International Journal of Community Research http://www.arpjournals.com
ISSN: 2315 – 6562 **E-ISSN: 2384 - 6828**

LIPID PROFILE OF TYPE 2 DIABETES PATIENTS ATTENDING IRRUA SPECIALIST TEACHING HOSPITAL IRRUA, EDO STATE, NIGERIA

*[1]Alaiya, T. H., [1]Omozokpia, U. M., [2]Omeni, A. A., [1]Adekanle, E., [3]Olafeide, O. S.
[1]Department of Biochemistry, Ambrose Alli University, Ekpoma, Nigeria; [2]Department of Zoology, Ambrose alli University, Ekpoma, Nigeria; [3]Irrua Specialist Teaching Hospital, Irrua, Nigeria
*Corresponding author: alaiya2014@outlook.com

ABSTRACT

This study investigated the lipid profile (LP) of type-2 diabetics and non-diabetic patients presenting at Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria, with a view to assessing the risk of cardiovascular disease among the diabetics. Twenty (20) diabetic and 20 non-diabetic patients (control) formed the study population. Total cholesterol (TC), triacylglycerol (TG), high density lipoprotein-cholesterol (HDL-C), and low density lipoprotein-cholesterol (LDL-C) were assayed for each group using standard biochemical methods, while the fasting blood glucose levels of the patients were assayed using the glucose oxidase method. The results showed higher mean TC and HDL-C levels among the diabetic patients than their non-diabetic counterparts and the observed differences were statistically significant ($p<0.05$). The mean glucose, TG, and LDL-C were equally higher among the diabetics than their non-diabetic counterparts, but in this instance, the differences were not statistically significant ($P>0.05$). Regardless of the high lipid profile levels among the diabetics, the values obtained fell within acceptable range; suggesting that the patients were responding to treatment or life style changes.

Keywords: Lipid Profile, Type-2 Diabetes, Cardiovascular Disease, Teaching Hospital.

Received: 2nd January, 2015 **Accepted: 25th January, 2015** **Published: 31st January, 2015**

INTRODUCTION

Total lipid profile or lipid panel of an individual is a contributory factor resulting from blood cholesterol along with its associated varieties of lipoproteins i.e. high-density lipoproteins (HDL-C or α-lipoproteins), very low density lipoproteins (VLDL-C or pre-β-lipoproteins) and triglycerides (Dasofunjo *et al*., 2013). Dyslipidaemia is one of the major cardiovascular disease (CVD) risk factors and plays an important role in the progress of atherosclerosis, the underlying pathology of CVD (Singh and Kumar, 2012). According to the American Diabetes Association in 1998, these are more complex abnormalities that are caused by the interrelation among obesity, insulin resistance and hyperinsulinism (American Diabetes Association, 1998).

It noteworthy to emphasize that fatty tissue is exclusively related to risk factors, such as the altered insulin and lipid profile which can contribute to the development of the insulin resistance syndrome comprising several risk factors for the emergency of cardiovascular complications (Singh and Kumar, 2012). In patients with type 2 diabetes, it is most commonly characterized by elevated TG and reduced HDL-C.

Diabetic patients with type 2 diabetes mellitus are at greater risk of developing vascular diseases because of lipid changes (Shaikh *et al*., 2010). Type 2 diabetes is associated with a cluster of interrelated plasma lipid and lipoprotein abnormalities, including reduced HDL cholesterol, a predominance of small dense LDL particles and elevated triglycerides (American Diabetes Association, 2003). These abnormalities occur in many patients despite normal LDL cholesterol levels. These changes are also a feature of the insulin resistance syndrome (also known as the metabolic syndrome), which underlies many cases of type 2 diabetes (Krauss, 2004). Insulin resistance has striking effects on lipoprotein size and subclass particle concentration for VLDL, LDL, and HDL (Reaven *et al*., 1993; Garvey *et al*., 2003).

