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Research Article

Serum uric acid and lipid profile in diabetic retinopathy in rural Haryana, India

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ABSTRACT

Background: Diabetic retinopathy is associated with severe ophthalmic morbidity. Present study aimed to analyse serum uric acid (UA) and lipid profile in newly diagnosed type-II diabetes mellitus (DM) who presented with and without retinopathy.
Method: A total of 57 subjects were recruited for the present study and were divided in three groups. Sixteen type-II DM patients without retinopathy (group-I), 18 type-II DM patients with retinopathy (group-II) and 23 age and sex matched healthy controls (group-III). Five ml of fasting venous blood sample was collected under proper aseptic precautions from median cubital vein and analyzed for fasting blood sugar, HbA1c, UA, total cholesterol (TC), triglycerides (TG), high density lipoproteins (HDL) by standard enzymatic methods. Very low density lipoproteins (VLDL) and low density lipoptoteins (LDL) was calculated using Frieldwald's formula. FBS, HbA1c, UA, total cholesterol, triglycerides, HDL, LDL and VLDL levels were compared between different groups. Statistical analysis was done using SPSS software and student't' test.
Results: A statistically significant lower value of mean HDL was found in group-I and II than group-III (p=0.01 and 0.00 respectively). Mean HbA1c and mean FBS significantly correlated with UA (r=-0.45, p=0.01 and r=-0.39, p=0.02 respectively) in group-I and II. A deranged HDL profile and a significant correlation between glycemic control and HbA1cand UA were thus found in diabetic subjects (with or without retinopathy).
Conclusions: An insight into the deranged biochemical profile could assist in predicting onset of complications of diabetes.

Keywords: Diabetic retinopathy, Serum uric acid, Lipid profile

INTRODUCTION

Visual disability associated with diabetes mellitus (DM) is a significant public health problem. Diabetic retinopathy (DR) is one such visual disability which has got significant adverse effect on quality of life of these patients. Pathogenesis of DR is multifactorial and various hypotheses have been proposed. Despite the fact that this complication of DM is largely preventable, no definitive evidence has been proposed till date for its etiology.

Deranged biochemical profile of serum uric acid (UA) has been shown to play a significant role in development of various complications of DM like neuropathy and nephropathy[1], but the role of serum uric acid in diabetic retinopathy has been very controversial. Similarly high lipid levels are known to cause endothelial dysfunction due to a reduced bioavailability of nitric oxide and this endothelial dysfunction has been suggested to play a role in retinal exudates formation in DR but this role of dyslipidemia in causation is also controversial.[2] The objective of the study was to investigate level of serum

UA and lipid profile in subjects with newly diagnosed type-II DM with and without retinopathy in Rural Haryana and correlate these finding with degree of control of blood sugar as suggested by FBS and HbA1c.

METHODS

The study was conducted over a one year period from April 2013 to March 2014. Patients with newly diagnosed type-II DM without any signs of retinopathy were identified from outpatient services of department of Medicine of BPS GMC for women (group I). Patients with newly diagnosed type-II DM with retinopathy were identified from outpatient services of department of Ophthalmology (group II). Diabetic retinopathy was diagnosed after doing detailed dilated fundoscopic examination as per the standard criteria.[3] For this study further classification into proliferative and non-proliferative retinopathy was not undertaken. Age and sex matched Controls comprising of non-diabetic patients were identified from routine patients of department of Ophthalmology (group III). Subjects with hypertension, arthritis, myocardial infarction or other major systemic associations which are known to be associated with deranged uric acid level were excluded.

5 ml of fasting venous blood sample was collected under proper aseptic precautions from median cubital vein and transferred immediately to appropriate vacutainers. 1.5 ml blood was transferred to fluoride vacutainer and fasting blood sugar (FBS) assessment was done by GOD-POD method. Next 1.5 ml blood was transferred to EDTA vacutainer and HbA1c assessment was done by turbidimetric method. Rest 2 ml blood was transferred in plain vacutainer, blood was allowed to clot and serum was separated. Serum was used to assess uric acid by uricase method, total cholesterol (TC), Triglycerides (TG), high density lipoproteins (HDL) were analyzed by standard enzymatic methods and very low density lipoproteins (VLDL) and Low density lipoproteins (LDL) was calculated using Frieldwald's formula.

All biochemical analysis was done on fully autoanalyser "Cobas". Statistical analysis was done using SPSS software (version-16) and student't' test; p-value of <0.05 was considered significant.

RESULT

A total of 57 patients were included; 16 in group-I, 18 in group-II and 23 in group-III. Mean values of all parameters and p-values are given in table-1. A statistically significant difference was found in mean HbA1C and FBS in group-I vs. Group-III (p=0; p=0) and in group-II vs. group-III (p=0; p=0). The difference was not significant statistically in group-I vs. Group-II (p=0.87 and 0.90 respectively). A statistically significant difference was found in mean high density lipoprotein (HDL) value in group-I vs. Group-III (p=0.01) and in group-II vs. group-III (p=0.00); the difference was not significant statistically in group-I vs. Group-II (p=0.96).

