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ORIGINAL ARTICLE

Gender-dependent Side Effects of Two Highly Active Antiretroviral Therapy Regimens on HIV/AIDS Patients Attending Nsukka District Hospital, Nsukka, Enugu State, Nigeria: A Comparative Evaluation

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Abstract

Background: This study evaluated the gender-dependent potency and side effects of Highly Active Antiretroviral Therapy regimens (i) Zidovndine/Lamuvidine/ Nevirapine (ii) Tenofovir/Emtricitabine/Effavirenz on HIV-positive/AIDs patients attending Nsukka district hospital Enugu, from January 2013 to December 2013.
Method: A retrospective study of two hundred (200) patients of both sexes within the age bracket of 15 – 70 years attending Nsukka District hospital who were treated with HAART was conducted. Clinical and laboratory data were obtained through self developed validated data collection form.
Results: Abdominal pains and diarrhea (3.3%) were the most reported clinical manifestations in regimen 1, followed by headache and chills (2.2%) while in regimen 2, headache, hotness and dizziness (2.4%) were the most reported clinical manifestations followed by pruritis. HAART 1 showed more adverse effects than HAART 2 on both sexes on most of the biochemical variables; glucose (34.57±95.97 - 4.89±0.3 mmol/l), cholesterol (17.33±39.87 - 3.63±0.62 mmol/l), serum glucotransaminase (SGOT) (36.78±27.76 - 32.83±17.10 iu/l), blood urea nitrogen (BUN), (18.66±13.33 - 15.14±6.01mg/dl) and amylase (126.29±186.21 - 104.43±31.38 µg/l).While both regimens showed improved immunological and hematological outcomes: CD_4+; 282.03±219.57 - 380.89±241.21 cells/µl (HAART1), 312.09±242.60-404.15±253.17 cells/µl (HAART2), hemoglobin(Hb) 10.60±1.74 - 10.93±1.81 g/dl (HAART1), 10.46 ±2.00 - 11.46±1.85 g/dl (HAART2).
Conclusion: The adverse effects on clinical manifestation were more noticeable in regimen 1 in the study population, with the female population being the greater affected. Comparison of the two regimens with respect to their adverse effects on clinical manifestation favors regimen 2.

Keywords: Gender-dependent, Nsukka, HIV, AIDS, HAART, Hematology, Biochemical

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INTRODUCTION

From the time Nigeria's first two Acquired Immunodeficiency Syndrome (AIDS) cases were diagnosed in 1985 in Lagos [1] to the present time, the Nigerian Government has put in a lot of resources in the management of Human Immunodeficiency Virus (HIV) infection. With the introduction of antiretroviral therapy (ART) in Nigeria in the early 1990s and the establishment of HIV/AIDS diagnostic and treatment centers, access to antiretroviral drugs by HIV/AIDS patients has become relatively easy.

Highly Active Antiretroviral Therapy (HAART) is the gold standard in the management of HIV/AIDS and all persons who are eligible to ART are expected to commence treatment with HAART as soon as possible and maintain strict adherence to the treatment. However, prolonged treatment with combination regimens can be difficult to sustain because of problems with adherence and toxic effects. All antiretroviral drugs can have both short-term and long-term side effects. The risk of specific side effects varies from drug to drug, from drug class to drug class, and from patient to patient. At Nsukka district hospital Zidovindine/Lamivudine/Nevirapine (AZT/3TC/NVP) and Tenfovir/Emtricitabine/Effavirenz (TDF/FTC/EFV) are the two HAART regimens in use for the management of HIV/AIDs patients. Some of the active components of these drugs, such as nevirapine and effavirenz, have been associated with hepatotoxicity [2] and central nervous system (CNS) - based diseases, respectively [3].

The existence of sex-driven disparities in immunological

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responses to various drugs regimens is documented [4].

According to Rakshith et al [5] there is variation in gender response to pharmacological treatment, much the same as the prevalence, incidence, and severity of a wide variety of diseases and ailments are significantly influenced by the significant disparities that occur between the sexes. In a culture characterized by fragile economic base and illiteracy, the weight of socio-economic burdens may be more stressful to women, especially, widows, with the potential to elicit an avalanche of stress hormones. Literature [6,7] reports that psychophysiological stress and stress-related disorders appear to have a major impact on the expression and activity of several CYPs that catalyze the metabolism of widely prescribed drugs. Similarly, studies by Maria et al [8] indicated that stress can affect constitutive and induced expression levels of CYP isoforms in ways that may critically modify the pharmacokinetic profile of drug-substrates

Since the inception of the Nsukka district hospital as one of the referral hospitals for the treatment and management of HIV/AIDS patients, the two HAART regimens have been used for both sexes without considerations of gender influence on the potency and adverse effects of the drug regimens. So, the study is designed to investigate: 1) whether the HAART regimens have adverse effects on the HIV/AIDs patients attending Nsukka district hospital and if the adverse effects are gender-dependant, 2) Whether the adverse effects are on clinical and, or biochemical manifestations and 3) which of the two HAART drug regimens presents more adverse effects.

