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Fasting Blood Glucose and Lipid Profile in Human Immune Deficiency Virus positive population in Kaduna, North Central Nigeria

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ABSTRACT: Diabetes and hyperlipidemia has been implicated in HIV/AIDS infection. However, this study was carried out to determine the fasting blood glucose and lipid levels of people living with HIV/AIDS that are on antiretroviral therapy in Kaduna metropolis. Blood samples of 120 seropositive subjects were randomly selected and 80 HIV/AIDS seronegative subjects were also collected as controls. The CD4 count and body mass index were also estimated. An enzymatic method was used to assess the glucose and lipid levels of these subjects using commercially prepared reagents (Randox kits). The data was analyzed using student's T-test and P-values ($p < 0.005$) were considered significant. The patients mean values of FBG, Total cholesterol, and TG/HDLC ratio were 4.6 ± 0.08mmol/l, 4.8 ± 1.28mmol/l, and 1.65 ± 0.07 respectively and were statistically significant when compared with the control group ($p < 0.05$), which were 4.1 ± 0.11 mmol/l, 4.4 ± 0.13 mmol/l, and 1.39 ± 0.06. The value of BMI in the control group was higher compared with the study group. The female mean values of FBG, Total cholesterol, HDLC, LDLC. BMI were 4.7 ± 0.19mmol/l, 5.1 ± 0.21mmol/l, 1.30 ± 0.07mmol/l, 3.56 ± 0.22mmol/l, 25 ± 0.52 kg/m^2 respectively were higher when compared with male subjects mean values of FBG 4.5 ± 0.17mmol/l, total cholesterol 4.5 ± 0.15mmol/l, HDLC 1.09 ± 0.05mmol/l, LDLC 3.14 ± 0.18mmol/l and BMI of 24.1 ± 0.55kg/m^2. The BMI of female (n = 60) 25 ± 0.52kg/m^2 was higher compared with male patients (n = 60) which was 24.1 ± 0.55kg/m^{2,} though the difference was not statistically significant ($P>0.05$). Higher CD_4 count of 395± 30.65cells/µl was recorded in male patients when compared with female patients of CD4 count 381 ± 29.09 cells/µl which were not statistically significant ($p > 0.05$). The overall result showed slight increase in the mean values of fasting blood glucose and lipid levels of HIV/AIDS patients when compared with control subjects. However, the result in this study does not indicate abnormally on the patients.

Key Words Fasting blood glucose,Fasting lipid profile,HIV,Kaduna, Nigeria.

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Introduction

Human Immune-Deficiency Virus (HIV) is the etiologic agent of acquired immune deficiency syndrome (AIDS). AIDS is the leading cause of death of many Nigerians; it is characterized by a progressive decline of immune function which increases the susceptibility to a wide range of opportunistic infections (1). AIDS is diagnosed when a patient exhibits characteristic opportunistic infections with $CD4^+$ T – cell count of 200 or less Lymphocytes per microlitre (2).

Lipids are compounds that yield fatty acid on hydrolysis and form part of cell membranes and are also used to synthesize hormones (3). However, much fat in the blood increases the risk of heart diseases leading to metabolic derangement (4). Fatty liver has become one of the commonest liver diseases worldwide and is being increasingly documented in patients with HIV/AIDS infections (5).

Abnormal blood lipid levels (dyslipidemia) are among the most troublesome side effect which are associated with elevated risk of cardiovascular diseases due to antiretroviral therapy (6) High levels of triglycerides, low-density lipoprotein cholesterol (LDLC) "bad" and Total cholesterol are associated with atherosclerosis, while high density lipoprotein cholesterol (HDLC) "good" is considered protective (7).The findings of this study will help to reduce the incidence of heart disease in HIV/AIDS patients through early detection. Which can also serve as a guide for planning diet, a guide for further research into the relationship between HIV/AIDS blood glucose, lipid levels and incidence of heart diseases.

The aim of this study is to determine the fasting blood glucose and lipid levels of people living with HIV/AIDS and to establish the relationship between the fasting blood glucose and lipid levels of people living with HIV/AIDS on ART in Kaduna .

