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Effects of Anti-Retroviral Therapy on Some Reproductive Indices of HIV Sero-Positive Individuals in Rivers State, Nigeria

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Abstract
This study was investigated to determine the effect of antiretroviral therapy on some reproductive indices of HIV seropositive individuals in Rivers State, Nigeria. Highly Active Antiretroviral Therapy (HAART) is a combination of two or more anti-retroviral drugs that inhibits viral reverse transcriptase (RT) (nucleoside and non-nucleoside RT inhibitors), protease, integrase, viral co-receptor attachment (CCR5 inhibitor), and/or virus penetration (fusion inhibitor). A total of 300 HIV patients, who are undergoing treatment were recruited in this study, aged 20-70 years, seen at the HIV clinic of University of Port Harcourt Teaching Hospital, Rivers State Nigeria. Ethical approval for the study and informed consent from the participants were obtained. HIV infections were confirmed by using national algorithm such as determine, unigold and statpak. The hormonal parameters of HIV positive subjects on HAART and those not on HAART reveals that there is a statistically significant difference in the hormonal parameter of HIV positive subjects on HAART and those not on HAART ($F<0.05$, $P<0.05$). LH level was higher in HIV positive subjects on HAART [11.6667±2.08167] than in those not on HARRT [11.4333±4.93390]; FSH level was higher in HIV positive subjects on HAART [20.6667±.80833] than in those not on HAART [8.3333±2.51661], prolactin was did not significant change in level in HIV positive patients on HAART [19.0000± 12.28821] and those without HAART [19.0110± 6.24500]; testosterone was higher in HIV positive subjects on HAART[1.1000±0.36056] than in those not on HAART [1.0667±0.20817]; progesterone level was higher in HIV positive subjects on HAART [6.6333±1.70098] than in those not on HAART [5.2000±2.95127]; oestrogen was also higher in HIV positive subjects on HAART [0.2233±0.10970] than in those not on HAART [0.2133±0.013512]. The consequences of long-term administration of HAART to HIV infected positive subjects could lead to metabolic disorder such as dyslipidaemia which could predispose the patient to high risk of conorary heart disease.

Keywords: Highly Active Antiretroviral Therapy, HIV seropositive individuals, oestrogen, progesterone, testosterone

Introduction

Human Immunodeficiency Virus (HIV) is a lentivirus (a member of the retrovirus family) that causes Acquired Immunodeficiency Syndrome (AIDS), (Weiss, 1993; Danel et al; 2006; Karim et al; 2010), a condition in humans in which the immune system begins to fail, leading to life-threatening opportunistic infections. Infection with HIV occurs by the transfer of blood, semen, vaginal fluid, pre-ejaculate, or breast milk. Within these bodily fluids, HIV is present as both free virus particles and virus within infected immune cells. The four major routes of transmission are unsafe sex, contaminated needles, breast milk, and transmission from an infected mother to her baby at birth (vertical transmission). Screening of blood products for HIV has largely eliminated transmission through blood transfusions or infected blood products in the developed world. HIV infection in humans is considered pandemic by the World Health Organization (WHO). Nevertheless, complacency about HIV may play a key role in HIV risk.

As people living with HIV get older and older, their life expectation gets closer to the age of the general population (Robinson, *et al;* 2012; Biswas et al; 2013; Jiang et al; 2015). Older individuals are exposed to numerous new infectious populations. Furthermore, age-related disease develops much faster in people living with HIV.

The older age is associated with a higher risk of development of AIDS, as well as those not AIDS-related death (Simon, *et al*; 2010). These facts were reflected in the introduction of CD4 count in patients over 50 years of age, whereas, the IAS-USA guideline increased this border line to 60 years of age.

The main goal of HAART is the suppression of viral load leading to the reduction of infections. ART should be considered as an efficient element of the prevention of infections among “sero-discordant couples” , that is , those in which one of the patients is HIV sero-positive and the other is not infected with HIV for the use of antiretroviral agent in HIV-1-infected adults and adolescents (Zhang et al; 2011; Moyo et al; 2013).

