Evaluation of Serum Lipid and Lipoprotein in Diabetic and Hypertensive subject Attending Specialist Hospital Damaturu Yobe State

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Abstract
Absorbility and availability of food nutrients depends on many factors. In serum, lipid molecules are present in combination with proteins. Such lipid-protein complexes are called lipoprotein. This combination promotes solubility of lipid in an aqueous environment, this make it more available for cells up take. Lipoproteins have a core of insoluble (non-polar) cholesterol esters and Triglycerides. The study is aimed at determining the lipids and lipoproteins profiles in the serum of diabetics and hypertensive subjects. Automated chemistry analyzer (selectra pros) was used for these analyses. The results obtained from sample analyzed for serum Total cholesterol, high density lipoprotein, low density lipoprotein and triglyceride from hypertensive and diabetes patients are TC 9.3 mmol/L, HDL 1.9 mmol/L, LDL 2.3 mmol/L, TG 0.9 mmol/L. This study has generated data which shows that dyslipidemia exists in patients at Damaturu who suffers from diabetes and hypertension, or both diseases as compared with normal individuals. It was recommended that the patients of diabetes and hypertensive are at risk of cardiovascular disease due to the composition of the analysed lipoproteins.
Keywords: Lipoproteins, diabetics, hypertensive, cardiovascular, risk factors

I. Introduction

Lipid molecules are present in combination with proteins such lipid-protein complexes are called lipoprotein. This combination promotes solubility of lipid in an aqueous environment (Lopez, 1998). Lipoproteins have a core of insoluble (non-polar) cholesterol esters and Triglycerides. The inner core is surrounded by proteins (apolipoprotiens), phospholipids and free cholesterol with their water soluble groups facing outwards (Baron *et al*., 1993; Tietz *et al*., 2008). Lipoproteins are classified according to their density, composition and electrophoresis mobility (Whitbey *et al*., 2008). The increasing orders of lipoproteins are: chylomicrons, very low density Lipoprotein (VLDL), low density lipoprotein (LDL) and high density lipoprotein (HDL) (Bucolo and David, 1999). Electrophoresis mobility is determined by electrophoresis and depends on the charge resulting from the apolipoprotein content (Tietz *et al*., 2008). Electrophoresis of normal plasma separates the lipoproteins into alpha-lipoproteins (HDL) pre-beta lipoproteins (VLDL) and beta-lipoproteins (LDL). Chylomicrons remain at the origin (ADA, 2007). A lipoprotein is a biochemical assembly whose primary purpose is to transport hydrophobic lipid also known as fat) molecules in water, as in blood or extracellular fluid .They have a single-layer phospholipid and cholesterol outer shell, with the hydrophilic portions oriented outward toward the surrounding water and lipophilic portions of each molecules oriented inward toward the lipid molecules within the particles (Aburtoe et al., 2013).

Apolipoproteins are embedded in the membrane, both stabilizing the complex and giving its functional identity determining its fate. Thus the complex serves to emulsify the fats, enzymes, transporters, structural proteins, antigens, adhensins, toxins and lipoprotein. Examples include the plasma lipoprotein

particles classified as HDL, LDL, IDL, VLDLP and ULDLP (chylomicrons) lipoproteins, according to density, subgroup of which are primary drivers/modulators of atherosclerosis (Sola *et al.*, 2010).
Lipoproteins may be classified as five major groups. Lipoproteins are larger and less dense when the fat to protein ratio increases. They are classified on the basis of electrophoresis, ultracentrifugation and nuclear magnetic resonance spectroscopy via the ventera analyzer (Oyelola *et al*., 2008). Chylomicrons carry triglyceride (fat) from the intestine to the liver, to skeletal muscles and to adipose tissue. They have different subunits or subgroup that has been identified (Dokken, 2009). The aim of this research work is to determine the proportion of lipids and lipoproteins in Diabetes and hypertensive patients.

