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Comparative Analysis of Baseline and One Year Post HAART Haematological Parameters of HIV Infected Patients in Ilorin, Nigeria

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Abstract

Haematological abnormalities are common manifestations of HIV infection. The aim of this study was to determine the effect of HAART on haematological parameters of HIV infected patients.This was a longitudinal prospective study conducted at the HAART clinic of University of Ilorin Teaching Hospital, Ilorin. Eighty newly diagnosed HIV positive patients between 21-75

years who were planned to commence HAART (lamivudine, zidovudine and nevirapine) were recruited into this study. Baseline and one year post- HAART full blood count were carried out by Sysmex KX21 according to manufacturer's instructions.Twenty nine percent of the patients had anaemia, 13% had neutropaenia and 0.02% had thrombocytopaenia at presentation. There was a significant increase in mean hemoglobin concentration of the patients from 10.79±1.89g/dl at baseline to 11.52±1.27g/dl at one year post HAART initiation. (*P value=0.003*) There was a statistically significant difference in mean baseline haemoglobin concentration of patients in WHO clinical stages 1, 2 and 3(11.67±1.39g/dl, 10.47±2.09g/dl, 10.00±1.86g/dl respectively; *P=0.012*). HIV patients were more likely to present with anaemia followed by neutropaenia and rarely thrombocytopaenia. Severity of anaemia increased with disease progression. HAART led to improvement in haematological abnormalities with significant increase in haemoglobin concentration. Haemoglobin concentration may therefore be used to monitor response to HAART in HIV infected patients.

Keywords: HIV, haematological parameters, HAART

Introduction

Human immunodeficiency virus (HIV) infection is a pandemic that affect people of all age group in virtually every country in the world. Nigeria has the second largest HIV epidemic in the world with about 3.4 million people living with the virus as at 2014. [1]However, because of increased investment in the AIDS response from Nigeria and its partners, the situation has improved in the past decade. New HIV infections dropped from 310 000 in 2004 to 230 000 in 2014, and coverage of highly active antiretroviral therapy (HAART) increased from 13% in 2011 to 22% in 2014.[1]

HIV infection is associated with a range of haematological abnormalities which include cytopaenias and morphological abnormalities of both the peripheral blood and bone marrow cells. [2]These abnormalities increase with disease progression. HIV directly affects marrow production either by direct infection of precursor cells or by infecting stromal or accessory cells,

thereby inducing altered production of regulatory cytokines. [2]

The use of Highly Active Antiretroviral Therapy (HAART) which includes combination of drugs from at least 2 of the 3 classes of antiretroviral therapeutic drugs; Nucleoside Reverse Transcriptase Inhibitor (NRTI), Non-Nucleoside Reverse Transcriptase Inhibitor (NNRTI), and Protease Inhibitors (PI) reduces the replication of Human Immunodeficiency Virus (HIV), increases CD4 T cell and delays progression into Acquired Immune Deficiency Syndrome (AIDS). [3, 4] HAART regimen has also been reported to lead to improvement in the haematological abnormalities in HIV infected patients. [5, 6] However some antiretroviral therapeutic drugs are known to be associated with cytopaenias especially when used in high doses. [7] There is therefore a need to determine the effect of HAART on the haematiological parameter of HIV infected patients especially those on combinations that include drug like zidovudine that have been associated with cytopaenic effects.

Most previous studies done on this subject have been cross sectional studies.[8, 9] The aim of this study was therefore to conduct a longitudinal prospective study to determine the effect of HAART on the haematological parameters of HIV infected patients after one year HAART therapy.

