COMPARITIVE AND CORRELATION STUDY OF SERUM URIC ACID AMONG NON DIABETIC AND DIABETIC RANGE OF FASTING BLOOD GLUCOSE

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ABSTRACT

BACKGROUND: Diabetes mellitus is a group of disorders characterized by chronic hyperglycemia associated with absolute or relative deficiency of insulin secretion or its action. Diabetes causes long term dysfunction of various organs like heart, kidneys, eyes, nerves and blood vessels. The present study was designed to compare the uric acid levels between normoglycaemic, prediabetic and diabetic range of FBG and explore the correlation of fasting blood glucose (FBG) with serum uric acid (UA). MATERIALS AND METHODS: FBG and serum UA were estimated in individuals who attended Master Health Checkup at KIMS hospital (6 months). Based on FBG values the subjects were divided into 3 groups—Normoglycemic (≤110 mg/dl), Prediabetic (111-126 mg/dl) and Diabetic (>126 mg/dl) The comparison of serum UA among groups and correlation of UA with FBG in each group were tested using SPSS 19 version. RESULT: UA Mean is low in Diabetic range compared to prediabetic and normal FBG and this difference is statistically significant. FBS is positively correlated with UA in Normal group & negatively correlated in Prediabetic and Diabetic range FBG group. SUMMARY AND CONCLUSIONS: At high concentrations of FBG there is decrease in Serum UA level probably due to inhibition of uric acid reabsorption in the proximal convoluted tubule of kidney by glucose.

KEY WORDS

Diabetic, Fasting blood glucose, Non diabetic, uric acid.

INTRODUCTION

Uric acid is formed by the breakdown of purines and by direct synthesis from 5-phosphoribosyl pyrophosphate and glutamine. Several epidemiologic studies have reported that high serum levels of uric acid are strongly associated with Gout & other health conditions such as obesity, insulin resistance, metabolic syndrome, diabetes, essential hypertension and renal disease [1-5]. Several studies have shown that high level of serum uric acid is a risk factor for diabetes [6-8]. The association between plasma glucose and serum uric acid is not clear. In patients with high plasma glucose levels, the relationship between glucose and uric acid has been studied which yielded conflicting results. Some studies reported low serum uric acid levels in diabetics compared to nondiabetic subjects [9, 10]. Some studies reported high serum uric acid levels in diabetics compare with non-diabetic subjects [11]. This study is undertaken to compare the uric acid levels between normoglycaemic, prediabetic and diabetic range blood glucose levels and explore the correlation of fasting blood glucose (FBG) with serum uric acid (UA) in normal individuals and in diabetic patients.

MATERIALS AND METHODS

The study was conducted in Kamineni institute of medical sciences, Narketpally, Nalgonda (District), Telangana. Subjects for the study were screened from those patients who attended the service of the Out-Patient Department of General medicine for master health checkup. Based on FBG values the subjects were divided into 3 groups — Normoglycemic- (≤110 mg/dl, n= 500), Prediabetic -200 (111-126 mg/dl, n=200) and Diabetic range (>126 mg/dl, n = 500) .A number of other variables known to be associated with both serum uric acid and glucose concentrations were considered and excluded from the study.

Inclusion criteria:

- Normal and Diabetic Male subjects of age group 45 – 60 years (Based on fasting plasma glucose values).
- BMI between 25 – 30.

Exclusion criteria:

- Subjects with history of smoking, alcoholism, hypertension, Hyperlipidemia.
- Patients with diseases that can cause altered uricacid levels were excluded.

Sample collection:

5 ml of venous blood was drawn after an overnight fasting into a sterile disposable syringe under aseptic conditions. Samples are centrifuged at 3000 rpm for 5 mins and plasma and serum were separated within two hours of collection of blood. Care was taken to prevent hemolysis of the samples. Lipaemic and icteric samples were discarded. The following parameters were estimated: Fasting Blood Glucose by GOD – POD method on BS 380 Autoanalyzer [12]; Serum Uric acid by uricase method on BS 380 Autoanalyzer [13].

Statistical Analysis:

The statistical analysis was performed using SPSS software 19.00 version. The descriptive results are expressed as mean ± S.D, significance of difference between the patients and control group observed and assessed by using the unpaired student `t` test. The P values are expressed along with mean values and S.D. The P value < 0.05 was considered statistically significant. Pearson correlation was used to assess the correlation between different parameters in the groups analyzed. The results were represented in the form of tables and bar diagrams.

