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Correlative study of uric acid, HbA1c and fasting blood sugar in newly diagnosed T2DM patients

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Abstract

Background: Incidence of type 2 diabetes mellitus is ever increasing in India. Hyperuricemia is often associated with diabetes, though a definite association is lacking. We tried to link hyperiuricemia with diabetes by establishing a correlation between uric acid and hbA1c as well as fasting blood sugar.

Method:A set of 50 cases of newly diagnosed type 2 diabetes mellitus along with age and sex match healthy controls were selected for the study.

Results: The study found a significant positive correlation between serum uric acid levels and HbA1c ($R = 0.06$ & $P < 0.005$) as well as between serum uric acid levels and FBS ($R = 0.35$ & $P < 0.005$), in newly diagnosed T2DM patient.

Conclusion: The study establishes uric acid either as a potential marker or as a risk indicator for diabetes. Regular monitoring of uric acid along with FBS and HbA1c in dT2DM patient is therefore suggested.

Key words: HbA1c, Uric acid, FBS, T2DM.

Introduction

Worldwide the prevalence of type-2 diabetes mellitus (T2DM) has been rising, and about 90 % of the diabetic population are of T2DM.[1] Of 371 million diabetic people worldwide 63 millions are Indian, i.e. every sixth diabetic is an Indian, as reported by the International Diabetic Federation (IDF) 2012 report.[2,3,4] Diabetes has been associated with several risk factors. Dyslipidemia and hyperuricemia is often associated with both micro as well as macro vascular complications of diabetes. Hyperuricemia have been linked to hypertension, hyperinsulinemia, reduced physical activity, increased body mass index (BMI), increased alcohol consumption and decreased HDL cholesterol.[6,10-13] Hyperuricemia is said to be a mediator of proinflammatory endocrine imbalance.[5] The relation between uric acid and diabetes is however controversial. Few studies showed that patients with hyperuricemia are at a significantly higher risk of progressing to type 2 diabetes and hyperuricemia is regarded as an independent risk factor for diabetes.[14-17] Few other studies revealed that there is no significant association, and yet other studies reached to a conclusion that diabetes mellitus risk is increased with low levels of serum uric acid.[18,19] So to verify the association of uric acid with diabetes we conducted this study with an aim to correlate serum uric acid level with level of HbA1c in patient with diabetes.

Methodology

The study is conducted by selection of data from a large scale Diabetes screening study on the Hindu priest population and their family. We selected 50 newly diagnosed T2DM subject of either sex as cases, and another 50 age and sex match non diabetic healthy subject as control. Only, newly diagnosed T2DM without oral hypoglycemic drugs and or Insulin are selected for the study. Alcoholics and subjects with renal disorders, hepatic disorders and those on drugs that may affect uric acid levels were excluded from the study.

Test included

Data for Fasting blood sugar (FBS), Serum creatinine, Blood urea, Serum uric acid, and HbA1c were collected. HbA1c was measured by Biorad D10 and, rest of the parameters was measured using Vitros 350 dry chemistry analyser.

Statistical analysis

The statistical analysis was done manually. The results of the study were expressed as mean ± standard deviation (SD). The statistical significance of difference between the various groups was determined by using the student's - t test, and a p value of < 0.005 is considered significant.

Result

The study shows a significant correlation ($P < 0.005$) in relation to HbA1c level, FBS and serum uric acid level between newly diagnosed diabetes patients and their healthy controls as depicted in Table I. Table I also depicts the mean values of HbA1c level, FBS and serum uric acid in both newly diagnosed T2DM patients and their healthy controls expressed as mg ± SD. The study finds a significant positive correlation between serum uric acid levels and HbA1c ($R = 0.06$ & $P < 0.005$) as well as between serum uric acid levels and FBS ($R = 0.35$ & $P < 0.005$), in newly diagnosed T2DM patient as depicted in Table 2. Figure I & II shows the scatter diagram for the correlation between Uric acid and HbA1c and uric acid and FBS respectively in newly diagnosed T2DM patient.

Discussion

The present study considered only newly diagnosed patients of T2DM as subjects for the study. We found a significant correlation of serum uric acid, HbA1c and FBS between cases and their healthy controls. HbA1c and FBS are established markers for diagnosis of diabetes, but our study also presents uric acid either as a potential marker or as a risk indicator for diabetes. Increase of uric acid in diabetes has been shown by several studies as well.[14,15] Few of the study found a "bell pattern" of uric acid with the rise in FBS, where initially there is a rise in uric acid level and beyond a certain value of FBS uric acid tend to fall again.[20-22] We however did not find the "bell pattern" relation, which can be partly because we considered only patient who are newly diagnosed to be T2DM, and they does not have an exuberantly high FBS value. Although it is not clear whether hyperuricemia is the cause or effect of diabetes, few studies have tried to explain this relation. Hyperinsulinemia could increase the activation of the hexose phosphate shunt, thereby promoting the biosynthesis and transformation of purine, thus increasing the rate of uricogenesis.[23] At the same time, insulin may increase reabsorption of uric acid from the kidneys by stimulating the urate anion transporter on the border membrane in the proximal tubular brush, the end result of which is an increase in the concentration of serumuric acid.[24]

