sex, educational status, marital status and income were significantly associated to anemia. Therefore, being male is 74%

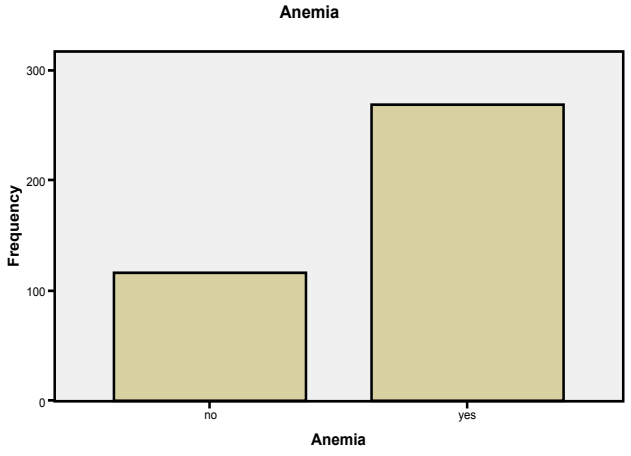

Figure 1: Shows frequency of anemia among HIV positive individuals who visited (N=384) university of Gondar hospital ART clinic, 2012.

Variables	ANEMIA		Total
	Positive N (%)	Negative N (%)	
Sex			
• Female	189(70.3)	44(38.3)	233(60.7)
• Male	80(29.7	71(61.7)	151(39.3)
Age			
• 15-30	95(35.3)	29(25.2)	124(32.3)
• 31-45	134(49.8)	63(54.8)	197(51.3)
46-64	40(14.9)	23(20.0)	63(16.4)
Marital status			
• Married	132(49.1)	68(51.9)	200(52.1)
• Single	57(21.2)	31(27.0)	88(22.9)
• Divorced	44(16.4)	10(8.7)	54(14.1)
• Widowed	36(132.4)	6(5.2)	42(10.9)
Religion			
• Orthodox	239(88.8)	100(87.0)	339(88.3)
• Muslim	20(7.4)	9(7.8)	29(7.6)
• Others	10(3.7)	6(5.2)	16(4.2)
Residence			
• Rural	39(14.5)	15(13.0)	54(14.1)
• Urban	230(85.5)	100(87.0)	330(85.9)
Educational Status			
• Illiterates	68(25.3)	17(14.8)	85(22.1)
• Elementary	91(33.8)	39(33.9)	130(33.9)
• Secondary	87(32.3)	50(13.5)	137(35.7)
• Higher Education	23(8.6)	29(7.8)	32(8.3)
Income			
• <500 Birr	177(65.8)	58(50.4)	235(61.2)
• 500-3000Birr	87(32.3)	55(47.8)	142(37)
• >3000 Birr	5(1.9)	2(1.7)	7(1.8)
HAART			
• Naïve	65(24.2)	21(18.3)	86(22.4)
• Users	204(75.8)	94(81.7)	298(77.6)
Duration of HAART usage			
• <1 Year	15(7.3)	4(4.3)	19(6.4)
• 1-5 Years	154(75.1)	70(74.5)	224(74.9)
• 6-10 Years	35(17.1)	19(20.2)	54(18.1) 2(0.7)
• 11-15 Years	1(0.5)	1(1.1)	
History of Malaria			
• No	186(69.1)	90(78.3)	276(71.9)
• Yes	83(30.9)	25(21.7)	108(28.1)
History of Intestinal Parasite			
• No	205(76.2)	96(83.5)	301(78.4)
• Yes	64(23.8)	19(16.5)	83(21.6)
CD4 count			
• <200	49(18.2)	15(13.0)	64(16.7)
• 200-500	158(58.7)	65(56.5)	223(58.1)
• >500	62(23.0)	35(30.4)	97(25.3)

Table 1: Distribution of HIV positive patients in their socio demographic variables, history and laboratory test results (N=384) University of Gondar Hospital ART Clinic, 2012.

(OR0.26, 95% CI=0.166, 0.415) protective of anemia compared the odds among females (Table 2). The odds of anemia among divorced participants were 2.3 times (OR2.26, 95% CI=1.075, 4.781) and among widowed participants were about 3.1 times (OR3.09, 95% CI=1.241, 7.698) compared to the odds among married counter parts (Table 2). The odds of anemia among those participants having secondary educational status were less (OR0.43, 95% CI=0.23, 0.821) compared to odds of illiterate (Table 2). The odds of anemia among individuals who were earning between 500-3000 birr were less (OR0.518, 95% CI=0.331, 0.812) compared to those participants earning less than 500 birr (Table 2).