Antiretroviral treatment reduces both the mortality and the morbidity of HIV infection, but routine access to antiretroviral medication is not available in all countries, (Pallela *et al.*, 1998). HIV infects primarily vital cells in the human immune system such as helper T Cells (to be specific, CD_4^+ T cells), macrophages, and dendritic cell. HIV infection leads to low levels of CD_4^+ T cells through three main mechanism: first direct viral killing of infected cells; second, increased rates of apoptosis in infected cells, and third, killing infected CD_4^+ T cells by CD_8 Cytotoxic lymphocytes that recognize infected cells. When CD_4^+ T cell numbers decline below a critical level, cell-mediated immunity is lost and the body becomes progressively more susceptible to opportunistic infections. Most untreated people infected with HIV - 1 eventually develop AIDs. These individuals mostly die from opportunistic infections or malignancies associated with the progressive failure of the immune system (Anderson et al; 2011)). HIV progresses to AIDs at a variable rate affected by viral, host, and environmental factors, most will progress to AIDS within 10 years of HIV infection: some will have progressed much sooner, and some will take much longer (Kumar & Sharma, 2009; Celum & Baeten, 2012). Treatment with anti-retroviral increases the life expectancy of people infected with HIV. Even after HIV has progressed to diagnosable AIDs, the average survival time with antiretroviral therapy was estimated to be more than 5 years as of 2005 (Schneider *et al*., 2005).

Although few studies exist on drug interactions with postmenopausal hormone therapy, steroid hormones may affect several drugs metabolized through the P450 system, which may predict an impact on antiretroviral clearance and metabolism. Compared with controls, a significant decrease in the unbound clearance and an increase in the total and unbound half-life of prednisolone was noted with postmenopausal conjugated estrogen replacement (Gustavson *et al*., 1986). In contrast, Harris *et al* found no significant change in prednisolone or erythromycin pharmacokinetics with postmenopausal hormone therapy, although he did find a difference between postmenopausal and premenopausal women in prednisolone pharmacokinetics (Harris *et al*., 1996).

Nigeria has the second highest number of new infections reported each year, and an estimated 3.7 percent of the population is living with HIV. The importance of antiretroviral drugs on reproductive indices are useful markers for monitoring the extent of damage to the organs.Studies have shown that the knowledge of antiretroviral therapy helps in developing antagonists that are important and in combination with antiretroviral drugs target other aspects of the HIV replication cycle.

There are few research reports about effects of ART among patients on HAART in Nigeria. Also, the roles of socio-demographic characteristic, psychosocial factors as predicators of effects have produced largely inconsistent results. This work is expected to identify those factors that influence effect of ART on the retro-positive patients, and also to address the effects of Nonnucleoside Reverse Transcriptase inhibitors (NNRTIS) which are associated with rash, and may cause Stevens-Johnson syndrome and toxic epidermal necrolysis.

Materials and Methods

Study Area

This study took place in the University of Port Harcourt Teaching Hospital, Choba, Port Harcourt, Rivers State, Nigeria from 26th July, 2016 – 23rd May, 2017. University of Port Harcourt Teaching Hospital serves as both a primary contact hospital and a regional referral hospital. Currently, the ART clinic provides HIV related services for both adults and children.

Port Harcourt, the capital of Rivers State, is located in South-eastern Nigeria (07^{o} 3’ E, 04^{o} 51’N, and 10m altitude above sea level) in the humid forest zone of the Niger Delta region, Nigeria. It is densely populated and home to multinational oil and gas companies and as such witnesses the influx of people in search of better living.

Port Harcourt features a tropical wet climate with lengthy and heavy rainy seasons and very short dry seasons. Temperatures throughout the year in the city are relatively constant, showing little variation throughout the course of the year. Average temperatures are typically between 21^{o}C-31^{o}C in the city (https://weatherspark.com/y/54960/Average-Weather-in-Port-Harcourt-Nigeria-Year-Round).

Study Population

A total of three hundred (300) subjects within the age range of 20-70 years were recruited for this study: two hundred (200) were undergoing treatment for HIV infection, and 100 healthy individuals. They were classified into three groups: (1) HIV sero-positive individuals on ART (2) Control 1 – HIV sero-positive individual but not on ART (3) Control 2 – HIV negative individual. The first batch was 100 in number, that is, HIV sero-positive on ART for the

minimum of seven months, and the second batch was 100 in number for HIV sero-positive individuals not on ART. The third batch was 100 that is HIV negative.

