

**STUDY OF SERUM URIC ACID IN TYPE 2 MALE DIABETES MELLITUS PATIENT
IN A TERTIARY CARE HOSPITAL**R Yeasmin¹, MA Muttalib², N Sultana³, MJH Karami⁴, NH Bhuiyan⁵, A Nesa⁶

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ABSTRACT

Type 2 diabetes mellitus is a chronic disease characterized by relative or absolute deficiency of insulin, resulting in glucose intolerance. The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Hyperuricemia is probably associated with glucose intolerance due to various mechanisms, however, the most important is the association between insulin and renal resistance to absorption of urates. 1/2, The aim of the study is to examine the serum uric acid level in Type 2 male Diabetic patients and to assess the association of serum uric acid level with fasting blood sugar (FBS), blood sugar two hours after breakfast (2HAB), glycated hemoglobin (HbA1C), duration of diabetes, and exercise time. This case-control study was conducted in Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorders (BIRDEM), out-patient department (OPD) during the period of June 2016 to January 2017. It included 110 Subjects of type 2 male diabetic patients as cases. In addition 100 age and sex matched non-diabetic male subjects were randomly selected as control Results: The mean serum uric acid of all cases of Type 2 DM was 8.39 ± 2.61 mg/dl which was significantly higher than controls (5.14 ± 0.84 mg/dl). The study found that there were significant differences in mean age, duration of diabetes, exercise time, waist-hip ratio, systolic blood pressure (SBP), and diastolic blood pressure (DBP) within cases and controls but no significant differences of mean BMI was found. This study also found that significant differences in mean of FBS, ABF and HbA1C between case and controls but there was no significant differences of mean TG, Cholesterol, HDL and LDL. The serum uric acid was not significantly correlated with FBS, 2HAB and HbA1C but significantly correlated with exercise time where $r = .340$. Chi square test was carried out to measure the association between HbA1C and Uric acid category. But had no significant association Conclusion: Our study findings conclude that serum uric acid is not significantly correlated with FBS, 2HAB and HbA1C, but significantly correlated with age, duration of DM, and exercise time.

Key words: FBS, glycated haemoglobin, hyperglycemia, hyperuricaemia, TG.

Introduction

The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Over the past 30 years, the status of diabetes has changed from being considered as a mild disorder of the elderly to one of the major causes of morbidity and mortality affecting the youth and middle aged people.¹ It has been estimated that the global burden of Type 2 diabetes mellitus for 2010 was 285 million people is projected to increase to 438 million in 2030.² Diabetes mellitus is a chronic disease characterized by absolute or relative deficiency of insulin, resulting in glucose intolerance.² Hyperuricemia is a condition that is significantly associated with markers of metabolic syndrome such as dyslipidemia, glucose intolerance, high blood pressure, and central obesity, which are accepted as risk factors for developing cardiovascular disease.³ Hyperuricemia is probably associated with glucose intolerance due to various mechanisms, however, the most important is the association between insulin and renal resistance to absorption of urates.^{1,2,3}

Materials And Methods

The present case control study was conducted in BIRDEM hospital, Shahbag, Dhaka, Bangladesh. It was a cross sectional study, conducted over a period of June 2016 to January 2017 on type 2 male diabetics. A total of 110 male type 2 diabetes mellitus patients were enrolled in the present study as cases. In addition 100 age and sex matched healthy male controls were randomly selected from the employee in BIRDEM. They were screened for FBS, 2HAB and without any symptoms of hyperglycemia.

Inclusion criteria:

1. Newly diagnosed male type 2 diabetes mellitus patients. 2. Cases of diabetes (male) who were already on treatment.

Exclusion criteria:

1. Patients with creatinine >1.4mg/dl. 2. Patients with stress hyperglycemia. 3. Patients with uricosuric drugs. 4. Patients with malignancy. 5. Patients taking long time salicylates.

Procedures:

Detailed patient information was collected in preformed questionere containing patient's name, age, sex, diet (fast food habit), clinical history, family history of diabetes. All the patients and controls were asked to attend BIRDEM OPD with overnight fasting. 6 ml venous blood was collected from each subject. Out of that 2 ml blood sample was collected in fluoride vaccutainer for estimation of fasting blood sugar and 4 ml blood was collected in plain vaccutainer for estimation of serum uric acid and serum lipid profile. Two hours after breakfast again 2 ml of venous blood was collected for estimation of blood sugar from each subject of type 2 diabetes mellitus and controls. Estimation of blood sugar was done by enzymatic method^{R4}. Estimation was done by Tulip corolyzer fully autoanalyzer for uric acid and lipid profile estimation.^{8,9} HbA1c was measured by HPLC method.¹⁰ Statistical Method-Student's t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) and chi square test to analyze the data having ordinal variables.

Results

Table-1: Distributions of study population according to age

Age (years)	Case (Type2DM) N =110	Control(Healthy Individual) N =100
30-40	16	40
41-50	39	33
51-60	36	21
61-70	19	6
Total	110	100

Table 1 shows the distributions of study population according to age. It indicates that 41-50 years study subjects were highest in number among cases (39%) But among controls 30-40 years age group was highest (40%).

