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Research article

FASTING INSULIN RESISTANCE INDICES AND METABOLIC SYNDROME IN DIABETES AND HIV INFECTED SUBJECTS

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ABSTRACT: Diabetes Mellitus and HIV remain two major clinical conditions of public health importance especially in developing countries.HIV impairs normal immune response against malignant infections and destroy many organs impairing their functions including the pancrease. Ordinarily, the pancrease performs exocrine functions thus producing insulin from the beta cells of the islets of langerhan aiding in nutrient metabolism.The beta cells of islet can be destroyed by the T-lymphocytes resulting to clinical diabetes characterized by hyperglycemia Diabetes and HIV have been associated with metabolic dearrangement particularly lipodystrophy.It was in this line that we designed a study to monitor fasting insulin resistance indices and metabolic syndrome in120 subjects of age 30-55 years comprises of 50 HIV –Infected,50 Type 2 Diabetes and twenty apparently healthy subjects who served as control attending Nnamdi Azikiwe University Teaching Hospital Nnewi(NAUTH).The blood samples collected from the subjects were used for evalution of lipid profile Tryceride(TG) ,low density lipoprotein-cholesterol(LDL-C) and high density lipoprotein –cholesterol (HDL-C), Fasting blood sugar was measured using routine standard method while fasting insulin was done using indirect ELISA method .The insulin resistance indices were also evaluated. Data were analyzed for the statistical significance using one way ANOVA. The fasting insulin, fasting blood sugar, triglyceride and LDL-C were remarkably higher inType 2 Diabetic subjects compared to control $P < 0.01$. Equally observed in the study was that the fasting insulin, fasting blood sugar and triglyceride were higher in HIV subjects compared to control subjects $P < 0.01$.Though, the HDL-C was quite reduced in HIV –Infected subjects $P < 0.01$. The finding of this study has revealed further lipid and carbohydrate distortion in both diabetic and HIV subjects which might place individuals to high risk of atherosclerosis due to reduced HDL-C if not checked**.**

Key words: Triglyceride, low density lipoprotein, high density lipoprotein, Fasting blood sugar and fasting insulin.

INTRODUCTION

Diabetes Mellitus and HIV remain two major clinical conditions of public health importance especially in developing countries (UNAIDS/WHO, 2006). In the developing region of the world, non –communicable diseases are replacing the traditional enemies such as infection as a leading cause of disability and premature deaths in adults (Christopher and Aam ,1996).In Africa diabetes has long and interesting history and appear to be the most common endocrine disease even in Nigeria. (Fumuyiwa,1993, Nigel, et al , 2001, Wierus- Wysocka et al , 2001).Diabetes Mellitus which develops as a result of insufficient insulin level in the body or insulin resistance to glucose, ultimately progresses to various complications like retinopathy, nephropathy, angiopathy and neuropathy.(kumar et al ,2004 Harris,1997 ,William and Pickup,1998).. The clinical features established in diabetic neuropathies are presence of persistent proteinuria, hypertension as a result of renal failure due to alteration of salt and water metabolism and an inflammatory reaction in the wall of any blood vessel (vasculitis) to mention but a few.(Cattel,1993 and Benjamin and Sacks,1994) . Conversely, the rate of progression of incipient and establishes nephyropathy can be slowed and the associated mortality may be reduced by aggressive antihypertensive treatment .Acute HIV infection is usually accompanied by transient non –specific illness characterized by fever, malaise, myalgia, lymphadenopathy, pharyngitis and rash (Dipentima,2005).

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A chronic HIV infection is asymptomic in early stages but symptoms such as night sweats; diarrhea and weight loss may develop. In later stage .patients may suffer minor opportunistic infection such as oral candidiasis .HIV infection leads to biochemical changes in the body of patients and this particularily stems from malnutrition and psychological stress.Before the availability of highly active antiretroviral therapy(HAART),blood glucose abnormalities were not frequently seen in people with HIV but with the use of protease inhibitors (PLS) in 1997 ,then came a health advisory warning of an association between PLS and hyperglycemia. Since then, there have been continued reports of insulin resistance in people using anti-HIV therapy.It is not clear what role antiretroviral drugs play in the development of insulin reisistance.However ,fat distribution changes including increase in visceral adipose tissue(VAT) and decreased sub –cutaneous adipose tissue(SAT) are indirect causes of insulin resistance(Kumar,2004) .Increased VAT for example is associated with elevation of fatty acids, which may contribute to an abnormal metabolic cycle that can result in altered insulin signaling .As for SAT, a significant decrease in the number of adipocytes may ultimately affect the physiological action of insulin as well(Kumar,2004).infact PLS use appears to be more directly related to disorders of glucose metabolism than other metabolic complication such as body fat gain or loss.(Dube,2000, Garg et al, 1990). There have been reports of association between HIV and HIV treatment with metabolic syndrome(Ford et al ,2002, Hadigan, 2003 and Ascaso,2003,).Incidentally ,insulin regulates the glucose and glycogen levels in the blood as well as the release of fatty acids from the adipocytes.When the glucose is very low ,the glycogen is converted to glucose.(Kumar,1999). Metabolic changes in diabetes have been associated with insulin resistance as the central pathology in patients with various components of metabolic syndrome .Obesity is strongly associated with decreased insulin sensitivity in type 2 diabetes subjects (Groop et al,1993).hypertension and dyslipidemia have also be associated with insulin resistance syndrome in type 2 diabetic subjects(Chaiken,1991 and Chaudhary,2000).