Advocacy, Mobilization and Pre-Survey Contacts

A letter of introduction from the Head, Department of Biomedical Sciences, University of PortHarcourtand a detailed proposal stating the purpose of researchwere submitted to the Chief Medical Directorand the ethical committee of University of Port Harcourt Teaching Hospital, and approval was obtained.

Scheduled meetings were held with the study subjects and writteninformed consent was gotten from them with structured questionnaires distributed with the help of field assistants.

Selection Criteria

Inclusion Criteria: HIV sero-positive individuals on ART for 7 months and above**,** HIV sero-positive individuals on ART within the age bracket of 20-70 years**,** HIV sero-positive individuals on ART on a given consent**,** HIV sero-positive individuals without ART on a given consentand HIV sero-negative individuals.

Exclusion Criteria: Subjects with chronic disease aside HIV, e.g. liver disease, renal disease**,** HIV sero-positive individuals outside the age bracket.

Reproductive Parameters Studied

Luteinizing hormone (LH), Follicle stimulating hormone (FSH), Prolactin, Testosterone, Progesterone, Estrogen.

Study Design

Baseline blood samples were collected from HIV sero-positive patients on anti-retroviral drugs (Group 1), HIV sero-positive patients without antiretroviral drugs (Group II), and HIV negative participants (Group III). Group I participant continued with their therapy for another 3 months when blood samples were collected for analysis. Samples were collected between 9 am-12 pm to reduce variability. Samples were centrifuged and stored at -20^{o}C. Estimation of reproductive parameters was carried out using appropriate reagents and equipment.

Laboratory Procedures

Blood Sample Collection

Five millilitre syringes were used to draw blood from the anti-cubital vein of each subject. The blood was dispensed into a tube containing ethylenediamine tetra-acetic acid (EDTA) and was used immediately for reproductive parameters.

Reproductive Study

Levels of Follicle stimulating hormone (FSH) was determined with kits from Monbindinc, Lake forest, CA 92630, USA, with product code: 425-300, following the manufacturer's instructions. Level of Luteinizing hormone was determined using the LH ELISA kit, following the manufacturer's instruction. Level of progesterone was determined using the progesterone EIA method, with Catalog No-10005, following the manufacturer's instructions. Levels of Prolactin hormone was determined using the method, Immunoenzymometric assay and using kits from Monobindinc, Lake forest, CA 92630, USA. Level of testosterone was

obtained with the method of competitive enzyme immunoassay with kits from monobindinc., Lake forest, CA 92630, USA. Level of Estrogen was obtained using Estradiol (E2) from Monbind Inc., Lake forest, CA 92630, USA, with product code: 4925-300, using the method, Delayed competitive enzyme Immunoassay Type 9.

HIV Test

This was done using the method of CHEMBIO by Essex et al. 1983

Statistical Analysis

Results were analysed using Statistical Package for Social Sciences (SPSS) version 15. The data were expressed using descriptive statistics and Analysis of Variance (ANOVA). Multiple comparisons for the parameter were done using Post Hoc Turkey (HSD) to test for the level of significance between means.

Values were expressed as mean ± Standard Deviation (m ± SD) and values above the 95% confidence limit ($P<0.05$) were considered statistically significant.

Results

Results in Table 1 show the hormonal parameters of normal (HIV negative) subjects based on age. It reveals that there is a statistically significant difference in the hormonal parameter of HIV negative subject with respect to age ($F<0.05$, $P<0.05$). LH level increased with higher age [46 years and above; 68.3800±40.11972], FSH level for normal subject also increased among normal subjects aged 46 years and above [60.6000±20.95304], PROL level reduced with higher age [46 years and above; 9.2000±8.50353], TESTOSTERONE decreased with higher age [<26 years; 13.6333±6.92122: 46 years and above; 2.6000±1.15326], PROGESTERONE level reduced with higher age [<26 years; 13.6333±6.92122: 46 years and above; 2.6000±1.15326] and OESTROGEN level also reduced with higher age [26 years; 0.3833±0.05774 : 46 years and above; 0.3833±0.0577].