In diabetics, lipid abnormalities and insulin are critically discussed. Lipid abnormalities in diabetics are described as increased serum triglycerides, very

***Endorsed By**: Innovative Science Research Foundation (ISREF). **Indexed By**: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society*; and *IRMS Informatics India* (*J-Gate)*

low density lipoproteins, low density lipoproteins and lowering of high density lipoproteins in patients with type 2 diabetes mellitus (American Diabetes Association, 2003). Shaikh *et al*. (2010) observed that persons with Type 2 diabetes were suffering from preventable vascular complications at Karachi. It was studied that more food with less exercise predisposes to features of metabolic syndrome. However, lifestyle modifications were proposed to be required for healthy life.

Type 2 diabetes mellitus is the predominant form of diabetes mellitus worldwide; thus, this study was conceived to investigate the lipid profile of Type 2 diabetic patients presenting for treatments at Irrua Specialist Hospital (ISTH), Irrua, Edo State, Nigeria.

MATERIALS AND METHODS

Study Design: The subjects used in the study were diabetic patients presenting at Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria. A total of 20 diabetic patients (13 males, 7 females) and 20 healthy controls (15 males, 5 females) were randomly selected. The mean age for the total (combined males and females) was 58 (ranged 52 – 81) years and the mean age values for males and females were 62 (ranged 51-73) and 53 (ranged 35-65) years respectively. Patients with other ailments and metabolic disorders were excluded from the study. Diabetes was ruled out in the control group by asking questions about the clinical signs of diabetes such as polyuria, polydipsia and recent weight loss. Laboratory tests were also used to confirm the absence of diabetes in the control group. Ethical clearance was sought and obtained for the study from the hospital. The aim of the study was explained to the subjects by the physicians and those who gave informed consent were included in the study by the researchers.

Sample Collection: In both subjects, venous blood samples were obtained after overnight fast into tubes containing lithium heparin (for lipid profile) and EDTA (for blood glucose) as anticoagulants. The samples were centrifuged at 1500 rpm for 5 minutes to obtain the plasma.

Laboratory Analysis: Plasma cholesterol, triacylglycerol, high density lipoprotein – cholesterol (HDL-C), and glucose were determined using kit based on enzymatic method from Randox laboratory, Aldren, USA as described by Tietz (1990). Fasting blood glucose concentration was determined using kit based on glucose oxidase method of Barham and Trinder (1972). LDL-C was calculated indirectly by the method of Friedwald *et al*. (1972) as shown below:

$$\text{LDL-C} = \text{Total cholesterol} - \text{HDL-C} + {}^{TG}/_{5}$$

The lipid profile of the subjects was classified based on the ATP III model (NCEP, 2001).

Statistics: The data obtained in this study were subjected to student t-test analysis using GraphPad InStat tm (V2.04a). Results were recorded as mean ± standard error of mean. The difference was considered statistically significant when $P<0.05$.

RESULTS

The result of the lipid profile of diabetics and non-diabetics are shown in Table 1. The results represents mean value of triplicate determinations ± standard error of mean. The various biochemical parameters include high density lipoprotein-cholesterol (HDL-C), low density lipoprotein (LDL-C), triglycerides, total cholesterol and glucose concentration.

The results showed that the diabetic group had a significantly higher mean fasting glucose level ($P>0.05$), confirming their hyperglycaemic state. LDL-C and triglyceride were non-significantly higher in diabetics than in the control group while HDL-C and total cholesterol was significantly higher in the diabetic than in the control group. However, diabetics recorded a higher HDL-C, LDL-C, triglyceride and total cholesterol than the control groups (Figure 1).

DISCUSSION

From the result, patients with diabetes recorded a non-significantly ($P>0.05$) elevated levels of LDL-C (104.55 ± 9.86mg/dl) and triacylglycerol (90.05 ± 8.95mg/dl); and a significantly ($P<0.05$) higher levels of HDL-C (77.95 ± 6.78mg/dl) and total cholesterol (153.93mg/dl) compared to the control group (non-diabetic patients).