II. Materials and Methodology

Collection and storage of samples

The blood samples (3-5ml) of diabetes and hypertensive subjects were collected and placed into plain containers or lithium heparin, centrifuged at 3,000 revolutions per minute for 3 minutes before separation of serum. Samples are labeled accordingly. Samples were analyzed soon after separation, or stored at 4^{o}C for 1-8 days before analysis. Samples that could not be analyzed within this period were kept frozen. All samples for the analysis were collected and analyzed at Yobe state specialist hospital Damaturu, Yobe State. The blood samples were analyzed using selectra proS chemistry analyzer**.**

Methodology

Using Automated chemistry analyzer (selectra proS)

Experimental design

A total of (100) hundred subjects were used for the analysis and were analyzed for the lipid profile comprising of TC, HDL, LDL and TG levels. The analysis was divided into two groups as follows:

Group 1: Lipid and lipoprotein of male.

Group 2: Lipid and lipoprotein of female.

III. Results

The results obtained from analyses of blood sample for serum lipids and lipoprotein (Total cholesterol, high density lipoprotein, low density lipoprotein and triglyceride) from hypertensive and diabetes patients are present below in a logical order.

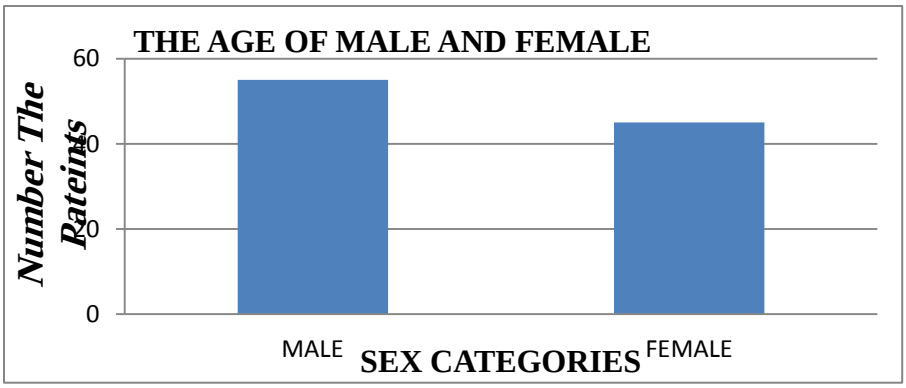

Figure 1: Showing the sex distribution of the sampled patients

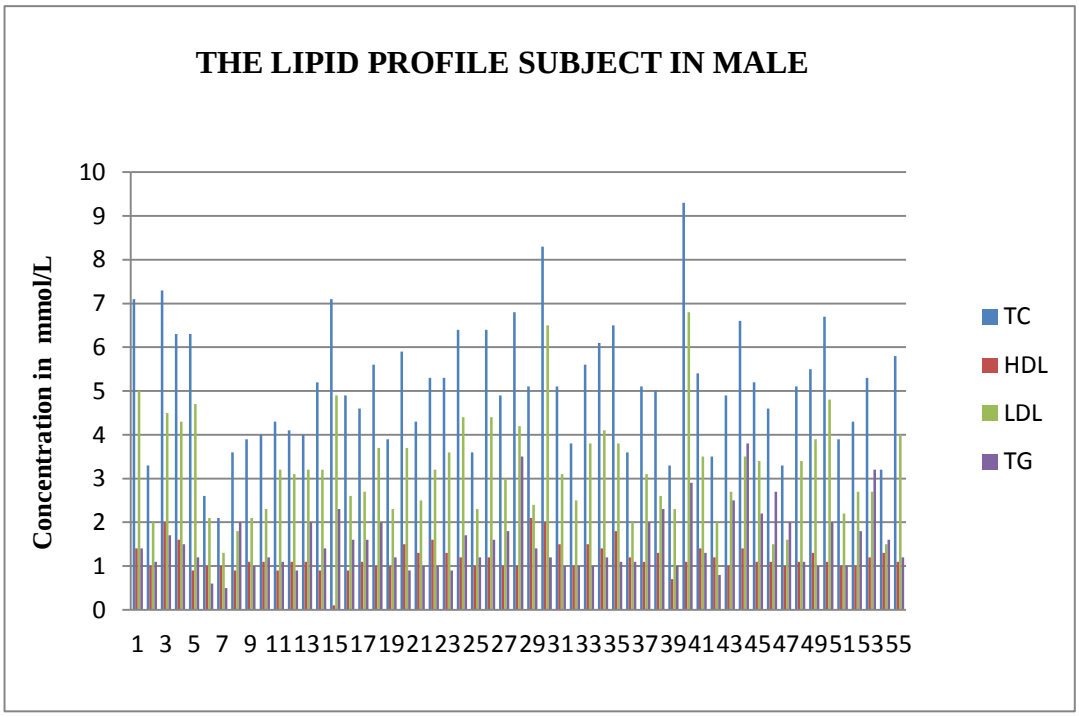

Figure 2: Showing lipids profile for male subject

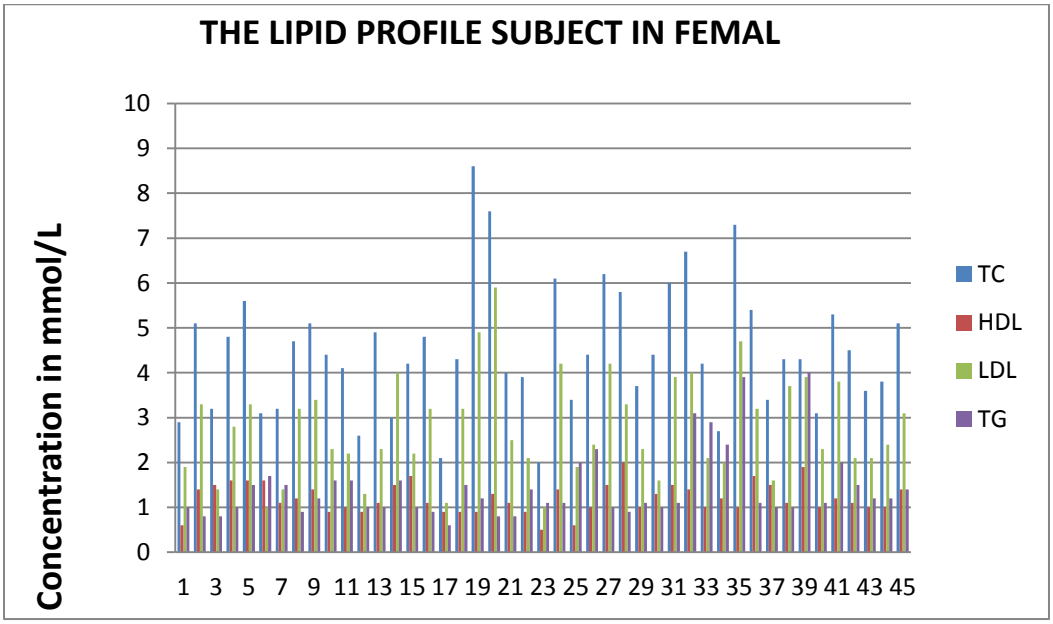

Figure 3 : Showing lipids profile for Female subject

IV. Discussion

The analysis of the serum lipid and lipoprotein profile was carried out using automated chemistry analyzer. Hundred (100) subjects divided into two (2) groups (diabetes and hypertensive,) each were recruited for this study. From the study, data generated shows that dyslipidemia exist in patients

