

Correlation of HbA₁C with Serum Uric Acid Level in Type II Diabetic Mellitus

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Abstract: Patient's daily blood glucose tests provide only a snapshot of glycemic control at the moment testing. The HbA_{1c} test, on the other hand, gives the big picture by showing how patient blood glucose control has been over the previous period of time. HbA_{1c} tests are helpful to physician because they give an immediate indication of patient blood glucose control. Over a longer period of time, consecutive HbA_{1c} tests may provide an overall trend of diabetes control. On other hand it has been shown that serum acid is positively associated with serum glucose level in healthy subjects. Recent studies have demonstrated that the uric acid levels are higher in subjects with type 2 diabetes than in healthy controls. **Objectives:** study was conducted to find out correlation of HbA₁C with serum uric acid level. **Materials and Methods:** A cross sectional study was done and included 140 cases of type 2 DM. Serum HbA₁C level and serum uric acid levels were estimated by fully automated chemistry analyzer. **Results:** The mean HbA_{1c} level was 8.743, and standard deviation (SD) was 1.80. The mean of uric acid was 5.10, and standard deviation (SD) was 1.58. The statistical analysis using T-test found that there was significant association between HbA_{1c} and uric acid levels among study subjects ($p < 0.05$). **Conclusion:** We found significant association between HbA_{1c} and uric acid levels among the study subjects.

Keywords: Diabetes Mellitus Type; Serum Uric Acid; HbA₁C

1. Introduction

Diabetes Mellitus (DM) is an important health issue today. According to World Health Organization (WHO), the number of people with diabetes has increased from 177 million in 2010 to 326.5 million in 2017, in the age group of 20-64 years. It is expected that the number will be around 438 million by the year 2040. In 2017 alone is considered, China is the country with highest number of people with diabetes, with 114 million people suffering from DM. Next to China, India has the next highest number. India contributes 49% of the world's diabetes burden, with around 72 million in 2017. The data show that the number is expected to increase to 134 million by 2025¹.

DM is a leading cause of morbidity and mortality worldwide². About 2-3 % of the world's population is estimated to have DM³. People with DM are at higher risk for cardiovascular disease, nephropathy and retinopathy^{3,4}.

Haemoglobin A1C (HbA_{1c}) is a measure of glycosylated haemoglobin over the period 3 months due to the usual lifespan of erythrocytes of 120 days and is used to monitor control of blood glucose levels in patients with DM⁵.

Serum Uric acid is the final oxidation product of purine metabolism in the circulation. Elevated serum uric acids levels are associated with increased risk for cardiovascular disease and so the metabolic diseases such as metabolic syndrome and diabetes mellitus⁶. Patients with hyperuricemia are significantly more likely to DM⁷. Some study suggests uric acid may be associated with glycometabolic disorders, because of this association between uric acid and glucose metabolic⁸.

However, among patient with diabetes mellitus type 2, uric acid levels tend to decline with increasing blood glucose concentration⁹. The reason for the inverse relationship is

unclear. However, insulin levels are also closely related to uric acid levels¹⁰. Serum uric acid levels are directly associated with serum insulin levels in diabetic, but the mechanism for this is not clear¹¹. We aimed to determine if there is an association between HbA_{1c} and uric acid among patients with diabetes mellitus type 2 who attend a tertiary care center in Aurangabad city, Maharashtra.

Aim

Correlation of HbA₁C with serum uric acid level in type II diabetic mellitus

2. Material and Methods

The sample size of 140 patients and was cross sectional study. The study duration is of 2 years. Inclusion criteria are the selection of all cases of type 2 diabetic mellitus according to ADA criteria 2015 at the tertiary care center. Exclusion criteria are patient with chronic kidney disease, stress hyperglycaemia, uricosuric drugs, malignancy and those who do not give consent.

In each subject, demographic, age, sex, body mass index, abdominal circumference, blood pressure, and laboratory tests such as fasting blood glucose, HbA_{1c} and uric acid levels were obtained and recorded. The student's T-Test was used to determine an association between HbA_{1c} and uric acid levels. A p-value < 0.05 was considered statistically significant.

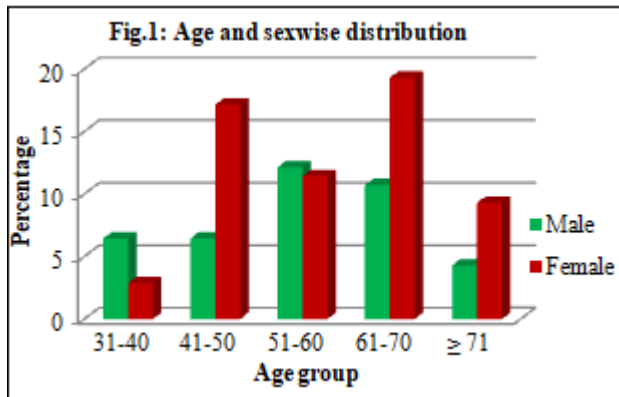
3. Results

140 cases and controls were analysed for this study. Mean age score was 58.13 and SD was 12.55.