Thus, a better understanding of the gender-dependent potency and side effects of these two HAART regimens used in Nsukka District hospital is of interest not only for HIV specialists as they try to optimize therapy, but also for other healthcare personnel who care for HIV-positive patients as well as the patients who may misunderstand some symptoms of side effects. We present here, a retrospective study of the gender-dependent potency and side effects of the two HAART regimens on HIV positive/AIDs patients who attended Nsukka district hospital Enugu, from January 2013 to December 2013.

METHODS

Description of Study Location

Nsukka district hospital is located along Enugu road in Nsukka Urban within the geographical co-ordinates of 6°51′24″N 7°23′45″E.

Protocols for the Study

This study was a one year retrospective study that took

Figure 1. Map of Nsukka Urban, showing the Study Location

place from the month of January 2013 to December 2013. There was no ethical certification beyond approval from the Nsukka District Hospital Management Board, to retrieve data sets from the patients' folders.

A total of two hundred patients of both sexes within the age bracket of 15 – 70 years attending Nsukka District hospital were used for the study. Patients less than 15 years or above 70 years were excluded as well as those who have been on chemotherapeutic drugs for cancer co-morbidity. Data were obtained from the folders of patients placed on AZT/3TC/NVP or TDF/FTC/EFV regimen (Reg. 1 and Reg. 2 respectively). The data forms were prepared for entry of data for each month and for each gender. These forms were manually checked by the research team for completeness before data entry and storage in the computer.

Baseline (before onset of HAART therapy) clinical signs and symptoms that were assessed during their clinic visiting days, through patients' primary complaints, medical and physical examinations as well as laboratory investigations, were collected from their records and after 1 year on HAART therapy, to investigate the side effects associated with continuous intake of HAART on clinical signs and symptoms and some biochemical and hematological profiles. The changes in CD_4+ counts were used as indices of immunological failure or improvement/therapeutic efficacy, while changes in biochemical and hematological parameters were used as indices of side effects (toxicity) of the two drug regimens investigated.

Data Analysis

Data acquired were analyzed using SPSS software (version 19, SPSS Inc., Chicago, IL, USA). Results were presented using descriptive statistics as means, standard deviation (SD), median, percentage, tables and charts. For comparisons, chi-square test, Friedman test, Kruskal-Wallis test were used.

RESULTS

The results are presented in figures 1- 3 and tables 1-4. Figure 1 represents the map of Nsukka urban showing the study area. Situated directly opposite the popular Queen of the Holy Rosary Secondary School, an all-girls school operated by the Catholic Church of Nsukka diocese and a short drive from the Ede-Oballa Market, the strategic location of the hospital gives it easy access to many patients as it is one of the referral hospitals for the treatment and management of HIV/AIDS patients in the South-East geopolitical zone and neighboring states of Kogi, Benue, and Rivers. Patients who come from different primary and secondary, faith based health facilities, and some private hospitals and other health care providers within the senatorial zone and neighboring states find it easy to locate because of the poplar landmarks identified with the hospital. While most patients come on a referral for anti-retroviral management, other people voluntarily come for screening tests.

Figure 2 represents the adverse effects associated with the regimens in the study population. Rashes, abdominal pains and diarrhea (3.3%) were the most reported clinical manifestations in regimen 1, followed by headache and chills (2.2%), then weakness, pruritis, paraesthesia, insomnia (1.1%). In regimen 2, headache and dizziness (2.4%) were the most reported clinical manifestation followed by pruritis, abdominal pains, cough, dysmenorrhea and arthritis (1.2%). No significant association (P>0.05) was observed between adverse effects presented and treatment groups.