suffering from diabetes, hypertension or both disease which confers on the patients a high risk of accelerated atherosclerosis, a greater risk of cardiovascular disease and coronary artery disease. Diabetes and hypertension are important metabolic disorders in Nigeria and the prevalence of these diseases are on an increase worldwide. Some diabetics are also afflicted with hypertension. The mean values of TC, TAGs and LDL-C were higher in hypertensive and diabetics, and the HDL-C was significantly lower in the two conditions. This finding is in line with earlier report of (Sola *et al.*, 2010). The lower HDL-C may result from the inability of the liver to synthesize HDL under both conditions (of diabetes and hypertension). These observations were consistent with previous reports of (Bello-Sani *et al*., 2007). That dyslipidaemia is usually present in diabetes mellitus and in hypertension. Dyslipidaemia in diabetes mellitus is due to both insulin deficiency and insulin resistance that affects enzymes and Pathways of lipid metabolism. Lipoprotein lipase (LPL) is the main enzyme for the catabolism of chylomicrons. The LPL is an insulin dependent enzyme and insulin resistance will lead to increased triglyceride levels with decreased catabolism of triacylglycerols rich lipoprotein (Reckless *et al*., 1978). Hypertension even in the absence of diabetes mellitus is known to cause insulin resistance (Dokken, 2009). Insulin resistance occurs when the inner wall of the artery is bombarded with an elevated pressure due to hypertension. The excessive stretching and tension on the wall leads to cracking. The cracks increase the filtration of plasma lipids in the intimal cells. The result of insulin resistance is chronic hyperglycaemia and increased lipolysis which then results in elevated levels of lipids in the plasma (Jarret, 2009; Oyelola *et al*., 2008).

The standard acceptable values for the various parameters are as follows: for total cholesterol (TC), the value is ≤2.5-5.2 mmol/L**;** for triacylglycerols (TAGs), the value is ≤2.0-2.9mmol/L; for low density lipoproteins-cholesterol (LDL-C), the value is ≤3.9mmol/L and the value for high density lipoprotein-cholesterol (HDL-C) is ≥1.1-1.5 2 mmol/L. Moreover, the higher serum levels of TC, TAGs and LDL-C found among the diabetic and hypertensive, in our reports. A patient as against their control indicates that these patients are at a high risk of developing cardiovascular diseases such as coronary artery disease, myocardial infarction and angina pectoris (Reckless *et al*., 1978). The lowered concentration of HDL-C in diabetic and hypertensive also points to the danger of coronary artery disease in these conditions. From the study, the highest prevalence of those with high total cholesterol was found among subjects with both diabetes and hypertension. The prevalence of subjects with high LDL-C was highest in subjects with both diabetes and hypertension, while the prevalence of subjects with low HDL-C was highest in hypertensive subjects. High triacylglycerol levels were most prevalent in hypertensive subjects.

The study revealed that the lipid and lipoprotein profiles of type 2 diabetic and hypertensive patients were not statistically different from those of non-diabetic and hypertensive non-diabetic subjects, respectively. These findings are not in consonance with previous studies which suggest that lipoprotein abnormalities are higher in diabetic than in non-diabetic subjects (Idogun et al., 2007). The results showed gender differences in TC concentrations of hypertensive type 2 diabetic females and hypertensive type 2 diabetic males. In this study, the mean TC concentrations were 5.10 2 mmol/L and 5.62 mmol/L among the type 2 diabetic males and females, respectively. These values are lower than those reported by Khandekar et al. (5.52 mmol/L for type 2 diabetic males and 5.97 mmol/L for type 2

diabetic females) (Onyemelukwe et al., 1981). Also reported slightly higher values in persons with type 2 DM compared with controls (Onyemelukwe et al., 1981).

Comparison of the mean lipid profile of hypertensive type 2 diabetic and hypertensive non-diabetic males HDL acts by enhancing the removal of cholesterol from the peripheral tissues and so reduces the body's cholesterol pool. Type 2 DM was usually associated with low plasma levels of HDL-C(Barret-Connor et al ., 2005).There were also lower mean HDL-C concentrations in hypertensive type 2 diabetic males and hypertensive type 2 diabetic females. Low HDL-C concentrations are often accompanied by elevated TG levels as seen in this study and others (Lamarche *et al*., 1996). And this combination has been strongly associated with an increase in risk of coronary heart disease (CHD) (Assmann *et al*.,1992). In Nigeria, hypertension and type 2 DM occur in 10–15% and 2–4% of the population, respectively (Jeppesen et al., 1997). Both the conditions coexist frequently, the prevalence of hypertension among the diabetics being 20–40 % (Manninen et al., 1992).

