INTRODUCTION

The present era has the most diabetogenic environment seen so far in the human history.¹ From the Indian point of view; there has been an alarming rise in the prevalence of diabetes, which has gone beyond epidemic form to a pandemic one. It was estimated to be 40.9 million in the year 2007 and is expected to increase to 69.9 million by the year 2025.² India presently has the largest number of diabetics and is being called the diabetic capital of the world. It is estimated that very soon every fifth person with diabetes will be an Indian. Diabetic nephropathy (DN) is a major contributor to chronic kidney diseases globally as well as in India and is associated with increased cardiovascular risk. The aim of this study is to estimate HbA₁c, Fasting Insulin, total lipid profile, renal parameters and anthropometric parameters in assessing the most common complications of Diabetic Nephropathy. Two hundred fifty type 2 diabetes mellitus and non-diabetes subjects were studied for their anthropometric and biochemical parameters. Independent paired t-test was used to compare mean differences between parameters and p-value < 0.05 was considered significant. Diabetic patients had higher BMI, WHR and higher insulin levels compared to non-diabetics. Significant relation was observed between HbA₁c and HDL-C in diabetic patients. Higher values of fasting insulin, HbA₁c, lipid profile with anthropometric measurements and other biochemical parameters were significantly associated with commonest conflict of diabetic nephropathy. It further predicts CVD mortality in patients with diabetic nephropathy. Early screening for incipient diabetic nephropathy and aggressive management of these risk factors is important in optimizing the renal outcome of patients with diabetes mellitus. These results indicate that the risk of developing diabetes is certainly higher in non-diabetes subjects.

Keywords: Type 2 diabetes, Diabetic Nephropathy, Fasting Insulin, HbA₁c.

Raja Reddy P¹*, Shashidhar KN², Karthiyanee Kuttay³ and Lakshmaiah V⁴
¹Assistant professor, Department of Physiology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India
²Professor, Department of Bio-chemistry, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India
³Professor, Department of Physiology, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India
⁴Professor, Department of Medicine, Sri Devaraj Urs Medical College, Tamaka, Kolar, Karnataka, India

ABSTRACT

Diabetic nephropathy (DN) is a major contributor to chronic kidney diseases globally as well as in India and is associated with increased cardiovascular risk. The aim of this study is to estimate HbA₁c, Fasting Insulin, total lipid profile, renal parameters and anthropometric parameters in assessing the most common complications of Diabetic Nephropathy. Two hundred fifty type 2 diabetes mellitus and non-diabetes subjects were studied for their anthropometric and biochemical parameters. Independent paired t-test was used to compare mean differences between parameters and p-value < 0.05 was considered significant. Diabetic patients had higher BMI, WHR and higher insulin levels compared to non-diabetics. Significant relation was observed between HbA₁c and HDL-C in diabetic patients. Higher values of fasting insulin, HbA₁c, lipid profile with anthropometric measurements and other biochemical parameters were significantly associated with commonest conflict of diabetic nephropathy. It further predicts CVD mortality in patients with diabetic nephropathy. Early screening for incipient diabetic nephropathy and aggressive management of these risk factors is important in optimizing the renal outcome of patients with diabetes mellitus. These results indicate that the risk of developing diabetes is certainly higher in non-diabetes subjects.

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RESULTS
The observed mean BMI was 25.64 kg/m² for diabetes and 24.57 kg/m² for non-diabetes. The mean WHR was 0.95 for diabetes and 0.96 for non-diabetes and was not statistically significant (p = 0.113). The mean SBP in diabetes was 126.20 mmHg and in non-diabetes 123.06 mmHg (Table 1). DBP was 79.56 mmHg in diabetes and in non-diabetes 80.02 mmHg. Fasting blood glucose (FBG) was 158 mg/dl in diabetes and 85 mg/dl in non-diabetes and statistically it was significant (p < 0.000) and HbA1c was 9.43 % in diabetes and non-diabetes 6.10 % which is statistically significant (p < 0.000) With respect to the Fasting Insulin in diabetes it was 18.45 mcU/ml and in non-diabetes it was 9.90 mcU/ml with confirming that the patient was in the relaxed state. Biochemical parameters were measured after an overnight fast, and the parameters were estimated using Johnson and Johnson auto analyzer. The blood glucose estimation was done by Glucose Oxidase Peroxidase method (GOD-POD),

glycated hemoglobin (HbA1c) was estimated by HPLC, serum creatinine (SCR) was estimated by deproteinisation method, uric acid estimation by uricase method, total cholesterol (TC) was estimated by cholesterol oxidase method, triglycerides (TG) estimation is by Enzymatic colorimetric test- GPO PAP, HDL cholesterol (HDL-c) estimation was done by Direct Enzymatic colorimetric method and low density lipoprotein (LDL-c) was calculated. Spot urine albumin (UAE) was estimated by sulfo salicylic acid method. Value of HbA1c was given as percentage of total hemoglobin and values of all other parameters were given in mg/dl. Dyslipidemia was defined as per American Diabetes Association (ADA) criteria. Statistical analysis was carried out by the Student t-test by using the SPSS version 16. Independent paired t-test (2-tailed) was used to compare mean differences between parameters and p-value < 0.05 was considered significant.