Materials and Methods

This study is a Laboratory based Prospective cross-sectional study that was carried out in Barau Dikko Specialist Hospital Kaduna.Two Hundred (200) subjects were randomly selected from the outpatients HIV/AIDS clinics of Barau Dikko Specialist Hospital Kaduna. Out of the 200 subjects 120 are HIV/AIDS positive out this, 60 are male, 60 are female, the rmaining 80 participants rae apparently healthy 40 male, 40 female as control.
Clearance was obtained from the Ethical Committee of Kaduna State Ministry of Health

Anthropometric Data Collection

Measurement of height, waist, and hip circumference was done by the use of meaqasuring tape calibrated in meters. The weight was measured using a weighing balance calibrated in kilograms and the age and sex of the subjects were recorded.

Blood Sample Collection

Five millilitres of venous blood was collected from the subjects by venepunctureinto a sterile plain vaccum tube and allowed to clot. The clotted samples were centrifuged at 3000rpm for 5 minutes using IEC CL 30 centrifuge. The serum was seperated and kept in the refrigerator at 2C to 8 C until it was needed for analysis. The blood (2ml) for CD^{4+} cell count was collected into anticoagulant containers and analyzed the same day using CD4 BD FACS Machine.

Methods for Laboratory Analysis

An enzymatic method was used to assess the glucose and lipid levels of these subjects using commercially prepared reagents (Randox Laboratories Limited United Kingdom).

Statistical Analysis Of Data

Data collected was summarized as mean ± SEM. Differences between individual groups were assessed by student's t- test using a Graph Pad Version 2 Computer Software. A p – value ($P < 0.05$) was considered significant.

Results

The mean values of all HIV- seropositive patients (n = 120) were FBG (4.6 ± 0.08mmol/l), total cholesterol (4.8 ± 1.28mmol/l), TG (1.66 ± 0.04mmol/l, BM1 (24.0±0.37kg/m^2), CD_4 count (381 ± 20.46cells/µl) and triglyceride/HDLC ratio (1.65± 0.07) showed significant difference (P< 0.05) when compared with control values of FBG (4.1 ± 0.11mmol/l), total cholesterol (4.4 ± 0.13mmol/l), triglyceride (1.60 ± 0.03mmol/l), BMI (26.0 ± 0.34kg/m^2), CD_4 count (301± 19.80cells/µl), TG/HDLC (1.39 ± 0.06) respectively (Table 1).

Male HIV-seropositive patients (n = 60) and male HIV –seronegative controls (n = 40), showed a significant difference (P< 0.05) in mean values of FBG (4.5 ± 0.17mmol/l), Triglyceride (1.73 ± 0.07mmol/l), HDLC (1.09 ± 0.41), BMI (24 ± 0.55kg/m^2), CD_4 count (395 ± 30.65cells/µl), and triglyceride/HDLC of 1.75 ± 0.09 when compared with mean values of male HIV-seronegative control values of FBG (3.9. ± 0.16mmol/l), TG (1.54 ± 0.05mmol/l), HDLC (1.31 ± 0.08mm; /l), BMI (26.6 ± 0.60kg/m^2), CD_4 count (642 ± 60.95 cells/µl) and TG/HDLC (1.33 ± 0.09). (Table 2)

The female mean values of HIV-seropositive patients (n-60) that showed significant difference (P< 0.05) are total cholesterol (5.1 ± 0.22), CD_4 count (381 ± 29.09cells/µl) and triglyceride/HDLC (1.51 ± 0.11), compared with female HIV-seronegative Control values (n = 40) of total cholesterol (4.7 ± 0.19mmol/l), CD_4 count (556 ± 51.19cells/µl) and TG/HDLC (1.45 ± 0.09) (Table 3).

