Plasma Lipid Profile and Cardiac Risk Markers in Diabetic Nephropathy

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ABSTRACT

BACKGROUND
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.

METHODS
Patients of type 2 diabetes suffering from diabetic nephropathy undergoing haemodialysis at Subbaiah Institute of Medical Sciences, Shivamogga, 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.

CONCLUSIONS
Patients of diabetic nephropathy undergoing regular haemodialysis must be screened frequently for cardiovascular complications.

KEY WORDS
Diabetic Nephropathy, Haemodialysis, Cardiac Risk Markers
BACKGROUND

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.[3,4] 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. 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. 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.

METHODS

The present Analytical cross-sectional study was carried out during January-April 2019 jointly by Dept. of Research and Development, Dept. of Medicine and Dept. of Diabetology, Subbaiah Institute of Medical Sciences, Purle, Shivamogga. 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 Subbaiah Institute of Medical Sciences, Purle Shivamogga 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 the Nephrology Unit of Subbaiah Institute of Medical Sciences and its affiliated hospitals were taken as DN patients (Group-3). The age- matched normal control subjects were taken from the employees of Subbaiah Institute of Medical Sciences 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,[5] total cholesterol, triacylglycerols (TAG),[6] and HDL-cholesterol[7,8] 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.[9-13]

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

Statistical Analysis

The results were expressed as their Mean ± SD and the statistical significance was calculated using GraphPad InStat (Version 3.10) by ANOVA.

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.

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

<table>
<thead>
<tr>
<th>Group</th>
<th>FPG (mg/dl)</th>
<th>TC (mg/dl)</th>
<th>TAG (mg/dl)</th>
<th>HDLC (mg/dl)</th>
<th>LDLC (mg/dl)</th>
<th>VLDLC (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (50)</td>
<td>98.27 ± 13.01</td>
<td>168.28 ± 22.25</td>
<td>98.60 ± 10.25</td>
<td>59.92 ± 9.50</td>
<td>91.31 ± 46.29</td>
<td>20.92 ± 6.20</td>
</tr>
<tr>
<td>Group 2 (50)</td>
<td>152.31 ± 21.80***</td>
<td>216.20 ± 26.50***</td>
<td>218.04 ± 36.60***</td>
<td>39.90 ± 16.92***</td>
<td>98.62 ± 39.25***</td>
<td>44.06 ± 11.33***</td>
</tr>
<tr>
<td>Group 3 (50)</td>
<td>216.0 ± 27.0</td>
<td>132.62 ± 18.50***</td>
<td>132.71 ± 18.30***</td>
<td>24.94 ± 11.50***</td>
<td>83.25 ± 9.30**</td>
<td>27.54 ± 8.99***</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Group</th>
<th>CRR</th>
<th>AIP</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (50)</td>
<td>2.81±0.72</td>
<td>1.66±0.15</td>
<td>1.82±0.18</td>
</tr>
<tr>
<td>Group 2 (50)</td>
<td>6.27±1.98***</td>
<td>6.21±1.65***</td>
<td>5.27±1.98***</td>
</tr>
<tr>
<td>Group 3 (50)</td>
<td>6.32±2.02</td>
<td>6.47±1.98</td>
<td>5.24±1.95</td>
</tr>
</tbody>
</table>

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 complications.
The present study in 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.

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).

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.

The authors thank the authorities of Subbaiah Institute of Medical Sciences and its affiliated hospitals for their help and encouragement.

REFERENCES