The study found a significant positive correlation between serum uric acid and HbA1c. High HbA1c reflects that the person is diabetes for the preceding three month.[5-9] So a positive correlation between serum uric acid and HbA1c reflects either a cause or effect relationship in diabetes. We could not find suitable literature explaining the above fact. Many studies have however found similar

association between serum uric acid and HbA1c.[25] Most of the studies found a negative correlation between serum uric acid and FBS.[25] Our study however found a positive correlation between serum uric acid and FBS. Khaja Moinuddin et.al also found a positive correlation between serum uric acid and FBS upto an FBS value of 275 mg/dl, however, beyond this value they found a negative correlation.[26] Our study therefore agrees with them partially, which can be attributed to the fact that we considered only newly diagnosed diabetes patients who does not have an exuberantly high FBS value. The study therefore reflects a positive relation between uric acid and diabetes. Hyperuricemia is said to be a mediator of proinflammatory endocrine imbalance in the adipose tissue which may be one of the factors for dyslipidemia and the inflammatory process leading to atherogensis.[27] Diabetes is prone for microvascular and macrovascular complications. So the additive effect of hyperglycemia and hyperuricemia can cause early progression of diabetic complications. Hence our study suggest monitoring of serum uric acid along with blood sugar and HbA1c estimation in person at risk for developing diabetes and those living with diabetes. The study has some shortcoming as the sample size is small, only newly diagnosed T2DM were considered and follow up of study population was not possible. The study however depicts an important aspect of future in depth research on the subject.

Conclusion

The study finds a definite positive correlation between serum uric acid and both HbA1c and FBS in newly diagnosed cases of T2DM. Though a large scale study in varied population can give a better picture, but our study definitely presents uric acid as one of the risk marker for diabetes. So regular monitoring of uric acid along with HbA1c and FBS may help prevent many of the complications of diabetes.

Table I

Parameter	Patient	Control
Uric acid (mg/dl)	7.68 ± 5.9	4.9 ± 6.2
HbA1c (%)	8.1 ± 5.8	3.9 ± 6.4
FBS (mg/dl)	152.8 ± 17.9	89 ± 9.5

Table II

	Correlation coefficient	P value
Uric acid & HbA1c	0.06	< 0.005
Uric acid & FBS	0.35	< 0.005

Figure I

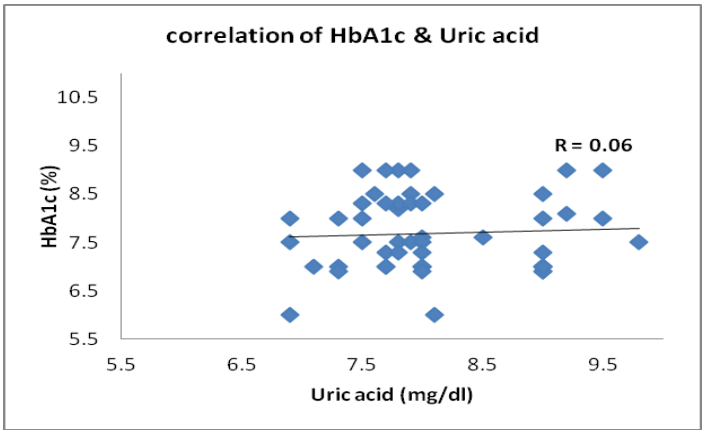
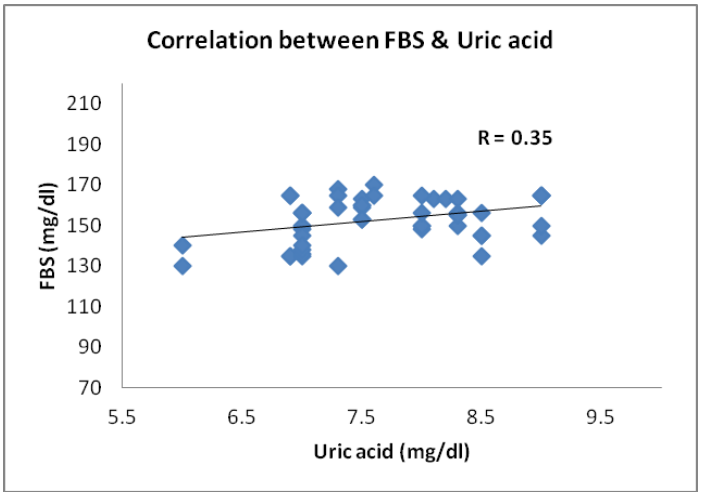


Figure II



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