Table 1: Hormonal Parameters of Normal (HIV Negative) Subjects Based on Age

GROUP	Age	LH	FSH	PROL	TEST	PROG	OEST
NORMAL SUBJECTS	<26 years F=0.00 P=0.00	17.6200± 6.98835	14.7667±4. 45571	82.5333±8 .02143	1.8667± 0.05774	13.6333±6. 92122	0.3833±0.0 5774
	26-35 years F=0.000 P=0.000	69.0600± 51.05613	78.1333±5 4.24356	44.3333±2 .55408	1.5200±0.4 4385	0.3967±0.0 0577	8.6333±2.8 0238
	36-45 years F=0.000 P=0.000	32.9200± 12.86476	23.3000±1 7.03174	29.0000±1 4.79865	0.2667±0.1 5275	6.8000±8.0 9877	0.2033±0.1 2702
	46 years and above F=0.000 P=0.000	68.3800± 40.11972	60.6000±2 0.95304	9.2000±8. 50353	0.1033±0.0 0577	2.6000±1.1 5326	0.1033±0.0 0577

Results in Table 2 show the hormonal parameters of normal (HIV negative) subjects based on sex. It reveals that there is a statistically significant difference in the hormonal parameter of HIV negative subject with respect to sex (F<0.05, P<0.05). LH level was higher in females [79.6000±65.99553] than males [10.6000±4.50777]; FSH was also higher in females [81.5667±50.64912] than males [6.5667±1.95021]; PROLACTIN level was elevated in females [84.5667±6.46323] than male [4.4333±0.80829]; TESTOSTERONE however level higher in males [1.8333± 0.05774] than female [0.5667±0.11547]; PROGESTERONE level was elevated in females [13.6333±6.92122] than in males [1.400±0.17321]; OESTROGEN was also higher in females [0.3888±0.05774] than in males [0.3833±0.00577].

Table 2: Hormonal Parameters of Normal (HIV Negative) Subjects Based on Sex

GROUP	Gender	LH	FSH	PROL	TEST	PROG	OEST
NORMAL SUBJECTS F=0.000 P=0.000	Male	10.6000± 4.50777	6.5667± 1.95021	4.4333±0.80 829	1.8333± 0.05774	1.400±0.17321	0.3833±0.00 577
	Female	79.6000± 65.99553	81.5667 ±50.649 12	84.5667±6.4 6323	0.5667±0.11 547	13.6333±6.921 22	0.3888±0.05 774

Data in Table 3 show the hormonal parameters of HIV positive subjects on HAART based on sex. It reveals that there is a statistically significant difference in the hormonal parameter of HIV positive subjects with respect to sex (F<0.05, P<0.05). LH level was higher in females [11.7333±1.32791] than males [10.9667±5.05404]; FSH level was higher in females [14.9333±9.12159] than males [8.1333±3.87986], PROLACTIN was elevated in females [29.0000±4.84974]; TESTOSTERONE was however, higher in males [13.0333± 5.36781] than females [1.3000±0.10000]; PROGESTERONE level was higher in females [16.2667±8.40972] than males [3.4333±1.65025]; OESTROGEN was also higher in females [0.3000±0.01732]

Table 3: Hormonal Parameters of HIV Positive Subjects on HAART based on Sex

GROUP	Gender	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE SUJECTS ON HART F=0.000 P=0.000	Male	10.9667± 5.05404	8.1333±3 .87986	11.6333±5. 26245	13.0333± 5.36781	3.4333±1.6502 5	0.1267±0.02 082
	Female	11.7333± 1.32791	14.9333± 9.12159	29.0000±4. 84974	1.3000±0.10 000	16.2667±8.409 72	0.3000±0.01 732

Results in Table 4 show the hormonal parameters of HIV positive subjects on HAART based on duration of therapy. It reveals that there is a statistically significant difference in the hormonal parameters of HIV positive subjects on HAART based on duration of therapy (F<0.05, P<0.05). LH level was higher in HIV positive subjects whose treatment has lasted for 10 years and more [37.9500±31.32483]; FSH level was increased in subjects with prolonged duration of therapy; [0-1 year; 6.0333±2.15484: 2-5 years; 8.0333±1.46401: 5-10 years; 11.4500±1.34350: above 10 years; 13.8333±12.54804]. PROLACTIN level however

