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A Cross Sectional Study of Plasma Lipid Profile and Cardiac Risk Markers in Diabetic Nephropathy

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Abstract
Introduction: *Nephropathy is one of the serious diabetic complications and haemodialysis the common modality employed generally aimed to correct the altered crystalloids as well as to remove accumulated nitrogenous waste products. But it rarely corrects the vascular lipid levels, hence increasing the thrust of dyslipidaemia and dyslipidaemia induced cardiovascular complications in these patients. A study was planned to assess the cardiovascular risk factors, Cardiac Risk Ratio, Atherogenic Index of plasma and Atherogenic Coefficient in these patients to evaluate the cardiovascular risk.*
Materials and Methods: *Patients of type 2 diabetes suffering from diabetic nephropathy undergoing haemodialysis at Department of Medicine, Tagore Medical College, Rathinamangalam, Melakottaiyur, Chennai, Tamil Nadu and its affiliated hospitals in the age group of 30-60 years were randomly selected. A heparinised blood sample was collected after obtaining a written consent. Plasma lipid profile, Cardiac Risk Ratio, Atherogenic index of plasma and Atherogenic Coefficient were estimated. Aged matched non-diabetic subjects and type 2 diabetic patients without renal complications served as normal controls and diabetic controls respectively.*
Results: *Levels of FPG, TC, TAG, HDLC, LDLC, VLDLC, CRR, AIP and AC were significantly elevated in patients of diabetic nephropathy.*
Conclusion: *Patients of diabetic nephropathy undergoing regular haemodialysis must be screened frequently for cardiovascular complications.*
Key Words: *Diabetic Nephropathy. Haemodialysis, Cardiac Risk Markers*

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I. Introduction

Diabetes Mellitus (DM) is a chronic metabolic complication involving nutrient metabolism in general and glucose metabolism in particular resulting in persistent hyperglycaemia and glucosuria.[1] Further this disease involves derangement in lipid turnover leading to dyslipidaemia.[2] The persistent hyperglycaemia and the DM induced dyslipidaemia are the root cause for many life threatening diabetic complications including micro and macro vascular complications.[3]

Nephropathy is one of the serious diabetic complication which makes the life miserable for a diabetic patient whose kidneys normal function is much affected and the patient needs frequent haemodialysis to maintain vascular fluid normalcy as well as to thrive-on.[4]

Haemodialysis is generally aimed to correct the altered blood crystalloid substances as well as to remove the accumulated metabolic nitrogenous waste products, but it rarely corrects the vascular lipid levels which tends to alter in a diabetic patient due to underlying dyslipidaemia, thus driving the diabetic nephropathic (DN) patients to dyslipidaemia induced cardio-vascular complications.[5] Though raised levels of VLDL, LDL and triacylglycerols have been agreed as the risk factors of CVD but the significance of cardiac risk markers - Cardiac Risk Ratio (CRR), Atherogenic Index of Plasma (AIP) and Atherogenic Coefficient (AC) in DN patients have not been established.

Hence a study was undertaken to assess the plasma lipid profile parameters as well as the cardio-vascular risk factor in DN patients undergoing haemodialysis.[6]

II. Materials And Methods

The present Analytical cross-sectional study was carried-out during January-April 2019 by Department of Medicine, Tagore Medical College, Rathinamangalam, Melakottaiyur, Chennai, Tamil Nadu. A total number of 150 subjects including normal control subjects (n=50), control diabetic subjects (n=50) and diabetic with renal complications (n=50) were included in the present study. The type-2 diabetes mellitus patients, in the age

group of 30-60 years and are without any diagnosed diabetic complications (as screened by expert clinical examination) attending medical outpatient department of Tagore Medical College and its affiliated hospitals were randomly selected for the present study and were employed as control diabetic subjects (group-2). The diabetic subjects in the age group of 30-60 years with diagnosed renal complications and are undergoing routine haemodialysis (biweekly) at Tagore Medical College and its affiliated hospitals were taken as DN patients (Group-3). The age- matched normal control subjects were taken from the employees of Tagore Medical College and its affiliated hospitals (group-1). A fasting heparinised blood sample (4-6 ml) was collected from normal control subjects (group-1), control diabetic subjects (group-2) and from the DN patients (Group-3) after obtaining an informed consent from each one of them.

The blood samples were centrifuged at 3000 rpm for 6-8 mins and the separated clear plasma was employed for the estimation of glucose, total cholesterol, triacylglycerols (TAG), and HDL-cholesterol levels. Using the data VLDL cholesterol (VLDLC), LDL-cholesterol (LDLC) levels as well as the cardio-vascular risk indicators Atherogenic Coefficient (AC), Atherogenic Index of Plasma (AIP) and Cardiac Risk Ratio (CRR) were evaluated using the following standard relations.