Materials and Methods

This was a prospective longitudinal study conducted at the HAART clinic of university of Ilorin Teaching Hospital, Ilorin between January 2016 and January 2017. Eighty consecutive newly diagnosed HIV positive patients between the ages of 21 -75 years who were planned to commence HAART were recruited into this study. At recruitment the socio-demographic characteristics and other relevant information were obtained from these patients using a structured questionnaire. Pregnant women and patients who had tuberculosis co-infection were excluded from this study. Five millilitres of blood was obtained from each patient into EDTA bottle which was used for full blood count (FBC). One year after commencement of HAART

(lamivudine, zidovudine and nevirapine) another 5mls of blood was obtained for FBC. Both the baseline and one year post HAART full blood count were analysed by Sysmex KX21 according to manufacturer's instructions.

Data was analyzed using SPSS version 20. Results were calculated as frequencies, means, standard deviations, cross-tabulation, chi-square, Fisher's exact and paired sample t test. Bivariate correlation was also carried out between baseline and one year post HAART values of the haematological parameters. *P-value* was set at 0.05.

Results and Discussion

A total of 80 patients who were recruited into this study all had the baseline full blood count test done but 18 were lost to follow-up and we were left with 62 who had both baseline and one year post-HAART test, so our data analysis was based on these 62. There were 11 males and 51 females aged 21 to 75years with mean age 40.47±11.79 years. Twenty three (37.1%) presented in WHO clinical stage 1, another 23(37.1%) in stage 2 and 16(25.8%) presented in stage 3.

Eighteen (29%) patients had anaemia (Haemoglobin concentration<10g/dL) at baseline but this reduced to six (9.7%) after one year post HAART therapy. There was a significant increase in mean hemoglobin concentration of the patients from 10.79±1.89 at baseline to 11.52±1.27 at one year post HAART initiation. (*P =0.003*)(Table 1).

Table 1: comparison between baseline and one year post HAART haematological parameters of HIV infected patients

	Baseline	One year	*P-value*
Haemoglobin concentration (g/dl)	10.79±1.89	11.52±1.27	0.003
PCV (%)	34.18±5.93	35.61±3.86	0.059
WBC count ($x10^9$/L)	4.83±1.76	4.63±1.35	0.459
Absolute neutrophil ($x10^9$/L)	2.40±1.49	2.15±1.06	0.796
Absolute lymphocyte ($x10^9$/L)	1.89 ±0.73	1.94±0.82	0.618
Platelet count($x10^9$/L)	235.07±73.22	237.53±71.10	0.264

The mean pre HAART PCV increased from 34.18±5.9 at baseline to 35.61±3.9 at one year post HAART therapy but this difference failed to reach statistical significance. (*P=0.059*)(Table 1) However among the 18 patients who were anaemic at presentation there was a statistically significant increase in PCV from 27.56±4.18 at baseline to 34.39±3.2 post HAART therapy.(*P=0.000*) The percentage of anaemic patients in WHO clinical stages 1, 2 and 3 were 13%, 34.8% and 43.8% respectively(*P=0.086*). There was a statistically significant difference in mean baseline haemoglobin concentration of patients in WHO clinical stages 1, 2 and 3(11.67±1.39g/dl, 10.47±2.09g/dl, 10.00±1.86g/dl respectively; *P=0.012*). (Figure 1)