decreased with increased duration of therapy [0-1 year; 28.9667±12.12614: 2-5 years; 25.0000±10.52188: 5-10 years; 16.2000±10.33779]: 10 years and above; 14.4000±7.63675. TESTOSTERONE level also decreased with longer duration of therapy [0-1 year; 1.3000±0.70711: 2-5 years; 1.0333± 0.20817: 5-10 years; 0.9333±0.15275 and above 10 years; 0.8000±0.10000]. PROGESTERONE level also falls with prolonged duration of HAART [0-1 year; 7.9333±5.19359: 2-5 years; 0.2100±0.16462; 5-10 years; 0.1800±0.09539; above 10 years 0.1720±0.12124]. OESTROGEN level also decreased with longer duration of therapy [0-1 year; 0.2500±0.14526: 2-5 years; 0.2100±0.16462: 5-10 years; 0.1800±0.09539: above 10 years; 0.1520±0.12124]

Table 4: Hormonal Parameters of HIV Positive Subjects on HAART based on Duration of Therapy

GROUP	Duration of Therapy	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE SUBJECTS	0-1 year F=0.026 P=0.010	9.7667±2.77369	6.0333±2.15484	28.9667±12.12614	1.3000±0.70711	7.9333±5.19359	0.2500±0.14526
	2-5 years F=0.011 P=0.030	7.6667±2.45832	8.0333±1.46401	25.0000±10.52188	1.0333± 0.20817	7.3333±4.98130	0.2100±0.16462
	5-10 years F=0.000 P=0.000	17.2000± 14.14178	11.4500±1.34350	16.2000±10.33779	0.9333±0.15275	4.7500±5.30330	0.1800±0.09539
	10 years and above F=0.040 P=0.020	37.9500± 31.32483	13.8333±12.54804	14.4000±7.63675	0.8000±0.10000	3.9667±4.79201	0.1520±0.12124

Results in Table 5 show the hormonal parameters of HIV positive subjects on HAART based on age. It reveals that there is a statistically significant difference in the hormonal parameter of HIV positive subject with respect to age (F<0.05, P<0.05). LH level was higher in younger subjects [< 26 years; 26.0000±20.95304: 26-35 years; 13.0667±2.73922; 36-45 years; 8.9667±3.15013: 46 years and above; 5.3000±40.11972]. FSH level reduced with increasing age [< 26 years; 13.8667±6.09289: 26-35 years; 9.1667±1.20968: 36-45 years; 9.0000±2.50000: 46 years and above; 7.0000±2.55147]. PROLACTIN level decreased with increasing age [< 26 years; 31.6333±8.12143: 26-35 years; 12.6333±4.8045: 36-45 years; 7.5333±0.92916: 46 years and above; 5.9000±2.68887]. There was an inverse relationship between age and testosterone levels [< 26 years; 1.8667± 0.05774: 26-35 years; 1.5000±0.34641: 36-45 years; 1.4333±0.28868: 46 years and above; 1.0333±0.11547]. PROGESTERONE level decreased with increase in age [< 26 years; 0.3733±8.12424: 26-35 years; 0.3233±2.80238: 36-45 years; 0.3000±0.01732: 46 years and above; 0.1733±0.09292]. OESTROGEN also decreased with increase in age [< 26 years; 0.3733±8.12424: 26-35 years; 0.3233±2.80238: 36-45 years; 0.3000±0.01732: 46 years and above; 0.1733±0.09292

Table 5: Hormonal Parameters of HIV Positive Subjects on HAART based on Age

GROUP	Age	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE SUBJECTS	<26 years F=0.011 P=0.00	26.0000±20.95304	13.8667±6.09289	31.6333±8.12143	1.8667±0.05774	14.5333±6.30106	0.3733±8.12424
	26-35 years F=0.031 P=0.011	13.0667±2.73922	9.1667±1.20968	12.6333±4.80451	1.5000±0.34641	12.7667±2.93995	0.3233±2.80238
	36-45 years F=0.000 P=0.000	8.9667±3.15013	9.0000±2.50000	7.5333±0.92916	1.4333±0.28868	8.9667±1.56950	0.3000±0.01732
	46 years and above F=0.021 P=0.000	5.3000±40.11972	7.0000±2.55147	5.9000±2.68887	1.0333±0.11547	3.7667±2.99388	0.1733±0.09292