- VLDLC = (TAG/5)
- LDLC = (TC- HDLC – VLDLC)
- CRR = (TC/HDLC)
- AIP = log (TAG/HDLC)
- AC = (TC-HDLC/HDLC)

III. Results

A total number of 150 subjects were involved in the present study including 50 in group-1, 50 in group-2 and 50 in group-3 subjects Results obtained in the present study are depicted in table-1 and table-2. Table-1 narrates the plasma levels of glucose (Fasting plasma glucose), total cholesterol (TC), triacylglycerol (TAG), HDL-cholesterol (HDLC), LDL-cholesterol (LDLC) and VLDL-cholesterol (VLDLC) in group-1, group-2 and group-3. It is evident from the table that the levels of FPG, TC, TAG, HDLC, LDLC and VLDLC are significantly elevated in group-2 patients as compared to group-1, whereas except FPG all other parameters are significantly increased in group-3 as compared to group-2 patients.

	FPG (mg/dl)	TC (mg/dl)	TAG (mg/dl)	HDLC (mg/dl)	LDLC (mg/dl)	VLDLC (mg/dl)
Group 1 (50)	88.27± 13.30	168.38± 22.25	98.60± 10.25	59.92± 9.50	91.31± 46.39	20.92± 6.30
Group 2(50)	152.31± 21.80***	216.20± 26.50***	218.80± 36.60***	39.90± 16.92***	98.62± 39.25**	44.06± 11.38***
Group 3 (50)	216.0± 27.0	132.62± 18.50***	132.71± 18.30***	24.94± 11.50***	83.25± 9.30**	27.54± 8.98***

Table 1. Plasma Levels of Fasting Plasma Glucose (FPG), Total Cholesterol (TC), Triacylglycerols (TAG), HDL-Cholesterol (HDLC), VLDL Cholesterol (VLDLC), and LDL-Cholesterol (LDLC)

Note

1. **The values expressed as their Mean±SD.**
2. **The number in parentheses indicates the number of subjects.**
3. **Probability * p>0.05, **p>0.01 and ***p>0.001.**

	CRR	AIP	AC
Group 1 (50)	2.81±0.72	1.66±0.15	1.82±0.18
Group 2 (50)	6.27±1.98***	6.21±1.65***	5.27±1.98**
Group 3 (50)	6.32±2.02	6.47±1.98	5.32±1.95

Table 2. Cardiac Risk Ratio (CRR), Atherogenic Index of Plasma (AIP) and Atherogenic Coefficient (AC) in Group 1, Group 2 as Well as in Group 3

Note

1. **The values expressed as their Mean ± SD.**
2. **The number in parentheses indicates the number of subjects.**
3. **Probability * p>0.05, **p>0.01 and ***p>0.001.**

Table-2 gives the levels of CRR, AIP and AC in group-1, group-2 and group-3. It is clear from the table that all the three calculated parameters are significantly elevated in group-2 and group-3 as compared to group-1 suggesting both group-2 and group-3 patients are prone to cardio-vascular risk threat though they are undergoing regular haemodialysis (constant clinical supervision).

IV. Discussion

DM is a multi-systemic abnormality characterised by increased blood glucose levels (hyperglycaemia), increased blood lipid levels (hyperlipidaemia) with a prevalence to develop micro and macro vascular complications,[7] hence the diabetic patients are more prone to cardiovascular diseases. The more relevant pre-disposing factor of DM induced vascular complications is dyslipidaemia, an alteration in the composition and concentrations of lipid levels in the body.[8] The basic components of body lipids apart from free fatty acids are TAG, cholesterol and phospholipids. As the metabolism of triacylglycerols and cholesterol is much affected in diabetic condition, due to insufficient amount or insufficient functioning of hormone insulin and also due to more availability of precursor substances like Acetyl CoA, fatty acids and glycerol-phosphate. Resulting in elevated formation of these basic lipid components leading to dyslipidaemia, which further results in cardio vascular complications.[9]

Further DM is considered as a chronic inflammatory disease and normally inflammatory conditions trigger the release of cell signalling compounds like cytokines, interleukins, tissue necrotic factors and others causing alterations in systemic lipid metabolism and lipid turnover through stimulating SREBP target genes as well as by of-regulation HMG CoA educates gene. This leads to an increase in the systemic synthesis of lipids including cholesterol which is need of inflammatory state for the extra lipid requirement. The elevation observed in cardiovascular risk indicators in group-2 and group-3 patients as observed in the present study (table 3) indicates these patients are more vulnerable group for the development of cardiovascular complications. Though the significance of decreased HDLC in predicting the cardiovascular risk the importance of raised plasma TAG levels as cardiovascular risk marker cannot be ignored. The development of cardiovascular complications, including atherosclerosis, is a multi-factorial process and the raised plasma lipid levels as well as dyslipidaemia are the major key factors.[10]