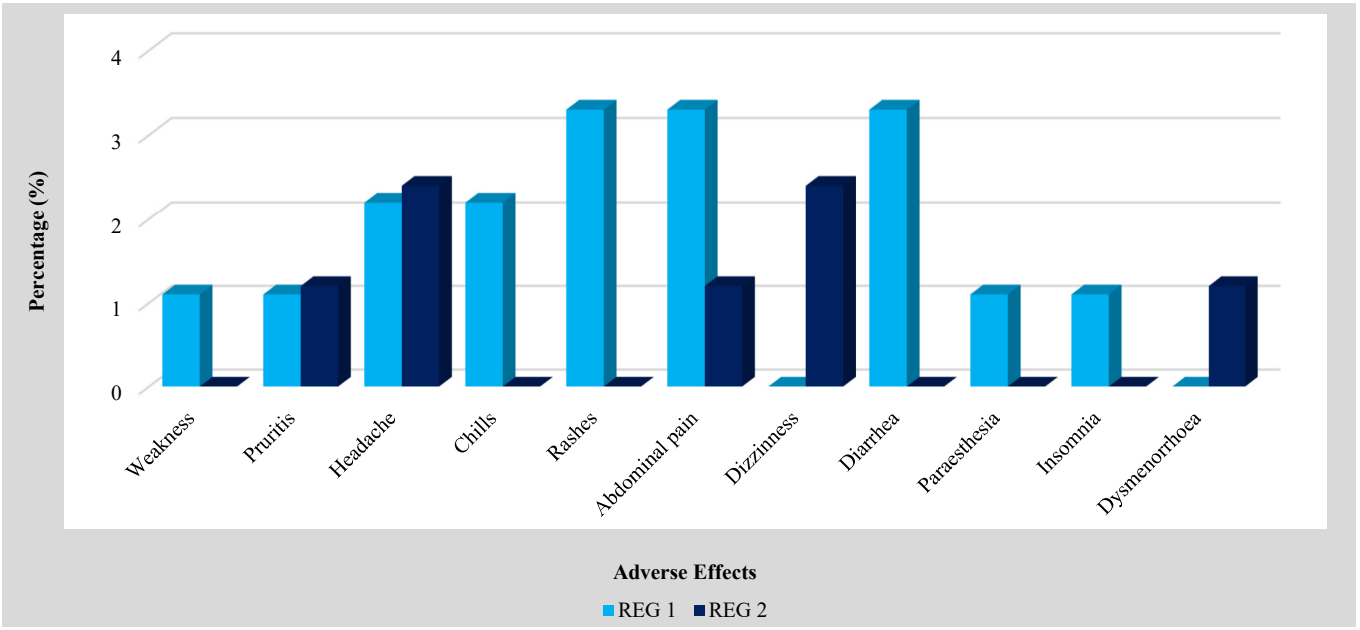

Figure2. Adverse Effects Associated with the Treatment Regimens on Clinical Presentation in Study Population after 1 year