***Endorsed By**: Innovative Science Research Foundation (ISREF). **Indexed By**: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society*; and *IRMS Informatics India* (*J-Gate)*

Table 1: Biochemical Parameters of Diabetics and Control

Parameters (mg/dl)	Diabetics	Control	P-Value
HDL-C	77.95 ± 6.78	45.40 ± 5.62	0.0007*
LDL-C	104.55 ± 9.86	99.15 ± 8.29	0.6774
Triglyceride	90.05 ± 8.95	68.40 ± 10.52	0.1252
Total Cholesterol	191.65 ± 8.35	153.8.93	0.0035*
Glucose	197.58 ± 85.75	85.76 ± 11.14	0.130

HDL-C = high density lipoprotein-cholesterol, LDL-C = low density lipoprotein cholesterol, * = P<0.05 (non-significant).

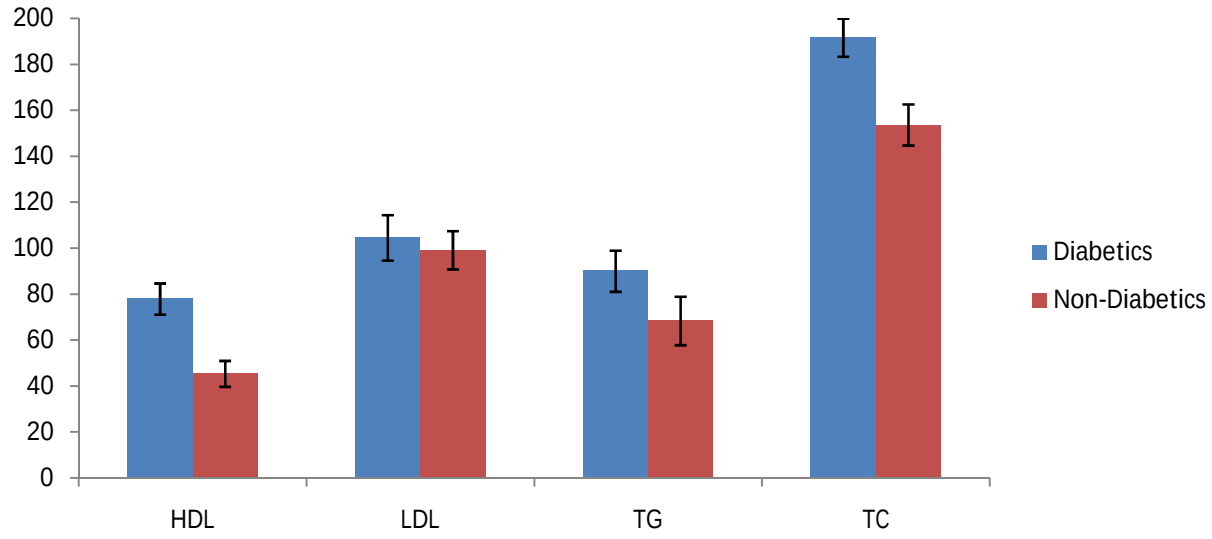

Figure 1: Lipid Panel of Diabetics and Non-diabetics

There have been contradicting reports on the lipid profile of diabetics. Some workers found high levels of lipids in diabetic patients (Idogun *et al*., 2007), others reported normal (Agaba *et al*., 2005) or even lower levels compared to controls. Oluyomi *et al*. (2010) reported a non-significant increase in plasma LDL-C and TC in diabetic patients when compared with normal non-diabetic controls. This agrees with the significant increase in LDL-C of diabetic patients compared to non-diabetic patients observed in this study. The observation may be due to the level of management of diabetes in some patients being studied, as adequate monitoring leading to necessary lifestyle adjustments have been found to be very effective in maintaining normal lipid levels and thus lowering the risk of coronary heart diseases in diabetic patients (Ugwu *et al*., 2009).