Table 2: Comparison of different characteristics and biochemical parameters of study subjects

variables	Case(Type-2 DM) Mean±SD	Control(Healthy individual) Mean±SD	P value
Age (years)	51.83±9.911	44.81±9.66	.000
Duration of diabetes (years)	6.87±5.54	00	.000
Body mass index (kg/m ²)	25.43±3.19	24.96±3.02	.274
Exercise time (hours)	1.94±.831	1.12±.327	.000
Waist (cm)	94±7.06	90.95±9.51	
Hip (cm)	102±6.19	98.48±8.24	
Waist: Hip	.92±.03	.91±.03	.035
Systolic BP (mm of Hg)	128±16.75	122±11.28	.002
Diastolic BP (mm of Hg)	85±8.41	81±6.18	.000
Fasting blood sugar (mmol/l)	8.19±2.48	5.91±1.13	<.05
2hs. after breakfast (2HAB) (mmol/l)	11.29±3.47	9.19±1.95	<.05
HbA1C (mg%)	7.96±6.04	5.93±1.01	<.05
TG (mg%)	189.72±111.36	200±104.49	.468
Cholesterol (mg%)	179±43	183±42.25	.495
HDL-C (mg%)	38.38±13.77	38.14±5.52	.870
LDL-C (mg%)	102.10±35.79	110±33.23	.088
Uric acid (mg%)	8.39 ±2.61	5.14 ±.84	.000

Table 2 shows that there were significant differences in mean of age, duration of DM, exercise time, waist hip ratio, systolic blood pressure and diastolic blood pressure within cases and controls. But no significant differences of mean BMI were found between cases and

controls. This table also shows that significant differences in mean of FBS, 2HAB, HbA1C and S. Uric acid between cases and controls was found. But there was no significant differences of mean TG, Cholesterol, HDL-C and LDL-C.

Table 3: Categorical distribution of serum uric acid category and HbA1C category in the study population

HbA1C category	Uric Acid Category				Total
	3.5- 6.4	6.5-9.4	9.5-12.4	12.5	
4.2-6.4	45	9	7	2	63
6.5-8.4	33	29	14	3	79
8.5-10.4	32	14	5	2	53
10.5	12	2	0	1	15

Table 3 shows that categorical distribution of serum uric acid and HbA1C in the study population. It shows that in HbA1C category (6.5-8.4) mg% was more study individuals in the category of uric acid ranges (9.5-12.5) mg%

Table 4: Correlation of uric acid with glycaemic status and duration of diabetes in study subjects

Uric acid	Duration of Diabetes	Fasting blood sugar(FBS)	2 hours after breakfast(ABF)	HbA1C	Exercise time
r = .416**	r = .063	r = .079	r = .071	r = .340**	
p = .000	p = .366	p = .303	p = .303	p = .000	

Table 4 shows the correlation of uric acid with glycaemic status and duration of DM. It shows that serum uric acid is significantly correlated with duration of DM where $r = .416$ and $p = .000$. It also shows that serum uric acid had no significant correlation with FBS, 2HAB and HbA1C. This table also shows that serum uric acid is significantly correlated with exercise time where $r = .340$.

Table 5: Different range of uric acid levels and their distributions in study subjects

Uric acid (mg/dl)	Case (Type-2DM) N=110	Control (Healthy Individual) N=100
3.5-6.4	28	94
6.5-9.4	48	6
9.5-12.4	26	0
12.5	8	0
Total	110	100

Table 5: shows the different range of uric acid levels and their distributions in study subjects. It shows that uric acid level ranges 6.5-9.4 mg/dl were high in cases (type 2 DM) whereas in controls, it was 6 mg/dl. In uric acid ranges 3.5-6.4 mg/dl control, it was 94 healthy subjects.

Table 6: Association of uric acid category with HbA1C category in overall study subjects

	HbA1C category	P value
Uric acid category	Chi-square value:19.175	.240

Chi square test was carried out to measure the association between HbA1C and Uric acid category. Table 6 indicates the overall non significant association between Uric acid and HbA1C category in the study population.

Discussion:

In this study mean serum uric acid level in cases (type -2 male diabetic patients) was 8.39 ± 2.61 mg/dl and in controls it was $5.14 \pm .84$ mg/dl. Mean serum uric acid of all cases of DM Type 2 was significantly higher than controls with p value was .0001. Sudhindra Rao M. studied mean serum uric acid level was lower in control

group (3.84 mg/dl)⁵ which higher in pre-diabetics (4.88 mg/dl) and again decreased in diabetics (3.78 mg/dl). M. Modan concluded that elevated serum uric acid is a feature of hyperinsulinaemia /insulin resistance.⁶ Our results are in consistent with Nakanishi N et al study.⁷ They found that Serum Uric Acid level is closely associated with an increased risk for hypertension. Previous studies examining the association between serum uric acid levels and diabetes mellitus were restricted to specific racial/ethnic groups and gender and were not consistent in the findings. Some studies reported that there is a positive association between elevated serum uric acid levels and diabetes⁸⁻¹³, whereas some other study reported no positive association between serum uric acid and diabetes mellitus¹⁴ Also, some studies reported that serum uric acid is inversely associated with diabetes mellitus.^{15,16} 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, including either men or women and not both, 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 diabetes mellitus may be related to the inhibition of uric acid reabsorption in the proximal tubule by high glucose levels in diabetic individuals.^{16,17-18} To clarify the independent relation between serum uric acid levels and diabetes mellitus, we decided to adjust for all potential confounders and do subgroup analysis by gender. 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 in both group. Therefore, higher uric acid levels may be a risk factor for diabetes mellitus as some researchers previously argued.⁸⁻¹³

Limitations of the study: In my study I included only male as case and in control.

Conclusion:

In summary, in a multi ethnic sample of Bangladeshi adult men, we found that significant mean differences of serum uric acid levels in type 2 male DM than in control group. Our study findings also conclude that serum uric acid is not significantly correlated with FBS, 2HAB and HbA1C and significantly correlated with age, duration of diabetes mellitus and exercise time.

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