Discussion

Treatment of HIV with only antiretroviral therapy may not be ideal if other factors debilitating like anemia are not treated also. The purpose of this study was to investigate the prevalence of anemia and its associated risk factors in HIV positive patients in Ethiopia. The prevalence anemia in this study, 70.1% is similar to that of studies in Iran (71%) [20], USA (77%) [21] and Tanzania (77.4%) [22]. 70.3% our anemic patients were females which is higher than the study in USA (54%) [21] and Tanzania (65%) [22]. Mild to moderate anemia and severe anemia was 54% and 2% respectively, in our study compared to the study in Iran (67% and 4%) [20]. The age group with a high prevalence of anemia 30-45 years 48.8% closer to was the study in Tanzania (65.3%) [22] for the age group 30-40/years.

A considerable difference of anemia prevalence for HAART users and HAART naïve was observed (76% and 68% respectively) but in a study in Florida there was no significant difference between patients receiving HAART and patients not receiving HAART [23]. Similarly, a different association between CD4 cell count and anemia was reported in Mexico where only CD4 cell count <200 cells/mm3 was associated with increased risk of anemia [24] but in our study CD4 cell count has not statistically significant association with risk of anemia. Thus, Lack

Variables	ANEMIA		Total	P-value	Crude OR
	Positive	Negative			
Sex					
• Female	189	44	233	0.000	1.000 0.262(0.166,0.415)
• Male	80	71	151		
Age					
• 15-30	95	29	124	0.124	1.000 0.649(0.389,1.084)
• 31-45	134	63	197		0.531(0.274,1.027)
• 46-64	40	23	63		
Marital Status					
• Married	132	68	200	0.032	1.000 0.947(0.560,1.603)
• Single	57	31	88		2.267(1.075,4.781)
• Divorced	44	10	54		3.091(1.241,7.698)
• Widowed	36	6	42		
Religion					
• Orthodox	239	100	339	0.787	1.434(0.508,4.052)
• Muslim	20	9	9		1.333(0.370,4.805) 1.000
• Others	10	6	16		
Residence					
• Rural	39	15	54	0.707	1.000 0.885(0.466,1.678)
• Urban	230	100	330		
Educational Status					
• Illiterates	68	17	85	0.010	1.000 0.583(0.304,1.118)
• Elementary	91	39	130		0.435(0.230,0.821)
• Secondary	87	50	137		0.639(0.251,1.629)
• Higher Education	23	29	32		
Income					
• <500	177	58	235	0.004	1.000 0.518(0.331,0.812)
• 500-300	87	55	142		0.819(0.155,4.336)
• >3000	5	2	7		
HAART					
• No	65	21	86	0.205	1.000 0.701(0.405,1.214)
• Yes	204	94	298		
Duration of drug users					
• No	64	21	85	0.550	1.000 1.230(0.368,4.118)
• <1 Year	15	4	19		0.722(0.409,1.274)
• 1-5 Years	154	70	224		0.604(0.287,1.273)
• 6-10 Years	35	19	54		0.328(0.020,5.479)
• 11-15 Years	1	1	2		
History of Malaria					
• No	186	90	276	0.070	1.000 1.606(0.962,2.684)
• Yes	83	25	108		
History of Intestinal parasite					
• No	205	96	301	301	1.000 1.577(0.895,2.780)
• Yes	64	19	83	83	
CD4 Counts					
• <200	49	15	64	0.215	1.000
• 200-500	158	65	223		0.744(0.390,1.420)
• >500	62	35	97		0.542(0.266,1.105)

Table 2: Association between anemia and study variables among HIV positive individuals who visited university of Gondar hospital ART clinic, 2012.

of knowledge about anemia, low income and marital status showed a predisposing effect for anemia.

Conclusion

Anemia was prevalent in HIV positive patients. But the rate was higher in females than males. There was no statistically significant difference in prevalence of anemia between HAART users and non-users. However, there was statistically significant association between anemia and sex, marital status, educational status and income on bivariate analysis. Only sex was associated with an increased risk of anemia.

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