According to NCEP (2001), LDL levels <100 is considered to be optimal, 100–129mg/dl is considered to be near optimal, 130–159mg/dl is considered to be on the borderline, 160–189mg/dl is seen to be high, while ≥190mg/d above is considered to be very high. Also, triglyacylglycerol levels <150mg/dl was reported to be normal, 150–159mg/dl is considered to be on the borderline while 200–499mg/dl was considered to be associated with some cardiovascular diseases. These however suggested that irrespective of the non-significantly (P>0.05) higher LDL-C and triacylglycerol levels in the

Endorsed By*: Innovative Science Research Foundation (ISREF).* ***Indexed By****: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society*; and *IRMS Informatics India* (*J-Gate)*

diabetic patients, the values still fell within the safe range of LDL-C and triglyceride. LDL-C is considered as "bad cholesterol" because they can transport their content of fat molecules into artery walls, attract macrophages, and thus drive atherosclerosis (Superko *et al*., 2002). Triglycerides as a major component of very low-density lipoprotein (VLDL) and chlylomicrons play an important role in metabolism of energy sources and transporter of dietary fat. High levels of triglycerides in the bloodstream have been linked to atherosclerosis and by extension, the risk of heart disease and stroke.

Khoo *et al*. (1997) reported that the higher the HDL-C, the lower the risk of developing atherosclerosis. HDL is known to be "good cholesterol" because they can remove fat molecules from macrophages in the wall of the arteries. The study revealed a significantly ($P<0.05$) higher HDL-C in diabetic patients compared to the control which thus, suggests a lower risk of developing cardiovascular diseases. Also, the TC levels were desirable (<200mg/dl) in both diabetic patients and control as reported by NCEP (2001). According to Lecerf and Lorgeril (2011), cholesterol is required to build and maintain body membranes; it modulates membrane fluidity over the range of physiological temperatures. Through the interactions with the phospholipids fatty acid chains, cholesterol increases membrane packing thus, reducing membrane fluidity. However, increased levels of cholesterol have been reported to be associated with several ailments such as cardiovascular diseases, and atherosclerotic disorders.

CONCLUSION

The findings of this study have shown that diabetic patients had a controlled lipid profile due to treatment and medical advice from the medical practitioner. That the diabetic patients recorded an appreciable range of lipid profile suggests the need for proper management of diabetes mellitus in terms of adequate medications and life style changes.

ACKNOWLEDGMENT:

Special thanks go to the Chief Medical director of Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria for his overall assistance in the completion of this research.

REFERENCES

Agaba, E.I., Duguru, M., Agaba, P.A., and Angbazo, D. (2005). Serum Lipid Profile of Nigerian Diabetics with End Stage Renal Disease. *West African Journal of Medicine;* 24(4): 305 – 308.

American Diabetics Association (1998). Management of Dyslipidaemia in Adults with Diabetes. *Diabetes care*; 21: 179 – 182.

American Diabetes Association (2003). Management of Dyslipidaemia in Adults with Diabetes. *Diabetes care*; 26(1): 83 – 86.

Barham, D. and Trinder, P. (1972). An Improved Colour Reagent for the Determination of Blood Glucose by the Oxidase System. *AnalystI*; 97: 142–145.

Barham, D. and Trinder, P. (1972). A colorimetric method for serum glucose determination. *Analyst*; 97(151): 142 – 145.

Dasofunjo, K., Nwodo, O.F.C., Johnson, J.T., Ukpanukpong, R.U., Ugwu, M.N. and Ayo, V.I. (2013). Phytochemical Screening and Effect of Ethanolic Leaf Extract of *Piliostigma thonningii* on Serum Lipid Profile of Male Albino Rats. *Journal of Natural Products and Plant Resources*; 3(2): 5–9.