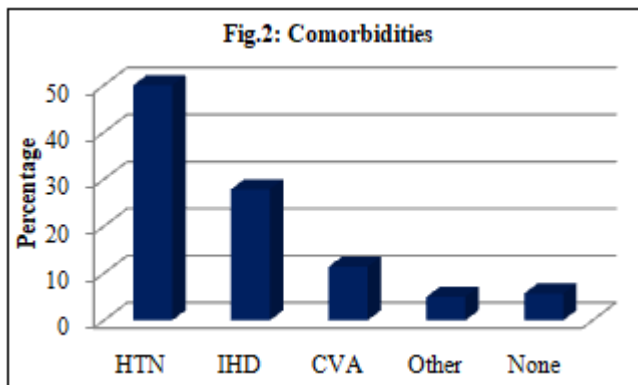
Table 1: Age wise distribution of study population

Age (in years)	Male	Female	Total
31-40	09 (6.43%)	04 (2.86%)	13 (9.29%)
41-50	09 (6.43%)	24 (17.14%)	33 (23.57%)
51-60	17 (12.14%)	16 (11.43%)	33 (23.57%)
61-70	15 (10.71%)	27 (19.29%)	42 (30.00%)
≥ 71	06 (4.29%)	13 (9.29%)	19 (13.57%)
Total	56 (40%)	84 (60%)	140

Maximum cases were in age group of 61-70 years constitute 42 (30 %) followed by 41-50 years and 51-60 years age group belongs 33 (23.57%) samples, > 71 yrs. having 19(13.57%) samples (Table.1).



In study females were 84 (60 %) and males were 56 (40%) of total population.



In study comorbidity such as hypertension 70(50%), IHD 39(27.86%) and CVA 16 (11.43%) was seen. The mean duration of diabetes mellitus was 5.65 years found in the study.

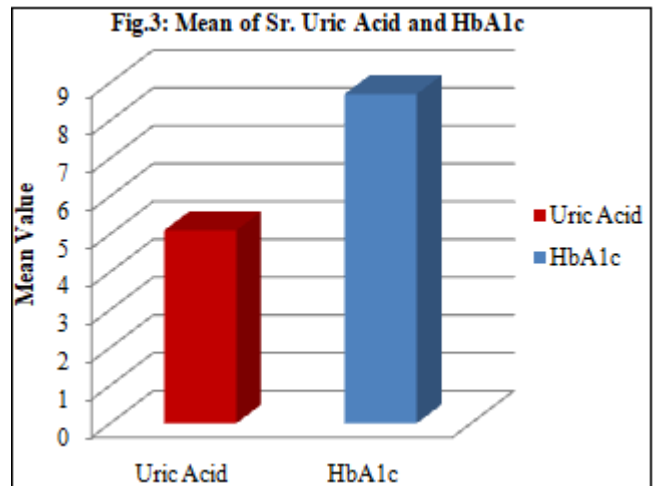
The mean fasting blood sugar level of diabetes mellitus of cases was 165.38 mg/dl that of postprandial blood sugar level was 242.73 mg/dl. The mean serum uric acid level in type 2 diabetes mellitus of cases was 5.10.

Table 2: Age and laboratory result among study (n = 140)

	Min	Max	Mean	SD
Age	32	95	58.13	12.55
Uric Acid	3.6	7.7	5.10	1.0
HbA1c	6.5	12.5	8.743	1.8

The mean (range) HbA1c level was 8.7 (6.5-12.5 %). We found significant association between HbA1c and uric acid levels among the study subjects. We used the statistical

analysis and found that there was significant correlation at type 2 diabetes mellitus patients (p< 0.05).



4. Discussion

The need for early indicators of diabetic complications is essential to prevent late complications and their detrimental / deleterious effects. There is need for sensitive serum markers that are associated with diabetes and its complications. Estimation of these parameters helps in early intervention, thereby delaying / reverting the chronic complications of diabetes in the early stages.

Elevated serum uric acid level can result from no. of factors including both acute and chronic causes. Acute causes of hyperuricemia include the intake of large amount of alcohol, tumour lysis syndrome (a complication of cancer chemotherapy) and a diet that is high in purines or proteins. Alternatively, chronic hyperuricemia can result from conditions that cause a reduction in the glomerular filtration rate, a decrease in the excretion of uric acid or an increase in overall tubular absorption.

Several mechanism have been proposed on how uric acid is elevated, Rosolowsky showed increased serum uric acid with decreasing renal function¹² and defect in URATI transporter which is responsible for urate reabsorption from Kidney¹³. Elevated levels of uric acid have been shown to be an independent marker in many conditions like hypertension¹⁹, DM, stroke¹⁴, cardiovascular disease¹⁵ and renal disease. It remains unclear whether an elevated uric acid concentration contributes to the development of these conditions or whether it is a consequences of these conditions.

Over the years, the association between uric acid levels and glucose metabolism has been a hot research topic. A growing number of studies have indicated that there is a bell fit between uric acids and glucose concentrations. Many previous studies have linked uric acid to type 2 diabetes mellitus, but studies linking uric acids to HbA1c are scarce. Some studies have observed an increase in Uric acid levels in type 2 diabetes mellitus and our study found that there was no association between HbA1c and uric acid level in the subjects.

In the research by Yuliang Cui et al.⁵ that is an inverse correlation between uric acid and HbA1c, which is dependent on hyperinsulinemia in patients with newly diagnosed with type 2 diabetes. Some studies have found that serum uric acid levels are inversely correlated with blood glucose concentration in type 2 diabetes mellitus patients. However, until now, it has been unclear as to why this relationship exists and what factors influence this relationship.

High insulin levels may be important factor affecting the correlation between the uric acid and HbA1c, the same with Fengjiang Wei et al.¹¹, they found that serum uric acid level is inversely associated with HbA1c in Type 2 Diabetes Mellitus patients and according to the research by Walid G Babkir et al.¹⁶ show that patients with type 2 diabetes mellitus serum uric acid level has an adverse effect on glycemic control, but the research by V. Pavithra¹⁷ etc. has strongly established an association between uric acid and HbA1c thereby linking uric acid, the end product of purine metabolism to DM.

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