HIV impairs normal immune response against malignant infections and destroys many organs impairing their functions including the pancrease. (Monica, 2000). Ordinarily, the pancrease performs exocrine functions thus producing insulin from the beta cells of the islets of langerhan aiding in nutrients metabolism.The beta cells of islet can be destroyed by the T-lymphocytes resulting to clinical diabetes characterized by hyperglycemia (Barnett, 2002).Diabetes and HIV have been associated with metabolic dearrangement leading to lipodystrophy..It has been stressed that cardiovascular disease (CVD) is the most prevalent and detrimental cause of morbidity and mortality in people with diabetes and hypertension. (Lawoyin et al, 2002, Malcolm et al, 2002, Murphy et al 2002). It was based on these findings that we designed a study to monitor fasting insulin resistance indices and metabolic syndrome in HIV –Infected and Type 2 Diabetes patients.

MATERIAL AND METHODS

The study assessed fasting insulin resistance indices and metabolic syndrome in120 subjects of age 30-55 years comprises of 50 HIV –Infected,50 Type 2 Diabetes and twenty apparently healthy subjects who served as control attending Nnamdi Azikiwe University Teaching Hospital Nnewi(NAUTH).The blood samples collected from the subjects were used for evalution of lipid profile(TG, LDL-C and HDL-C) and Fasting blood sugar.these biochemical parameters were measured using routine standard methods while fasting insulin was done using indirect ELISA method .The insulin resistance indices were also evaluated.After the collection of the blood from the subjects .The blood was then transferred into a clean plain tube, allowed to clott ,centrifuged and serum separated for biochemical analysis of serum lipids,lipoproteins and fasting insulin.Zlatkis and Boyle (1953) method was used to determine the total cholesterol content. Burnsterin et al (1970) for high density lipoprotein cholestrol.while the method of Stewart (1980) was used for very low density.hte triglyceride content was estimated using the method of Friedwald et al (1972). Data was analyzed for the statistical significance using one way ANOVA.

RESULT AND DISCUSSION

In our study, we found that the fasting insulin, fasting blood sugar, triglyceride and LDL-C were remarkably higher inType 2 Diabetic subjects compared to control $P < 0.01$ Table. Along side, it was observed that the fasting insulin, fasting blood sugar and triglyceride were higher in HIV subjects compared to control subjects $P < 0.01$.Though, the HDL-C was quite reduced in HIV –Infected subjects $P < 0.0$ Table-1.

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Table-1: Serum HDL-C, TG, LDL-C, Fasting Blood Sugar Fasting Insulin IN Control, HIV and Diabetic Subjects

Parameters	Control(Subjects)	HIV Infected(Subjects)	Type-2-Diabetes(Subjects)
HDL-C(mmol/L)	1.17 ± 1.03	0.81 .±.0.53	0.92 ± 0.56
TG(mmol/L)	1.28± 0.53	2.40 ±.1.64	2.08 ± 1.46
LDL-C(mmol/L)	2.10± 1.09	3.59± 2.50	3.63± 2.60
Fasting Blood Sugar(mmol/L)	4.77± 2.43	8 .4±3.76	9.45± 5.59
Fasting Insulin(mmol/L)	7.31± 3.91	15.91.± 8.46	14.38.± 7.66

P <0.05

Basically ,insulin resistance is a condition in which the body's cell do not respond properly to the hormone insulin and cannot take up glucose which then builds up in the blood stream(Kaplan,1999).This causes beta cells to release extra insulin leading to high blood insulin levels(hyper-insulinemia). Over time, the beta cells fail to secrete enough insulin.when the body cannot produce sufficient insulin or cells do not respond to insulin effiently, the result is hyperglycemia- impaired fasting glucose and impaired glucose tolerance which eventually leads to diabetes(Briney,1970 and Viniks,1988).As the body fails to ultilize glucose for its energy production the body then falls back on its energy reserves in the adipose tissue ,leading to the release of fatty acids as observed in this study with increase in fasting insulin, fasting blood sugar, triglyceride and LDL-C which were remarkably higher in Type 2 Diabetic subjects**.** The fasting insulin, fasting blood sugar and triglyceride were higher in HIV subjects compared to control subjects .This is not surprising also, considering that there have been continued reports of insulin resistance in people using anti-HIV therapy. Though, it is not clear what role antiretroviral drugs play in the development of insulin reisistance.However ,fat distribution changes including increase in visceral adipose tissue(VAT) and decreased sub – cutaneous adipose tissue(SAT) are indirect causes of insulin resistance(Kumar,2004) .Increased VAT for example is associated with elevation of fatty acids, which may contribute to an abnormal metabolic cycle that can result in altered insulin signaling.As for SAT, a significant decrease in the number of adipocytes may ultimately affect the physiological action of insulin as well(Kumar,2004). The reduction in HDL level in HIV patients could either be as a result of utilization of protein in the multiplication of the viral particles.Again, it could also be attributed to an increase in the production of pro-inflammatory cytokines — IL-1, IL-6, IL-8. These cytokines are part of the innate immune response, which initiate the acute-phase response, leading to decrease in production of HDL. It should be noted however that HDL contain more protein than any of the other lipoproteins.

The finding of this study has revealed further lipid and carbohydrate distortion in both diabetic and HIV subjects which might place individuals to high risk of atherosclerosis due to reduced HDL-C if not checked.

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