The mean values of female HIV – patients (n = 60) were FBG (4.7 ± 0.19mmol/l), total cholesterol (5.1 ± 0.22mmol/l), HDLC (1.29 ± 0.07mmol/l), LDLC(3.56 ± 0.22mmol/l) and BMI (25.0 ± 0.52kg/m^2) were higher when compared to the mean values of male HIV-patients (n = 60) FBG (4.5 ± 0.17mmol/l), total cholesterol (4.5 ± 0.15mmol/l), HDLC (1.09 ± 0.05mmol/l), LDLC (3.14 ± 0.18mmol/l) and BMI 24.1 ± 0.55kg/m^2 respectively. There was significant difference (P< 0.05) between female mean values of total cholesterol 5.1 ± 0.22mmol/l and LDLC 3.56 ± 0.22mmol/l compared to mean values of male HIV-patients of total cholesterol 4.5 ± 0.15mmol/l and LDLC 3.14 ± 0.18mmol/l respectively. The mean values of male HIV-patients of TG 1.73 ± 0.07mmol/l and CD_4 count 395 ± 30.65cells/µl were higher than the mean values of female HIV-patients with TG 1.60 ± 0.05 and CD_4 count of 381 ± 29.09cells/µl respectively. There was no significant difference in their mean values (P> 0.05). Table 4. There was a positive correlation between the CD_4 count and the BMI, FBG, triglyceride, total cholesterol, LDLC and TG/HDLC. However, Body mass index correlated with FBG, triglyceride, total cholesterol and LDLC in all HIV-Seropositive patients irrespective of sex.

Table 1: Clinical characteristic of all HIV patients vs controls

	Age (yrs)	FBS (mmol/l)	Tchol. (mmol/l)	TG (mmol/l)	HDLC (mmol/l)	LDLC (mmol/l)	BMI (kg/m^2)	CD_4 cells/µl	TG/HDL	WHR
All patients (n=120)										
Mean ± SEM	35.4±0.78	4.6±0.08	4.8±1.28	1.66±0.04	1.19±0.04	3.35±0.14	24.0±0.37	381±20.46	1.65±0.07	0.86±0.005
All control (n=80)										
Mean ± SEM	34.7±1.16	4..1±0.11	4.4±0.13	1.60±0.03	1.26±0.05	3.25±0.17	26±0.34	301±19.80	1.39±0.06	0.86±0.007
P-Value	>0.05	<0.05	<0.05	>0.05	>0.05	>0.05	<0.05	<0.05	<0.05	>0.05
Significance	NS	S	S	NS	NS	NS	S	S	S	NS

BMI = Body mass index,
Tchol = Total cholesterol, TG = Triglyceride,
HDLC = High density lipoprotein cholesterol,
LDLC = Low density lipoprotein cholesterol,
TG/HDLC = Triglyceride-high density lipoprotein ratio,
FBG = Fasting Blood glucose, WHR = Waist-hip ratio.

Table 2: Clinical characteristics of male HIV patients vs male controls

	Age (yrs)	FBS (mmol/l)	Tchool (mmol/l)	TG (mmol/l)	HDLC (mmol/l)	LDLC (mmol/l)	BMI (kg/m^2)	CD_4^+cells/µl	TG/HDL	WHR
Male patients (n-60)										
Mean ± SEM	36.3±1.23	4.5±0.17	4.5±0.15	1.73±0.07	1.09±0.05	3.14±0.18	24.1±0.55	395±30.65	1.75±0.09	0.89±0.006
Male control (n=40)										
Mean ± SEM	35.4±1.68	3.9±0.16	4.2±0.16	1.54±0.05	1.31±0.08	3.08±0.25	26.6±0.60	642±60.95	1.33±0.09	0.86±0.09
P-Value	>0.05	<0.05	>0.05	<0.05	<0.05	>0.05	<0.05	<0.05	<0.05	>0.05
Significance	NS	S	NS	S	S	NS	S	S	S	NS

Table 3: Clinical characteristics of female HIV patients vs female controls

	Age (yrs)	FBS (mmol/l)	Tchol. (mmol/l)	TG (mmol/l)	HDLC (mmol/l)	LDLC (mmol/l)	BMI (kg/m^2)	CD_4^+cells/µl	TG/HDL	WHR
Female patients (n-60)										
Mean ± SEM	34.5±1.29	4.7±0.19	5.1±0.22	1.60±0.05	1.29±0.07	3.56±0.22	25.0±0.52	381±29..09	1.51±0.11	0.86±0.006
Female controls (n=40)										
Mean ± SEM	33.9±1.60	4.2±0.16	4.7±0.19	1.604±0.06	1.21±0.07	3.47±0.20	26.0±0.48	556±51..19	1.45±0.09	0.86±0.09
P-Value	>0.05	>0.05	<0.05	>0.05	>0.05	>0.05	>0.05	<0.05	<0.05	>0.05
Significance	NS	NS	S	NS	NS	NS	NS	S	S	NS