Results in Table 6 show the hormonal parameters of HIV positive subjects without HAART based on age. It reveals that there is a statistically significant difference in the hormonal parameter of HIV positive subject without HAART with respect to age. LH level decreased with higher age [<26 years; 14.1400±6.24444: 46 years and above; 10.4600±4.76896], FSH level increased with higher age [<26 years; 35.1200±2712973: 46 years and above; 39.000±30.43444], PROL level reduced with higher age [<26 years; 33.2800±29.05240: 46 years and above; 18.9400±13.84569], TESTOSTERONE level increased with higher age [<26 years; 0.8000± 0.25495: 46 years and above; 1.2600±0.03613], PROGESTERONE level reduced with higher age [26 years; 5.3000±5.20240 : 46 years and above; 0.2540±0.8325] and OESTROGEN level reduced with higher age [26 years; 0.2680±0.12795 : 46 years and above; 0.2540±0.8706].

Table 6: Hormonal Parameters of HIV Positive Subjects without HAART based on Age

GROUP	Age	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE WITHOUT HAART	<26 years F=0.00 P=0.00	14.1400±6.24444	35.1200±2712973	33.2800±29.05240	0.8000±0.25495	5.3000±5.20240	0.2680±0.12795
	26-35 years F=0.000 P=0.000	11.0800±4.2139	12.6280±8.13105	14.0200±7.34486	1.5200±0.44385	8.1200±5.49654	0.3120±0.4550
	36-45 years F=0.000 P=0.000	10.1200±3.64993	15.3200±16.55588	10.8600±4.44556	1.0400±0.53666	2.2000±0.70711	0.1020±0.00447
	46 years and above F=0.000 P=0.000	10.4600±4.76896	39.000±30.43444	18.9400±13.84569	1.2600±0.03613	0.2540±0.8325	0.2540±0.8706

Results in Table 7 show the hormonal parameters of HIV without HAART based on sex. It reveals that there is a statistically significant difference in the hormonal parameter of HIV subjects without HAART positive subjects with respect to sex (F<0.05, P<0.05). LH level was higher in females [14.2200±1.58019] than males [8.5800±2.37424]; FSH level was higher in females [44.0000±30.02940] than males [8.1600±2.6025], PROLACTIN was elevated in females [61.7000±20.56101]; TESTOSTERONE was however, higher in males [1.8000± 0.12247] than females [0.4600±0.08.944]; PROGESTERONE level was higher in females [15.5000±4.10000] than males [2.7800±1.73407]; OESTROGEN was also higher in females [0.4720±0.02049]

Table 7: Hormonal Parameters of HIV without HAART based on Sex

GROUP	Gender	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE WITHOUT HAART F=0.000 P=0.000	Male	8.5800±2.37424	8.1600± 2.6025	8.5200±2.25544	1.8000± 0.12247	2.7800±1.73407	0.2860±0.17024
	Female	14.2200± 1.58019	44.0000 ±30.02940	61.7000±20.56101	0.4600±0.08 .944	15.5000±4.10000	0.4720±0.02049

Results in Table 8 show the hormonal parameters of normal and HIV positive Subjects. It reveals that there is a statistically significant difference in the hormonal parameter of Normal and HIV positive subjects (F<0.05, P<0.05). LH level was higher in normal subjects [44.2000±35.14124] than in HIV positive subjects [11.3000±0.56569]; FSH level was higher in normal subjects [58.5000±30.44667] than in HIV positive subjects[11.5000±4.80833], PROLACTIN was higher in normal subjects [59.7500± 27.5484]; TESTOSTERONE was also higher in normal subjects[7.1500±8.27315] than in HIV positive subjects [1.4250±0.56789]; PROGESTERONE level was higher in normal subjects [9.8000±9.05097] than in HIV positive subjects [8.8000±5.87197]; OESTROGEN was also higher in normal subjects [2.4380±4.11000] than in HIV positive subjects [0.2100±0.12728].