They are independent risk factors for dyslipidemia (Bartoli, Fra and Carnevale, 2011). The UK Prospective Diabetes Study found that mean TC and LDL-C concentrations in those with type 2 DM may not differ significantly from those in non-diabetic subjects (Cooke, and Plotnick, 2008), in their report on gender differences in the pattern of dyslipidemia, noted that elevated LDL-C and reduced HDL -C concentrations were more commonly documented in females than in males (James et al., 2013).In this study, elevated TC, TG, HDL-C and LDL-C concentrations were comparable in type 2 diabetics and non-diabetics, as well as hypertensive type 2 diabetics and hypertensive non-diabetics for both genders. However, TC was significantly higher in hypertensive type 2 diabetic females than in hypertensive type 2 diabetic males. Most of the men were farmers or employed in jobs that required a lot of physical activity. On the other hand, most of the females were housewives and might have been engaged in work that would require less physical activity. This may have accounted for the lower TC in hypertensive type 2 diabetic males compared with that of their female counterparts (Lee et al., 2012). The TC/HDL-C ratio is a sensitive and specific index of cardiovascular risk (James et al., 2013). Apart from HDL-C, the ratio of TC/HDL-C is regarded as a predictor of CHD risk, especially with values >6.0 (Lee et al., 2012). In this study, the mean TC/HDL-C ratios in male and female type 2 diabetics, and hypertensive diabetics were less than 6.0, ranging from a low of 5.47 to a high of 5.93 (Onyemelukwe et al,.1981) reported an atherogenic ratio of 4.4 in type 2 diabetics in Nigeria.

In this study, serum TC, TG, and LDL-L concentrations are significantly higher in hypertensive patients than in normotensive subjects. This is consistent with earlier observations in parts of the world and in other parts of Nigeria (Pelkonen et al., 199). This is unlike the findings of (Carl, Edward and David, 2006) who reported that the TC, TG, and LDL-C of newly diagnosed hypertensive patients did not differ significantly from that of control subjects, though the newly diagnosed hypertensive tended to have a higher level of LDL-C, TG, TC (Malik et al., 2010).In this study, serum TC concentrations are significantly higher in hypertensive patients than in normotensive subjects. This is consistent with earlier observations in parts of the world and in other parts of Nigeria (Carretero and Oparil 2000). High levels of serum cholesterol are known to increase the risk of developing macro vascular complications such as

coronary heart disease (CHD) and stroke (Lawlor and Smith, 2005). Many epidemiological studies indicate a progressive increase in CHD risk as the serum TC exceeds 5.0 mmol/L (Wilks et al., 1999), which prompted Diao et al., (2012) to suggest that levels of serum TC in the range 5.0–6.5 mmol/L to be considered undesirable. It is to be noted that there was positive and significant correlation between serum TC and both systolic and diastolic BP in both hypertensive patients and normotensive controls. Similarly, there were statistically significant correlations between serum TC and BMI among both hypertensive and normotensive groups (Diao et al., 2012).

V. Conclusion

This study has generated data which shows that dyslipidaemia exists in patients at Damaturu who suffers from diabetes and hypertension, or both diseases as compared. Thus, these patients might be at high risk of accelerated and diffuse atherosclerosis and would be at a greater risk of cardiovascular disease and Coronary artery disease. The reports from this study provides another bench mark for evaluating the risks of developing cardiovascular disease in persons from the Northern part of Nigeria and elsewhere who may present diabetes, hypertension or both diseases.

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