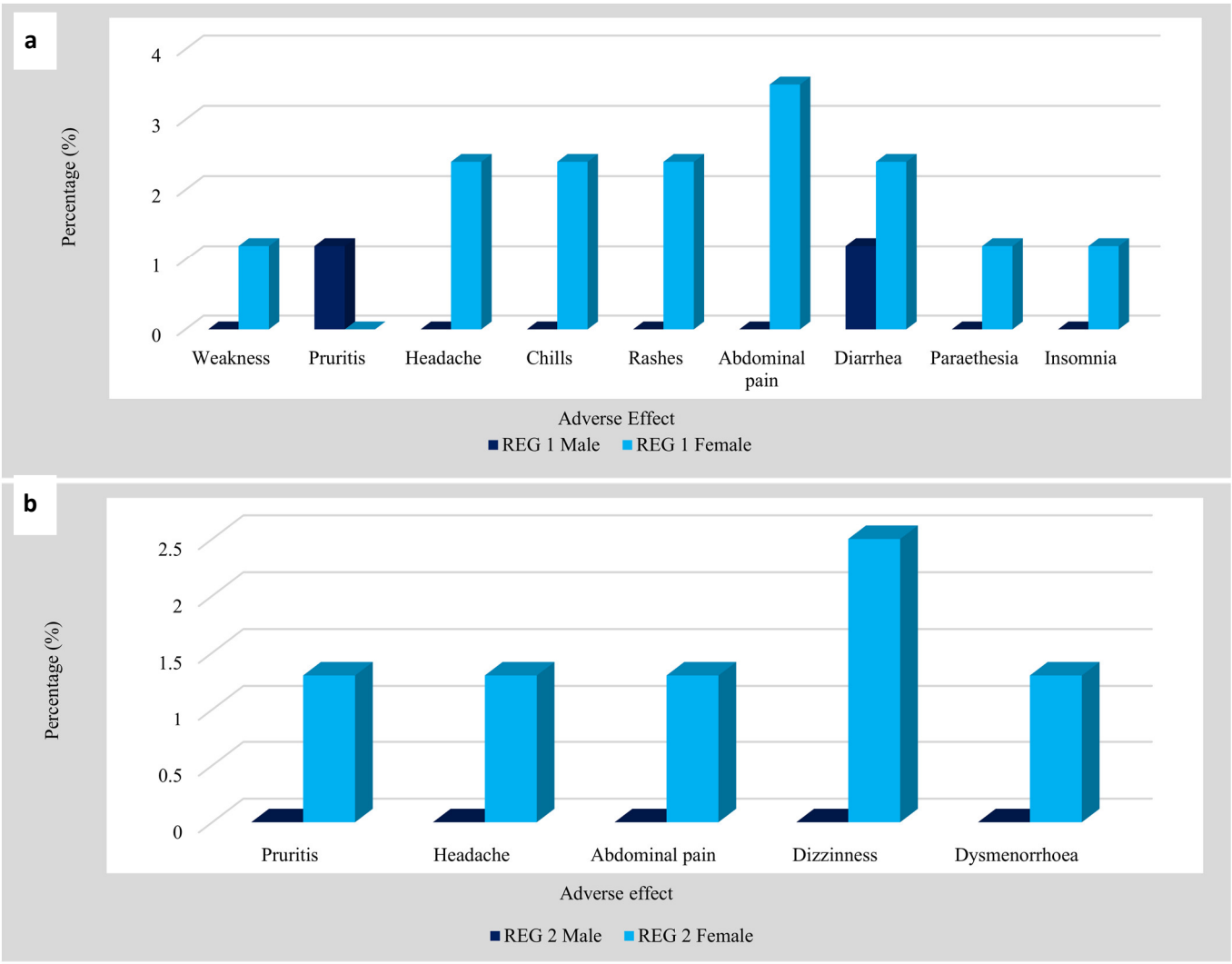

Figure3 (a and b). Gender-dependent Effects Associated with Regimen 1 (a) and Regimen 2 (b) on Clinical Presentation of the Patients after 1 year.

Table 1. Effect of the HAART Regimens on mean weight, CD cell counts and Biochemical Parameters in HIV/AIDS patients after 1 year of treatment

Parameter	Group	Regimen 1	Regimen 2	P-value Reg 1vs Reg 2
Weight (kg)	0	60.89±7.61	63.64±7.80	0.104
	1	64.43±7.35	68.71±6.73	0.006
CD4 (cells/µl)	0	282.03±219.57	312.09±242.60	0.404
	1	380.89±241.21	404.15±253.17	0.550
Glucose (mmol/l)	0	16.31±25.23	8.13±16.12	0.252
	1	4.89±0.31	5.52±0.88	0.211
Amylase (µg/l)	0	126.29±186.21	111.61±57.42	0.770
	1	10.4.43±31.38	100.98±42.59	0.911
Cholesterol (mmol/l)	0	17.33±39.87	4.03±1.47	0.125
	1	3.63±0.62	5.31±1.59	0.049
SGOT (iu/l)	0	36.78±27.76	39.92±21.63	0.638
	1	32.83±17.1	29.23±13.82	0.659

Table 1. Continued.

Parameter	Group	Regimen 1	Regimen 2	P-value Reg 1vs Reg 2
SGPT (iu/l)	0	25.89±21.85	26.61±17.47	0.880
	1	27.92±15.06	27.04±17.44	0.906
Creatinine (µmol/l)	0	52.11±30.90	52.78±27.40	0.084
	1	54.91±21.06	45.73±27.22	0.420
BUN (mg/dl)	0	18.66 ±13.33	18.64 ±591	0.997
	1	15.14 ±6.01	12.54 ±2.86	0.527

Table 2. Effects of AZT/3TC/NVP or TDF/FTC/EFV Regimens on Biochemical Parameters of Male and Female Subjects after 1 year of HAART Treatment