Table 4: Clinical characteristics of male HIV patients vs female HIV patients

	Age (yrs)	FBS (mmol/l)	Tchol (mmol/l)	TG (mmol/l)	HDLC (mmol/l)	LDLC (mmol/l)	BMI (kg/m^2)	CD_4^+ cells/µl	TG/HDL	WHR
Male patients (n=60)										
Mean ± SEM	36.3±1.23	4.5±0.17	4.5±0.15	1.73±0.07	1.09±0.05	3.14±0.18	24.1±0.55	395±30.65	1.75±0.09	0.89±0.06
Female Patients (n = 60)										
Mean ± SEM	34.5±1.29	4.7±0.19	5.1±0.22	1.60±0.05	1.29±0.07	3.56±0.22	25.0±0.52	381±29.09	1.51±0.11	0.86±0.06
P-Value	>0.05	>0.05	<0.05	>0.05	>0.05	<0.05	>0.05	>0.05	>0.05	>0.05
Significance	NS	NS	S	NS	NS	S	NS	NS	NS	NS

Discussion

The use of Antiretroviral Therapy (ART) in HIV/AIDS Patients increased the levels of TG and cholesterol compared to the control groups. However, the prevalence of dyslipidemia in this study is less than that of the

developed countries as reported by (8). The increase levels of CD_4 count, total cholesterol, TG and fasting blood glucose (FBG) in all patients on ART compared to control group in this study agrees with the work done by (9), who reported that the increase in CD_4 count, FBG, and TG is due to the effect of ART in improving the immunological properties of the patients.

At the time of this study the combination of ART used by the patients were Nucleoside reverse transcriptase inhibitors (Stavudine and Zidovudine), and Non nucleoside reverse transcriptase inhibitor (Nevirapine). The increase in body mass index (BMI), serum TG and CD_4 count seen in this study agrees with the report of (10) that there was an increase in BMI, TG and CD_4 count using the same combination of drugs. The increase in these clinical parameters was due to ART, which can be associated with a morphologic and metabolic abnormality syndrome (11). The positive correlation between the CD_4 count and BMI, FBG, TG, total cholesterol, LDLC and TG/HDLC ratio can be explored for monitoring the patients on ART. Other factors responsible for cardiovascular diseases, which are referred to as risk factors apart from the effect of ART, are old age, smoking, sex, diet, use of contraceptives in females and the presence of diabetes.

The findings in this study showed significant increase in LDL, total cholesterol and triglyceride in HIV infected patients compared to HIV seronegative subjects. However, the patients were not at immediate risk of developing hyperlipidemia at the time of this study.

In developing countries like Nigeria poverty and illiteracy has contributed to increasing the incidence of cardiovascular disease. It is important that healthcare professionals should educate people about the potential limitation of these drugs and assist patients in confronting the challenges posed by the adverse side effect of these drugs. Appropriate dietary and exercise measures should be encouraged for the treatment of hyperlipidemia. Nutritionists and dieticians should also be fully involved in the treatment and care of these patients. Smoking should also be discouraged since it is a modifiable cardiac risk factor.

In conclusion, dyslipidemia and diabetes are present in HIV/AIDS patients especially those on antiretroviral therapy. However the lipid levels in this study do not indicate abnormality possibly due to the duration of antiretroviral therapy. Dyslipidemia is common in HIV-Infected patients who are receiving antiretroviral therapy. Blood glucose and lipid profile assessment should be encouraged for HIV/AIDS patients before and after the commencement of therapy. People living with HIV-Infection should be evaluated and treated for dyslipidemia in a similar fashion as in any HIV-Seronegative patients with comprehensive attention to underlying cardiac risk factors.

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