Table 1: Mean ± SD of Physiological and Biochemical Parameters in type 2 Diabetes and non-diabetes Subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Diabetes (Mean ± SD)</th>
<th>Non-diabetes (Mean ± SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>23.64 ± 4.74</td>
<td>24.57 ± 4.43</td>
<td>0.010</td>
</tr>
<tr>
<td>Waist hip Ratio</td>
<td>0.95 ± 0.10</td>
<td>0.96 ± 0.14</td>
<td>0.113</td>
</tr>
<tr>
<td>Fasting blood glucose (mg/dl)</td>
<td>158.36 ± 81.13</td>
<td>85.86 ± 34.90</td>
<td>0.000*</td>
</tr>
<tr>
<td>Post prandial blood glucose (mg/dl)</td>
<td>256.47 ± 99.37</td>
<td>132.27 ± 59.43</td>
<td>0.000*</td>
</tr>
<tr>
<td>Glycosylated hemoglobin (%)</td>
<td>9.43 ± 5.15</td>
<td>6.10 ± 1.22</td>
<td>0.000*</td>
</tr>
<tr>
<td>Fasting insulin (mcU/ml)</td>
<td>18.45 ± 26.93</td>
<td>9.90 ± 11.15</td>
<td>0.000*</td>
</tr>
<tr>
<td>Systolic blood pressure (mmHg)</td>
<td>126.20 ± 14.80</td>
<td>123.06 ± 14.44</td>
<td>0.017</td>
</tr>
<tr>
<td>Diastolic blood pressure (mmHg)</td>
<td>79.56 ± 11.18</td>
<td>80.02 ± 11.48</td>
<td>0.653</td>
</tr>
</tbody>
</table>

*significant at p ≤ 0.01

Table 2: Mean ±SD of Lipid Profile in type 2 Diabetes and non-diabetes Subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Diabetes (Mean ± SD)</th>
<th>Non-diabetes (Mean ± SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>181.37 ± 104.7</td>
<td>173.60 ± 42.23</td>
<td>0.277</td>
</tr>
<tr>
<td>Triglycerides (mg/dl)</td>
<td>204.75 ± 110.96</td>
<td>164.96 ± 85.47</td>
<td>0.000*</td>
</tr>
<tr>
<td>High-density lipoproteins (mg/dl)</td>
<td>38.82 ± 27.68</td>
<td>38.15 ± 6.08</td>
<td>0.706</td>
</tr>
<tr>
<td>Low-density lipoproteins (mg/dl)</td>
<td>97.44 ± 36.73</td>
<td>108.22 ± 82.41</td>
<td>0.063</td>
</tr>
</tbody>
</table>

*Significant at p ≤ 0.01

Table 3: Renal Function Parameters for type 2 Diabetes and non-diabetes Subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Diabetes (Mean ± SD)</th>
<th>Non-diabetes (Mean ± SD)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum creatinine (mg/dl)</td>
<td>1.65 ± 10.94</td>
<td>90 ± 1.00</td>
<td>0.280</td>
</tr>
<tr>
<td>Uric acid (mg/dl)</td>
<td>4.61 ± 1.44</td>
<td>4.64 ± 1.20</td>
<td>0.802</td>
</tr>
<tr>
<td>Urine albumin excretion</td>
<td>11.81 ± 362.95</td>
<td>22.92 ± 89.08</td>
<td>0.000*</td>
</tr>
</tbody>
</table>

*significant at p ≤ 0.01

The present study was conducted in RL Jalappa hospital attached to Sri Devaraj Urs Medical College, Kolar, Karnataka, India. Randomly selected 250 type 2 diabetes and non-diabetes subjects with the age group of 30-60 years attending medicine outpatient department from March 2012 to January 2013 were included in the study. The study was approved by institutional ethical clearance committee and a written informed consent was obtained from all the participants. Patients suffering from other causes of secondary dyslipidemia, self-reported pregnancy; any chronic infectious diseases and weight loss by > 6 kg during past 6 months were excluded from the study. Weight and height were measured to the nearest 0.1 kg and 0.1 cm and Body mass index (BMI) was calculated as weight divided by height squared in meters (kg/m²). Waist circumference (WC) and Hip circumference (HC) was recorded according to Ash well et al as the smallest girth between the rib cage and the top to the lateral border of the iliac crest during the minimal respiration. Waist hip ratio (WHR) was calculated. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured in all subjects in the supine position, inflating the cuff tied at the level of heart to the left arm after

MATERIALS AND METHODS

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DISCUSSION

Individuals with type 2 diabetes mellitus (T2DM) are at high risk for developing chronic complications. In the present study mean BMI of diabetics showed higher than non-diabetics. Controversially, lower WHR was observed in diabetics than non-diabetics. These results indicate that the risk of developing diabetes is certainly higher in non-diabetics subjects. Study conducted by Wannamethee et al showed WC and BMI are equal predictors of diabetes. Similar findings were observed by Shah et al. This shows that the risk of developing diabetes is higher with WHR > 1.0, the higher systolic and lower diastolic blood pressure were observed in diabetes than non-diabetics. These results are similar to the observations by Wei-Lian Phan et al. Lower DBP helps to predict several metabolic Syndrome components in diabetes. One Component is an increase in WC, an obesity indicator, which manifests the strongest relationship between HbA1c and HDL levels, blood glucose and serum triglyceride concentrations which are characterized by high plasma insulin levels, blood glucose and serum triglyceride concentrations and more BMI and WHR. Significantly increased micro albuminuria was observed in diabetes and was associated with generalized vascular disease. We observed significant relation between HbA1c and HDL-Cholesterol in diabetic patients. Several investigators have reported significant correlations between HbA1c and lipid profiles and suggested the importance of glycemic control in normalizing dyslipidemia. Nephropathy is associated with many potentially modifiable risk factors. In estimating Diabetic nephropathy risk, AER (urinary Albumin Excretion Rate) is most important and should be done frequently but there are gains to be made in predictive precision by considering family history, smoking habits, glycemic, B.P., BMI and lipid levels. Early screening for incipient diabetic nephropathy and aggressive management of this risk factor is important in optimizing the renal outcome of patients with diabetes mellitus.

REFERENCES


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