Friedwal, W.T., Levy, R.I. and Fredrickson, D.S. (1972). Estimation of the Concentration of Low Density Lipoprotein Cholesterol in Plasma, without use of the Preparative Ultracentrifuge. *Clinical Chemistry*; 18: 499–502

Garvey, W.T., Kwon, S., Zheng, D., Shaughnessy, S., Wallace, P., Hutto, A., Pugh, K., Jenkins, A.J., Klein, R.L. and Liao, Y. (2003). Effects of Insulin Resistance and Type 2 Diabetes on Lipoprotein Subclass Particle Size and Concentration Determined by Nuclear Magnetic Resonance. *Diabetes*; 52: 453–462.

Idogun, E.S., Unuigbe, E.I., Ogunro, P.S., Akinola, O.T. and Famodu, A.A. (2007). Assessment of Serum Lipids in Nigerians with Type 2 Diabetes Mellitus

***Endorsed By**: Innovative Science Research Foundation (ISREF). **Indexed By**: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society*; and *IRMS Informatics India* (*J-Gate)*

Complications. *Pakistan Journal of Medical Sciences*; 23(5): 708–712.

Khoo, K.L., Tan, H. and Leiw, Y.M. (1997). Serum Lipids and their Relationship with other Coronary Risk Factors in Healthy Subjects in a City Clinic. *Medical Journal of Malaysia*; 52: 38–52.

Krauss, R.M. (2004). Lipids and Lipoprotein in Patients with Type 2 Diabetes. *Diabetes Care*; 27: 1496–1504.

Lecerf, J.M. and de Lorgeril, M. (2011). Dietary Cholesterol: From Physiology to Cardiovascular Risk. *British Journal of Nutrition*; 106(1): 6–14.

National Cholesterol Education Program (NCEP) (2001). Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *Journal of the American Medical Association*; 285: 2486 – 2497

Oluyomi, E.B., Fisayo, A.M., Bayode, F.J., Fasanya, M.K. and Adedayo, A.E. (2010). Lipid Profile of a Group of Nigerian Diabetic Patients. *Archives of Applied Science Research*; 2(4): 302–306.

Reaven, G.M., Chen, Y.D., Jeppesen, J., Maheux, P. and Krauss, R.M. (1993). Insulin Resistance and Hyperinsulinemia in Individuals with Small, Dense Low Density Lipoprotein Particles. *Journal of Clinical Investigation*; 92: 141–146, 1993

Shaikh, M.A., Kumar, S. and Ghouri, R.A. (2010). Type 2 Diabetes Mellitus and Lipid Abnormalities. *Journal of Liaquat University of Medical and Health Sciences*; 9(3): 145–147.

Singh, G. and Kumar, K. (2012). A Study of Lipid Profile in Type 2 Diabetic Punjabi Population. *Journal of Exercise Science and Physiotherapy*; 8(1): 7–10.

Superko, H.R., Nejedly, M. and Garrett, B. (2002). Small LDL and Its Clinical Importance as a New CAD Risk Factor: A Female Case Study. *Progress in Cardiovascular Nursing*; 17(4): 167–173.

Tietz, N.W. (1990). *Clinical Guide to Laboratory Tests*. Second Edition. W.B. Saunders Company, Philadelphia. Pp. 554–556.

Ugwu, C.E., Ezeanyika, L.U., Daikwo, M.A. and Amana, R. (2009). Lipid Profile of a Population of Diabetic Patients attending Nigerian National Petroleum Corporation Clinic, Abuja. *African Journal of Biochemistry Research*; 3(3): 66–69.

AUTHORS CONTRIBUTIONS:

All the authors are co-researchers; however the individual contributions of the authors are as follows: The research design and write up was done by Alaiya, T. H., Collection of samples, and laboratory analyses was completed by Omeni, A, A., Adekanle, E., Omozokpia, U. M., and Olafeide, O. S..

***Endorsed By**: Innovative Science Research Foundation (ISREF). **Indexed By**: African Journal Online (AJOL); Texila American University; Genamics; Scholarsteer; EIJASR; CAS-American Chemical Society*; and *IRMS Informatics India* (*J-Gate)*