RESULTS AND DISCUSSION

Fig. 1: Comparison of means of uric acid between Normal, Prediabetic & Diabetic range of FBG

Uric acid: Mean± S.D
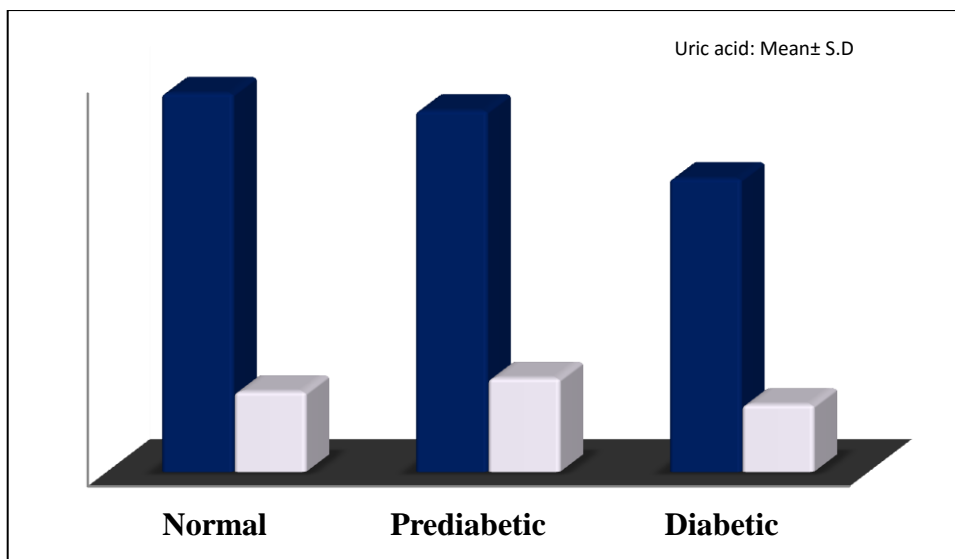
Mean UA levels are significantly low statistically in diabetic and prediabetic groups when compared to normal groups as shown in Table 1.

Table1: Showing Test of significance P among Groups

Group	P Value Normal	P Value Prediabetic	PValue Diabetic
Normal	_	0.147	0.000
Prediabetic	0.147	_	0.000
Diabetic	0.000	0.000	_

Mean UA is low in Diabetic group compared to Prediabetic & Normal Groups & this difference is statistically significant. FBS is positively correlated with UA in Normal group & negatively correlated in Prediabetic & Diabetic groups

Table 2: Showing correlation of UA with FBS among groups

Group	FBS Mean ± S.D	Uric Acid Mean ± S.D	Pearson correlation (r)
Normal	94.19±8.8	6.75±1.43	0.210
Prediabetic	115.04±6.7	6.44±1.47	- 0.282
Diabetic	189.57±59.28	5.24±1.27	-0.144

DISCUSSION

In the present study, at high concentrations of fasting blood glucose (> 126 mg/dl) there is decrease in Serum uric acid levels compared to individuals with normal fasting blood glucose (70 – 110mg/dl) and prediabetic range (110 – 126 mg/dl). Difference inmean serum uricacid levels between Normoglycemic and Diabetic group is statistically significant. It has been observed that meanserum uric acid levels are low in prediabetic range of plasma glucose compared to normal range and high compared to diabetic range fasting plasma glucose levels. This difference between normal and prediabetic range is not statistically significant whereas the difference is statistically significant between prediabetic and diabetic range of fasting plasma glucose.

Among normal FBG individuals,as FBG increases there is increase in serum UA whereas among prediabetic and diabetic range of FBG, as FBG increases there is decrease in serum UA levels. This observed relationship between serum uric acid and fasting blood glucose appeared to be independent of potential confounders like age, sex, body mass index, smoking, alcohol, hypertension and hyperlipidemia.

Previous studies examining the association between serum uric acid levels and diabetes mellitus were not consistent in their findings. Some studies reported that there is a positive association between elevated serum uric acid levels and diabetes [14-16], whereas some other study reported no positive association between serum uric acid and diabetes mellitus [17]. Also, some studies reported that serum uric acid is inversely associated with diabetes mellitus [18, 19]. The exact reason for why previous studies found a positive relation between uric acid and diabetes is not clear. Most of these studies were limited by small sample sizes, not having data on confounding factors, or were from selected populations such as industrial workers as opposed to general population samples.

A plausible mechanism for the observed results of an inverse association between increasing serum uric acid and Fasting blood glucose may be related to the inhibition of uric acid reabsorption in the proximal tubule by high glucose levels in diabetic individuals [21, 22]. We found that in the current study, an inverse association was observed between elevated serum uric acid and diabetes mellitus even after adjusting for age, sex, race-ethnicity, education, smoking, alcohol intake, BMI, hypertension, and serum total cholesterol.

SUMMARY AND CONCLUSIONS

In this study it was observed that serum UA levels were significantly lower in Diabetes mellitus Group than nondiabetic groups. Therefore, estimation of serum uric acid may serve as a potential inexpensive biomarker of alteration of glucose metabolism. Thus, serial monitoring of serum UA levels in diabetic patients can act as a surrogate marker for identifying deteriorating glucose metabolism. Large community based prospective study in Indian population is needed to establish the findings.

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