Parameter	Regimen	Males	Females	P-value
Glucose (mmol/l)	1	4.93±0.01	4.87±0.38	0.867
	2	5.69±1.68	5.50±0.70	0.868
Amylase (µg/l)	1	68.65±0.07	122.40±6.58	0.007
	2	98.05±0.35	100.98±42.59	0.809
Cholesterol (mmol/l)	1	3.80±0.86	3.28±0.37	0.571
	2	3.68±0.01	6.13±1.03	0.078
SGOT (iu/l)	1	37.33±27.19	29.45±7.51	0.729
	2	35.45±0.64	26.65±15.99	0.591
SGPT (iu/l)	1	18.23±6.24	31.02±17.48	0.981
	2	32.20±1.13	27.19±20.19	0.746
Creatinine (µmol/l)	1	71.60±22.34	48.56±20.53	0.341
	2	45.63±0.88	48.61±23.46	0.869
BUN (mg/dl)	1	22.98±0.00	12.52±3.63	0.031
	2	11.90±1.25	11.31±2.68	0.809

The gender dependent effects associated with regimen 1 on clinical presentation of the patients after 1 year is represented on figure 3(a and b). A total of 10 (20%) patients, 8 (16%) females and 2 (4%) males reported adverse effects on the regimen with abdominal pain (3.5%) as the dominant adverse effect, followed by head ache, chills, rashes and diarrhea (2.4% individually). Statistical significant association ($p = 0.03$) was observed between gender and those who presented with pruritis in Regimen 1(Figure3a). A total of five (5) patients' exclusively females reported adverse effects ranging from dizziness (2.5%), pruritis, headache, abdominal pains and dymenorrhoea (1.2%) respectively (Figure 3b). However, no adverse effect was reported by the male subjects. Statistically, no significant association ($P>0.05$) was observed between gender and adverse effects in regimen 2.

The mean weights and CD4 cell counts of the study population and biochemical parameters in HIV/AIDS patients after 1 year of treatment is represented in table1. After 1 year on HAART therapy, a statistical significant increase ($p<0.01$) in mean weight was observed in study participants on Regimen 2 (63.64±7.80 - 68.71±6.73 kg) when compared with those on regimen 1 (60.89±7.61 - 64.43±7.35 kg). In addition, weights of study participants on regimen 1 and regimen 2 revealed no statistically significant difference ($p>0.05$) when compared with their baseline mean values. The effect of AZT/3TC/NVP (Reg. 1) and TDF/FTC/EFV (regimen 2) regimens on CD4+ cell counts of study population revealed statistically significant increases in subjects placed on Regimen 1 (380.89±241.21; $p<0.0001$ cells/µl) and those on regimen 2 (404.15±253.17; $p<0.01$ cells/µl) after 1 year of treatment compared with their baseline values of 282.03±219.57 and 312.09±242.60 respectively.

Cholesterol levels of those on regimen 2 showed significant ($p = 0.049$) higher mean values (5.31 ± 0.62 mmol/l) compared to those on regimen 1 (3.63 ± 0.62 mmol/l). Though there were changes in mean values of biochemical markers for the hepatic and renal diseases [decreased serum glutamic oxaloacetic transaminase (SGOT) and blood urea nitrogen (BUN)] in both groups, creatinine in regimen 2 and increased serum glutamic pyruvic transaminase (SGPT) in both groups, the changes were not significant ($p>0.05$) between the treatment groups and when

compared with their baseline values after 1 year.

The effects of **AZT/3TC/NVP or TDF/FTC/EFV** regimens on biochemical parameters of male and female subjects after 1 year of HAART treatment is presented in table 2. When the gender is considered the mean CD4 cell counts was lower in the male subjects, 334.07±186.70 cells/µl for regimen 1 and 369.61±273.25 cells/µl for regimen 2 in contrast to that of the female subjects who recorded generally higher CD4 cell counts of 392.31±255.49 cells/µl in regimen 1 and 424.98±290.48 cells/µl in regimen2. No significant differences ($p>0.05$) were observed between the two treatment groups and between male and female subjects in both treatment regimen. Though not statistically significant ($p>0.05$), increases in mean glucose, total cholesterol, SGOT and Creatinine and a decrease in mean SGPT were observed in male when compared with the female subjects in regimen 1. However, amylase recorded statistically significant lower ($p=0.007$) and BUN higher ($p=0.031$) mean values in the male subjects (68.65±0.07 µg/l and 22.98±0.00 mg/dl) when compared to the females (122.40±6.58 µg/l and 12.52±3.63 mg/dl) respectively. Male patients treated with TDF/FTC/EFV (regimen2) recorded increases in mean glucose, SGOT, SGPT and BUN and decreases in amylase, Total cholesterol and creatinine levels in contrast to the female patients. Treatment did not cause any significant changes in the male and female subjects ($p>0.05$).