The two principle lipid constituents, the triacylglycerols and the cholesterol that make up the lipoproteins salient lipid transporting particles in humans. The very low density lipoproteins (VLDL) mainly transport endogenous or liver synthesized TAG whereas the cholesterol is being transported by low density lipoproteins (LDL) and High density lipoproteins (HDL).[11] The development of cardiovascular disease is generally predicted by cardiovascular risk indicators and the principally employed risk indicators are cardiac risk ratio (CRR), atherogenic index of plasma (AIP) and atherogenic coefficient (AC). The results obtained in the present study in group-2 and group-3 patients (Table 3 and 5) indicates that risk indicators CRR, AIP and AC are significantly elevated in these patients proving that these patients are more susceptible for cardiovascular complications and specific remedial steps are necessary in considering their treatment.[12]

It is further clear by the results depicted in table-1 that the plasma lipid parameters are significantly lowered in group-3 patients as compared to group-2 patients falsely suggesting that the diabetes induced dyslipidaemia in under control, but this may be due to regular haemodialysis which might have cleared many of the lipogenic precursors from the system. It is clear by the results of the present study shown in table-3 that the DN patients (group-3) are under great cardiovascular risk as indicated by the significant elevations seen in all the cardiac risk indicators (refer table-3).[13]

V. Conclusion

In DN patients, plasma lipid profile parameters do not throw much light on the prediction of cardiovascular complications. In these patients, cardiac risk markers are better predictors of cardiac risk. Hence, the DN patients undergoing regular haemodialysis must be screened frequently for their plasma cardiac risk indicators in order to control the development of cardiovascular complications

References

[1]. Johansen JS, Jensen BV, Roslind A, Nielsen D, Price PA: Serum YKL-40, a new prognostic biomarker in cancer patients? Cancer Epidemiol Biomarkers Prev.2006;15:194 –202.
[2]. Recklies AD, White C, Ling H: The chitinase 3-like protein human cartilage glycoprotein 39 (HC-gp39) stimulates proliferation of human connective tissue cells and activates both extracellular signal-regulated kinase-and protein kinase B-mediated signallingpathways. Biochem J.2002;365:119 –126.
[3]. Jun Ho Le, Sang Soo Kim , In Joo Kim, Sang HeonSong.Clinical implication of plasma and urine YKL-40, as a proinflammatory biomarker, on early stage of nephropathy in type 2 diabeticpatients.Journal of Diabetes and Its Complications.2012;26:308-312.
[4]. Anders R. Nielsen, Christian Erikstrup, ,Julia S. Johansen,Rikke Krogh-Madsen,SarahTaudorfet.al.Plasma YKL-40 .A BMI-Independent Marker of Type 2 Diabetes.Diabetes .2008;57: 3078-3082.
[5]. A. K., Omerovic, E.,&Vestergaard, H.YKL-40 levels are independently associated with albuminuria in type 2 diabetes. Cardiovascular Diabetology.2011; 10 (54):1-6.
[6]. ZacharyT.Bloomgarden. Blood pressure and diabetic nephropathy. Diabetes care. 2010; 33(3):e30-e35.
[7]. Matheson, A., Willcox, M. D.,Flanagan, J., & Walsh, B. J. Urinary biomarkers involved in type 2 diabetes: a review. Diabetes/Metabolism Research and Reviews.2010;26:150–171.
[8]. Deckert T, Feldt-Rasmussen B, Borch-Johnsen K, Jensen T, KofoedEnevoldsen A: Albuminuria reflects widespread vascular damage. The Steno hypothesis. Diabetologia.1989;32:219-226.
[9]. Rathcke CN, Vestergaard H: YKL-40, a new inflammatory marker with relation to insulin resistance and with a role in endothelial dysfunction and atherosclerosis. Inflamm Res.2006;55:221-227.

[10]. Thomsen SB, Rathcke CN, Zerahn B, Vestergaard H: Increased levels of the calcification marker matrix Gla Protein and the inflammatory markers YKL-40 and CRP in patients with type 2 diabetes and ischemic heart disease. CardiovascDiabetol.2010;9:81-86.
[11]. Yasuda T, Kaneto H, Katakami N, Kuroda A, Matsuoka TA, Yamasaki Y, MatsuhisaM, Shimomura I: YKL-40, a new biomarker of endothelial dysfunction, is independently associated with albuminuria in type 2 diabetic patients. Diabetes Res Clin Pract.2011;91:e50-e52.
[12]. Eknoyan G, Hostetter T, BakrisGL, et al. Proteinuria and other markers of chronic kidney disease: a position statement of the National Kidney Foundation and the National Institute of Diabetes and Digestive and Kidney Diseases. Am J Kidney Dis.2003; 42:617-622.
[13]. Rathcke, C. N., Raymond,I., Kistorp, C., Hildebrandt, P., Faber, J., &Vestergaard. Low grade inflammation as measured by levels of YKL-40: association with an increased overall and cardiovascular mortality rate in an elderly population. International Journal of Cardiology.2010;143:35-42.

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