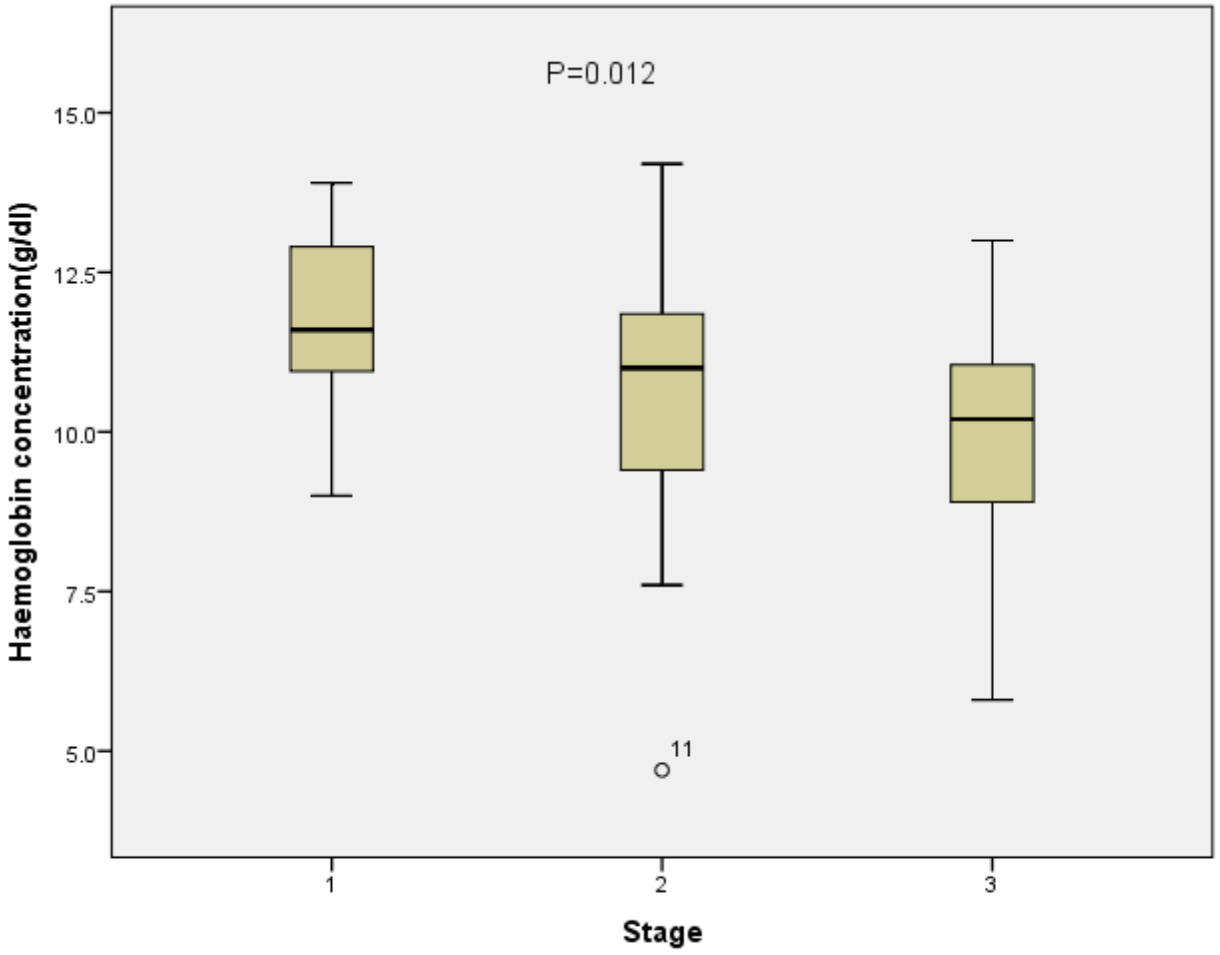

Figure1: Haemoglobin concentration according to WHO clinical stages

There was no significant difference in pre and post treatment total WBC count, absolute neutrophil and lymphocyte count as well as platelet count as shown in table 1. Ten patients (16.1%) had neutropaenia(absolute neutrophil count<1.5x10^9/L) at presentation but there was a significant increase in the mean absolute neutrophil count of these ten neutropaenic patients from 1.18±0.31 at baseline to 1.83±0.7 post HAART therapy. (*P=0.038*) Only one patient (0.02%) had thrombocytopaenia (platelet count of 70x10^9/l) at presentation but the platelet count rose to 205x10^9/l after one year on HAART.