The effect of AZT/3TC/NVP or TDF/FTC/EFV regimen on hematological parameters of treated HIV/ADS patients is represented in table 3. After 1 year of treatment, subjects on regimen 2 therapy when compared with those on regimen 1 revealed statistically significant increase ($p=0..21$) in RBC count [4.48±0.56 ($\times10^{12}$/l, 4.12±0.76 ($\times10^{12}$/l, respectively]. Hb, HCT, total WBC, absolute lymphocyte and platelet counts also recorded increased mean values in regimen 2 as against regimen 1, but not statistically significant ($p>0.05$). After 1 year of treatment, mean lymphocyte counts showed significant decreases ($p<0.01$) in subjects placed on regimen 1 (2.51±1.05%) while those on regimen 2 recorded a significant increase in hemoglobin concentration ($P<0.0001$, 11.46±1.85 g/dl) and hematocrit ($p<0.05$, 39.43±8.10 %) as against their baseline mean values (2.75±5.08 %, 10.46±2.00 g/dl and 38.06±7.24 %, respectively).

The changes in hematological variables amongst the male and female patients after 1 year treatment with regimen 1 or regimen 2 is represented on table 4. In regimen 1 treatment group, a statistical significant increase ($p = 0.02$) was observed in HCT mean value in male subjects (42.66 ±5.04 %) compared with the female subjects (37.10 ±4.78 %). RBC, HB, WBC and platelet recorded no statistically significant increases in the male subjects (4.57±0.73 ($\times10^{12}$/l, 12.23±1.26 g/dl, 6.44±1.50 and 266.57±71.5 ($\times10^{9}$/l) and decrease in lymphocyte counts (2.13±0.78 %) compared with the female subjects [3.94±0.65 ($\times10^{12}$/l, 10.59±1.86 mg/dl, 4.88±1.50 ($\times10^{9}$/l) and 227.54±89.1710^{9}/l) and (2.48±0.92 %)] correspondingly. Male subjects on Regimen 2 therapy showed statistical significant increase in RBC- 4.90±0.36 ($\times10^{12}$/l ($p = 0.001$), Hb -12.58±1.46 mg/dl ($p = 0.002$) and HCT -42.66±5.04 % ($p = 0.009$) mean values versus the female subjects with 4.28±0.53 ($\times10^{12}$/, 10.98±1.87 mg/dl and 37.14±7.40 % mean values. Non-significant ($p>0.05$) increase was observed in WBC and decrease in lymphocyte and platelet counts of the male subject compared to the female subjects.

DISCUSSION

Every therapeutic agent has one or more side effects which may be negative or positive, and vary in intensity from one drug to the other. Evaluation of side effects is therefore an important aspect of HIV/Aids management regimens, especially when the antiretroviral drugs involve the combination of one or more drugs as is the case with HAART .This work involved a retrospective study of the side effects of HARRT on HIV-positive/AIDS patients attending Nsukka district hospital in Enugu State from January 2013 to December 2013.

The changes in CD_4+ counts were used as indices of

Table 3. Effect of AZT/3TC/NVP or TDF/FTC/EFV Regimen on Some Hematological Parameters after 1 year of Treatment in HIV/AIDS Patients

Parameter	Group	Regimen 1	Regimen 2	P-value
RBC ($\times10^{12}$/l)	0	4.13±0.71	4.27±0.65	0.299
	1	4.12±0.76	4.48±0.56	0.051
HB (g/dl)	0	10.60±1.74	10.46±2.00	0.660
	1	10.93±1.81	11.46±1.85***	0.122
HCT (%)	0	38.54±8.42	38.06±7.24	0.793
	1	38.29±5.11	39.43±8.10*	0.444
WBC ($\times10^{9}$/l)	0	5.01±2.11	5.22±1.84	0.547
	1	5.03±1.51	5.11±1.16	0.750
LYMP (%)	0	2.75±5.08	2.78±3.95	0.968
	1	2.51±1.05**	3.04±5.67	0.527
PLT ($\times10^{12}$/l)	0	246.95±94.65	251.26±75.55	0.816
	1	232.39±92.15	250.12±49.68	0.280

Key: (*Compared with the baseline values. * <0.05, ** <0.01, *** p<0.0001)

Table 4. Effects of AZT/3TC/NVP or TDF/FTC/EFV Regimen on Hematological Parameters after 1 year of Treatment with amongst Male and Female HIV/ADS patients