Further analysis was undertaken to find out whether there was some significant correlation between the parameters. We found that mean HBA1C and mean FBS significantly correlated with UA (r=-0.45, p=0.01 and r=-0.39, p=0.02 respectively) in group-I and II combined (all diabetic subjects).In group-I, there was a significant association between serum UA levels and HbA1C (r=-0.45, P=0.05); this association was borderline significant in group-II (r=-0.45, P=0.05) and not statistically significant in group-III (R=-0.46,P=0.09).

Table 1: Mean value of different variables in the three groups.

Variable	Group-I	Group-II	Group-III	Comparison of means		
				Gr-I Versus Gr-II	Gr-I Versus Gr-III	Gr-II Versus Gr-III
Age (years)	63.1±2.4	61.3±3.9	52.5±8.9			
Disease duration (years)	8.7±1.6	10.7±2.9	0.00			
Sex (M:F)	10:6	10:8	12:11			
HbA1C (%)	10.2±3.2	10.0±4.0	6.2±0.9	0.87	0.00	0.00
FBS (mg/dl)	163.2±89.9	166.6±67.0	97.1±23.5	0.90	0.00	0.00
Uric acid (mg/dl)	5.1±1.5	4.4±1.9	4.7±1.6	0.26	0.36	0.68
TC (mg/dl)	155.5±40.2	153.5±47.1	168.2±34.4	0.90	0.29	0.25
TG (mg/dl)	180.6±75.1	139.7±52.8	132.8±76.6	0.07	0.06	0.75
HDL (mg/dl)	34.4±15.0	34.6±12.9	44.2±6.72	0.96	0.01	0.00
VLDL (mg/dl)	36.0±15.1	28.0±10.5	26.6±15.3	0.08	0.07	0.74
LDL (mg/dl)	85.0±30.0	90.8±37.3	97.3±3.0	0.63	0.24	0.55

FBS (fasting blood sugar), TC (total Cholesterol), TG (triglycerides), HDL (high density lipoprotein), VLDL (very low density lipoprotein), LDL (low density lipoprotein).

DISCUSSION

In the present study the level of uric acid is seen to be lower in group-II (diabetes without retinopathy) as compared to group-III (normal healthy subjects) (4.4±1.9 vs. 4.7±1.6) this difference was not statistically significant (p=0.68). Values of uric acid is seen to be on higher side in group-I (diabetes with retinopathy) as compared to group-III (normal healthy subjects) (5.1±1.5 vs 4.7±1.6) this difference too is not statistically significant (p=0.36).

Role of uric acid in subjects with type 2 diabetes with or without complication has been controversial since long. Some earlier studies have shown lower uric acid level in diabetic subjects suggesting that increased plasma glucose in diabetics imposes inhibitory action on renal reabsorption of uric acid in proximal convoluted tube of nephron leading to lower value of uric acid in diabetic subjets.[8,9] On the other hand Kodama S et al have shown significant hyperuricemia in patients with type 2 diabetes mellitus, they have suggested that uric acid play an important role in worsening the insulin resistance by inhibiting the bioavailability of nitric oxide, which is essential for insulin stimulated glucose uptake.[10] Hyperinsulinemia as a consequence of insulin resistance causes an increase in serum uric acid concentration by both inhibiting the renal uric acid secretion and retention of substrate responsible for uric acid production.[10] This leads to a vicious cycle which enhances level of uric acid in diabetic subjects. Quinones GA et al also have suggested that physiological hyperinsulinemia acutely reduces urinary uric acid and sodium excretion from the kidney in a coupled fashion.[11] Our finding is consistent with the former group of studies which states lower level of uric acid in diabetic subjects compared to healthy controls.

Our study has suggested higher level of uric acid in subjects of diabetes with retinopathy. This is consistent with the finding of Navin S et al where they have suspected the pro-oxidant role of uric acid in causation of oxidative stress leading to diabetic complication like diabetic retinopathy, though they could not clearly state that the hyperuricemia in diabetic retinopathy is either a protective response (due to its antioxidant role) or a primary cause of it (due to its pro-oxidant role).[4]

Association of dyslipidemia with diabetic retinopathy is also a subject of considerable debate. In many studies dyslipidemia has not been found to be associated with diabetic retinopathy.[12-14] While many other remarkable studies have shown statistically significant association of hypercholesterolemia and LDL-cholesterol with severity of retinal hard exudates.[15,16] In our study statistically significant difference in the lipid profile except HDL was not found in diseased (group-I & group-II) group compared to controls (group-III). When compared with group-III HDL was found to be lower in both group-I (p= 0.01) and group-II (p=0.00). It is well known fact that Low HDL is a risk factor for development of many of the complication of diabetes, this fact is further strengthened in present study.

CONCLUSION

To conclude, study suggests low level of uric acid in diabetic subjects without complication but rather higher level of uric acid in patients with diabetic retinopathy as compared to controls. Lipid profile except HDL was found to be in normal limits but HDL was found to be low in both group-I as well as group-II as compared to control (group-III). Further studies with more number of patients are needed to establish the role of elevated serum UA and low HDL in the pathogenesis of retinopathy in diabetic patients.

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