Table 8: Hormonal Parameters of Normal and HIV Positive Subjects

GROUP	LH	FSH	PROL	TEST	PROG	OEST
NORMAL SUBJECTS	44.2000±35.14124	58.5000±30.44667	59.7500± 27.5484	7.1500±8.27315	9.8000±9.05097	2.4380±4.11000
HIV POSITIVE SUBJECTS P=0.000 F=0.000	11.3000±0.56569	11.5000±4.80833	20.3000±12.30366	1.4250± 0.56789	8.8000±5.87197	0.2100±0.12728

Results in Table 9 show the hormonal parameters of HIV positive subjects on HAART and those not on HAART. It reveals that there is a statistically significant difference in the hormonal parameter of HIV positive subjects on HAART and those not on HAART (F<0.05, P<0.05). LH level was higher in HIV positive subjects on HAART [11.6667±2.08167] than in those not on HARRT [11.4333±4.93390];

FSH level was higher in HIV positive subjects on HAART [20.6667±.80833] than in those not on HAART [8.3333±2.51661], PROLACTIN was did not significant change in level in HIV positive patients on HAART [19.0000± 12.28821] and those without HAART [19.0110± 6.24500]; TESTOSTERONE was higher in HIV positive subjects on HAART[1.1000±0.36056] than in those not on HAART [1.0667±0.20817]; PROGESTERONE level was higher in HIV positive subjects on HAART [6.6333±1.70098] than in those not on HAART [5.2000±2.95127]; OESTROGEN was also higher in HIV positive subjects on HAART [0.2233±0.10970] than in those not on HAART [0.2133±0.013512].

Table 9: Hormonal Parameters of HIV Positive Subjects on HAART and those not on HAART

GROUP	LH	FSH	PROL	TEST	PROG	OEST
HIV POSITIVE SUBJECTS ON HAART	11.6667±2.08167	20.6667±.80833	19.0000± 12.28821	1.1000±0.36056	6.6333±1.70098	0.2233±0.10970
HIV POSITIVE SUBJECTS NOT ON HAART P=0.000 F=0.000	11.4333±4.93390	8.3333±2.51661	19.0110± 6.24500	1.0667±0.20817	5.2000±2.95127	0.2133±0.013512

Discussion

The reproductive study on the effects of antiretroviral therapy on HIV patients focused on reproductive indices such as LH, FSH, Prolactin, testosterone, progesterone and oestrogen. Gonadal dysfunction is common among HIV-infected men. The study investigated the gonadal dysfunction in male HIV patients and evaluated the effect of HAART on the hormonal function after six (6) months of HAART. In this study, patients with hypogonadism showed low testosterone levels along with low LH and low FSH (secondary hypogonadism hypogonad) levels. Recent studies on hypogonadism report up to 20% prevalence among HIV –infected men.

In this study, it was observed that prolactin level was sufficiently increased in nonHIV infected individuals than the HIV infected (positive) on HAART. The reduction in the prolactin level seen among the infected individuals might be attributed to the introduction of HAART on the HIV infected individuals (Ram *et al;* 2009) and co-workers stated that there was lower prolactin level in HIV patients. Merenish *et al*; (1990) also reported a change in level of prolactin and some steroid hormone in patients infected with HIV. A more recent study conducted by Ogundahunsi *et al;* (2011) on HIV positive women reported significant decrease in leutenizing hormone (LH), follicle stimulating hormone (FSH) and prolactin level.

HIV infection can directly affect endocrine gland) thereby causing HIV endocrinopathy. It was stated by Sinna *et al;* (2011) that complex interaction between HIV infection and endocrine system may be manifested as biochemical and hormonal to avert glandular failure.

Conclusion

This study demonstrated that long-term administration of HAART to HIV infected positive subjects could lead to metabolic disorder such as dyslipidaemia which could predispose the patient to high risk of coronary heart disease.

This study has revealed that gonadal dysfunction is common in HIV patients. Also, the research showed improvement in gonadal function on administration of HAART in HIV patients with hypogonadism. If the observation is true reflection of gonadal functions in patients with HIV on HAART, it presents a strong case to avoid unnecessary administration of various drugs, thereby decreasing morbidity and financial burden on the poor patients in this part of the country.

Further research should be carried out with larger sample sizes and additional information regarding the effect of HAART on other reproductive parameters in Nigerian populations should be assessed to better understand the effects of HAART on hormonal profile and other metabolic disturbances.

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