Parameter	Group	Males	Females	P-value
RBC ($\times 10^{12}$/l)	1	4.57±0.73	3.94±0.65	0.145
	2	4.90±0.36	4.28±0.53	0.001
HB (g/dl)	1	12.23±1.26	10.59±1.86	0.644
	2	12.58±1.46	10.98±1.87	0.002
HCT (%)	1	42.66±5.04	37.10±4.78	0.02
	2	43.49±6.23	37.14±7.40	0.009
WBC ($\times 10^{9}$/l)	1	6.44±1.50	4.88±1.50	0.645
	2	5.24±1.08	5.14±1.20	0.775
LYMP (%)	1	2.13±0.78	2.48±0.92	0.611
	2	2.49±0.90	3.40±7.08	0.593
PLT ($\times 10^{12}$/l)	1	266.57±71.5	227.54±89.17	0.563
	2	234.83±59.22	254.86±44.22	0.246

immunological failure or improvement/therapeutic efficacy, while changes in biochemical and hematological parameters were used as indices of side effects (toxicity) of the drug regimens (HAART). Several reports [3,9,10] have characterized HIV infection by the depletion of the CD4 + helper/inducer-subset of T-lymphocytes, leading to severe immune deficiency, so that changes in the values of CD4+ and lymphocyte counts may be used in the evaluation of regimens' therapeutic efficacy [11]. Thus, CD4 cell counts are another key measure of immune status and ART effectiveness [12]. Suppressing HIV replication with antiretroviral therapy (ART) rapidly increases peripheral blood CD4+ T-cell counts and reverses immunodeficiency [10]. In the present study the increased values of CD4+ count in the two drug regimens are indicative of the drugs therapeutic efficacy. Potent and effective ART leads to an increase in CD4 cells and recovery of the immune functions [10]. Under optimal conditions patients should be able to achieve a CD4 cell count increase of 50 to 100 cells/µl /year [13]. In this study, patients in regimen 1 recorded increased CD4 count value of 98.86cells/µl/year, while those in regimen 2 recorded increased CD4+ count value of 92.06cells/µl/year. This implies that regimen 1 is more potent in the suppression of viral load in the study population.

However, the decreased values of lymphocyte counts in regimen 1 calls for critical consideration, since suppression of the viral load increases the production of the lymphocytes under normal circumstances [11], though a case of immunological non response or immunological failure may not be ruled out. But in regimen 2, the lymphocyte increased from 2.78 to 3.04cells/µl, in agreement with the increased CD4+ count. At $p > 0.05$, there is no significance difference between the two drug regimens with respect to CD4+ and lymphocyte counts, but on each regimen, there is significant increase ($p = 0.00$) from the baseline value after 1year for CD4+ and $p = 0.004$ for lymphocytes. This agrees favorably with the work of Olatunji et al [11] who studied the effect of highly active antiretroviral therapy on CD4 counts and body weight in HIV/AIDS patients in South West Nigeria. Thus, immunologic and virological evolution of infection did not differ between the 2 drug regimens and gender groups, with the patients on both regimens having a CD4+ cell count >50 cells/µl after one year.

In the present study generally, the adverse effects on clinical manifestation were more noticeable in regimen 1 in the study population, with the female population been the greatly affected. The gender-dependant adverse effects in the clinical manifestation could be explained by the fact that women are more exposed to environmental, nutritional, social and psychological factors that may bear negatively on their immune status. In a culture characterized by fragile economic base and illiteracy, the socio-economic burdens weigh more heavily on women, often exacerbating the stress and stigma associated with HIV/AIDS diseases and the management. This has negative implications for the sustenance of positive gains achieved from the use of HAART in HIV/AIDS management. Comparison of the two regimens with respect to their adverse effects on clinical manifestation favors regimen 2. However, this comparative difference is not significant at $p > 0.05$.

The observed changes in the biochemical parameters were used as indices of adverse effects of the drugs. The increased values of weight on both regimens indicated that the drugs had no effect on such biochemical parameters responsible for weight, such as bone mass. This is expected since increase in CD40+ indicates reduction of viral load and increase in lymphocytes [12].

SGOT, SGPT and are hepatic enzymes that usually increase at the instance of hepatic diseases [14, 15] and their increase in the treatment with the regimens presupposes hepatotoxicity. While Bera et al [16] associated the nevirapine induced hepatoxicity with manifestation of elevated serum marker enzymes, bile duct obstruction and jaundice, hepatic necrosis, hepatitis and hepatic failure. Mirna et al [17] reported that the use of antiretroviral, both

fixed dosed combination and release dose regiment did not significantly associate with increase in SGOT and SGPT enzymes on people living with HIV/AIDS (PLWHA) in West Papua. Getaneh et al [18] reported HAART induced inflammation, toxicity and its determinants among HIV positive children in Addis Ababa, Ethiopia. Literature also exists [19, 20] on recent experimental studies that associated chronic lamivudine administration with an elevation in hepatoxic and lipid marker enzymes in plasma of rats.