There were significant positive correlations between baseline and one year post HAART values of haemoglobin concentration, PCV, platelet count and absolute lymphocyte count, but no significant correlation between baseline and post treatment values of total WBC count and absolute neutrophil count as shown in table 2

Table 2: **Bivariate correlations between baseline and one year post HAART haematological parameters of HIV infected patients**

	Pearson Correlation coefficient(r)	*P-value*
Haemoglobin concentration	.362	0.004
PCV	.338	0.007
WBC count	.153	0.244
Absolute neutrophil	.149	0.261
Absolute lymphocyte	.496	0.000
Platelet count	.482	0.000

Correlation is significant at the 0.01 level (2 tailed)

Anaemia was the most common cytopaenia among HIV infected patients in this study. This finding is in keeping with reports from previous studies in Nigeria, India and Etiopia.[8, 10-13]. Patients in WHO stage 3 had a higher prevalence of anaemia than those in stages 1 and 2, the mean haemoglobin concentration was also significantly lower in stage 3 than stages 1 and 2.This is in keeping with previous study by Kibaru et al in Kenya.[6] The increase in viral burden as the disease progresses, which leads to cytokine mediated myelosuppression and

anaemia is likely to be responsible for this observation. [11]At the end of one year on HAART therapy there was a significant increase in the mean value of haemoglobin concentration. The increase in PCV was not statistically significant but when only anaemic patients were considered there was a significant increase in PCV. This is in keeping with the outcome of previous studies. [5, 6, 12]. Use of HAART has also been shown to reduce the incidence of anaemia in HIV infected patients[8]

Neutropaenia was found in about 16% of patients. This finding is similar to the study in Ethiopia in which 14.5% of the patients had neutropaenia [12] . The mean neutrophil count at baseline was higher than the mean value after one year but this difference was not statistically significant. This finding is similar to findings of Idowu et al in the western part of Nigeria[5], and Enawgaw et al in Ethiopia[12]. However among the patients who had neutropaenia at baseline there was a significant increase in their absolute neutrophil count after one year. The aetiology of neutropaenia in HIV infection is multifactorial, direct bone marrow infection or infiltration or infection of bone marrow stromal cells have been suggested.[14, 15] Treatment related causes may also compound the problem of neutropaenia especially when drugs are given at high doses. This may be responsible for the higher values recorded at baseline than at one year post therapy. The improvement in neutophil count among those with neutropaenia at baseline suggests that positive effects of these drugs outweighed the negative effects. HAART therapy can therefore be said to correct neutropaenia in HIV infected patients because it leads to reduction in the viral load and thereby reduce the direct effect of the virus on the bone marrow.

Thrombocytopaenia was the least common cytopaenia among HIV infected patients at presentation in this study. This is similar to the findings in studies conducted in Ethiopia[12], India [10] and Mysore[11]. The only patient with thrombocytopaenia had an increase in platelet count to normal at the end of one year on HAART. However there was no significant difference between baseline and one year post HAART values of platelet count. This is in keeping with previous studies[5, 12].

There were positive correlations between baseline and one year post HAART values of all the haematological parameters except for total WBC count and absolute neutrophil count. This is consistent with the finding in this study of significant increase in the one year post HAART values of Haemoglobin concentration over the baseline value, one year post HAART PCV, platelet count and absolute lymphocyte count were also higher than baseline values although not statistically significant. One should therefore expect an increase in the values of haemoglobin concentration, PCV, platelet count and absolute lymphocyte count, but not absolute neutrophil count in HIV patients on HAART therapy.

In conclusion, HIV patient were more likely to present with anaemia followed by neutropaenia and rarely thrombocytopaenia . Severity of anaemia increased with disease progression. There were positive correlation between baseline and one year post HAART values of Haemoglobin concentration, PCV, absolute lymphocyte and platelet count but none for absolute neutrophil count. Highly Active antiretroviral therapy led to improvement in haematological abnormalities with significant increase in haemoglobin concentration. Haemoglobin concentration may therefore be used to monitor response to HAART in HIV infected patients. With the advent of newer HAART, anti-retroviral monoclonal antibodies and HIV vaccines which is also in the pipeline, we should look forward to a better outcome of HIV/AIDS patients with cytopaenias. [16] This will be an interesting subject for future research.

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