Our study observed that though there was an increased serum glutamic pyruvic transaminase (SGPT) in both groups, the changes were not significant ($p > 0.05$) between the treatment groups and when compared with their baseline values after 1 year, probably because the hepatotoxicity could be mild. However, the sharp increase in the concentration of SGPT in regimen1 implied more hepatotoxicity than regimen 2. This tally with the report of Lucien et al [21] that antiretroviral drug-related liver injury is defined by elevations in liver enzymes in serum, with SGPT characteristically greater than SGOT.

The effect of HAART on hepatic enzymes showed gender sensitivity as male patients treated with regimen 2 which contains TDF/FTC/EFV recorded increases in mean values of SGOT and SGPT in contrast to the female patients.

This is in line with the report of Kontorinis and Dieterich [22], that all (NNRTIs) except etravirine, have the ability to cause some degree of hepatotoxicity. The decrease in glucose shows that the drugs have hypoglycemic effects and therefore the continuous use of the regimens in patients already suffering from hypoglycemia may have serious health consequences. The clinical symptoms of headache, weakness and tiredness observed in regimen 1, (Figure1) may be traceable to these hypoglycemic effects.

Similarly, the decreased values of cholesterol and other associated fat derivatives are in agreement with the report of Tesfa et al [23] who included lipodystrophy among the many adverse effects of HAART. This may also be related to the hypoglycemic effects, since human cells resort to the use of fats and proteins in energization in the environment of low-blood sugar. It is important that a complete lipid profiling is integrated as a diagnostic component of HAART regimen, to know which of the cholesterol indices are thus affected. A patient with low HDLC (good cholesterol) is in grave danger of cardiac complications if the cholesterol so depleted is HDLC. HAART has been reported to adversely affect cardiac status in some HIV/AIDS patients.

The four parameters (Hct, Lymp, Rbc, and Plat; with decreased values in regimen 1 is indicative of the negative effects of the regimen on erythrocytosis, leading to anemia. Tesfa et al [23] associated HAART with different adverse effects such as: hepatotoxicity, nephrotoxicity, lipodystrophy, anemia and diarrhea. Zidovudine (AZT) in regimen 1 also has been found to cause anemia and bone marrow suppression [23]. This HAART-induced anemia can be related to the clinical manifestation of weakness, headache, nausea presented by the patients after one year of treatment in the study population. The same four parameters (Hb, Hct, Lymp and RBC) with increased values in regimen 2 after 1 year indicated that regimen 2 has no adverse effect on the most hematological parameters associated with enhanced immunity. In all, regimen 2 was observed to be more hematological friendly than regimen 1.

LIMITATION

The study was limited to retrospective search of hospital case records of the patients on the two HAART regimens, without any physical interactions with the patients. Such physical interactions would probably have thrown more lights on some lifestyle characteristics capable of affecting the HAART potency and adverse effects that were not captured in the hospital case files. It is recommended that an integrated approach involving interviewer-administered questionnaires and search of hospital case records be adopted in further studies. Such studies will also need to be extended beyond one year to look for any possible delayed adverse effects, especially in the case of regimen1 with decreased values of lymphocyte in the face of increased CD4+since suppression of the viral load increases the production of the lymphocytes under normal circumstances.

CONCLUSION

The two drug regimens have positive effects on the treatment of HIV/AIDS patient after 1 year. The CD4+ which is an index of therapeutic efficacy of HAARTs and lymphocyte counts increased significantly. In the study generally, the adverse effects on clinical manifestation were more noticeable in regimen 1 in the study population, with the female population been the greatly affected. Comparison of the two regimens with respect to their adverse effects on clinical manifestation favors regimen 2. However, this comparative difference is not significant at $p > 0.05$. Thus, immunologic and virological evolution of infection did not differ between the 2 drug regimens and sex groups, with the patients on both regimens having a CD4+ cell count >50 cells/µl after one year. There were non-significant adverse effects ($p>0.05$) on the hepatic and renal enzyme markers on the patients using the two drug regimen after 1 year. While the two drug regimens showed improved CD4+ and some other immunological variables, regimen 2 is recommended as the most ideal drug between the two because regimen 2 was observed to be more hematology friendlier than regimen 1. More attention should be paid to the female HIV/AIDS patients when they are placed on regimen1.

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