

## The Correlation of Uric Acid Levels With Glycemic Control in Type II Diabetic Patients

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### ABSTRACT

The association between serum uric acid levels and glycemic control in diabetic patients is not fully clarified. This study aimed at investigating the association between levels of serum uric acid and glycemic control in type II diabetic patients. The study included 270 diabetic patients and 136 healthy controls, recruited from the outpatient clinic of Najran University Hospital and Najran area respectively. Uric acid, creatinine, BUN and FBS were measured by COBAS INTEGRA 400 and Roche diagnostics commercial kits. HbA1c was estimated using Nycocard HbA1c Method. Weight and height were measured using standardized scale for weight and height and then BMI was calculated. In diabetic patients, serum uric acid level was found to correlate positively with HbA1c ( $r=0.135$ ,  $p=0.026$ ). We found a statistically insignificant difference in mean creatinine concentration between the two study groups. There was a slight gender variation in mean serum uric acid level which was more evident in diabetics than healthy controls. In conclusion, serum uric acid level has an adverse effect on glycemic control in type II diabetic patients.

**Keywords:** Uric acid, Creatinine, BUN, FBS, HbA1c, BMI.

### INTRODUCTION

The association of elevated serum uric acid and increased risk of cardiovascular disease<sup>1</sup>, systemic arterial hypertension<sup>2</sup>, and chronic renal dysfunction has well been documented<sup>3</sup> in previous studies. Metabolic syndrome (which is a complexity of risk factors related to insulin resistance) is said to be similarly associated with high concentrations of serum uric acid<sup>4</sup>. Increased serum concentrations of uric acid are also associated with the development peripheral arterial disease<sup>5</sup>. The association between elevated serum uric acid concentration and the risk of development of diabetes mellitus was not well clarified. Some studies suggested that high serum uric acid is

associated with increased risk of diabetes mellitus<sup>6-11</sup>. However, other studies revealed that there is no significant association<sup>12</sup>, other studies reached to a conclusion that diabetes mellitus risk is increased with low levels of serum uric acid<sup>13,14</sup>. Furthermore, a variety of lines of evidences, both epidemiologic and clinical, have pointed to a close interrelation between hyperuricemia, hypertension, and obesity<sup>15</sup>.

The scientific background under which this study was conducted was the rarities of studies focusing on the association between the level of serum uric acid and the level of glycemic control in patients who are well known to have diabetes by taking into account fasting blood sugar (FBS) and

glycated hemoglobin (HbA<sub>1c</sub>) in relation to the level of serum uric acid in the same subjects.

## RESULTS

HbA<sub>1c</sub> percent showed a highly significant difference ( $p < 0.001$ ) between diabetic patients and the healthy controls (mean level =  $9.7 \pm 2.4$  and  $5.47 \pm 0.7$  % for diabetics and healthy control group respectively). Similarly, the fasting blood sugar concentration (FBS) showed a highly significant difference ( $p < 0.001$ ) between diabetic patients and healthy control subjects (mean =  $203.58 \pm 81.54$  mg/dl for diabetic and  $77.94 \pm 11.07$  mg/dl for control group). In diabetic patients, serum uric acid was found to have a non-significant positive correlation with HbA<sub>1c</sub> ( $r=0.135$ ,  $p=0.026$ ) and non-significant negative correlation with FBS ( $r = -0.211$ ,  $p=0.000$ ). In healthy controls there was a statistically non-significant negative correlation between uric acid and FBS ( $r=0.139$ ,  $p=0.106$ ) and a positive correlation with HbA<sub>1c</sub> ( $r=0.037$ ,  $p=0.106$ ) (table1).

As shown in table (2) , there was statistically significant difference ( $p < 0.01$ ) in the mean serum uric acid concentration between

diabetic patients and the healthy control subjects (mean=  $5.4 \pm 1.8$  mg/dl in diabetic compared to  $3.0 \pm 0.9$  mg/ dl in control group). There was a slight difference in BUN which is statistically insignificant ( $p = 0.488$ ) between the two groups (mean= $15.7 \pm 9.7$  mg/ dl in diabetic compared to  $14.8 \pm 7.8$  mg/dl in the control group). Similarly, a statistically insignificant ( $p=0.723$ ) difference in mean creatinine concentration was found (mean =  $1.0 \pm 0.8$  mg/dl in diabetic and  $0.97 \pm 0.79$  mg/dl in the control group). There was a slight gender variation in mean serum uric acid which was more evident in diabetics than healthy controls (mean= $5.34$  males and  $5.25$  in diabetic females), fig.1

## DISCUSSION

This study enrolled diabetic patients, whom were randomly selected from attendees of the outpatient clinic at Najran University hospital - Najran area in Saudi Arabia. In diabetic patients, serum uric acid level was found to correlate positively with HbA<sub>1c</sub> (table1) probably reflecting the adverse effect of the elevated serum uric acid in glycemic control, although other researchers assume that the possible mechanism for the association between increasing serum uric acid and

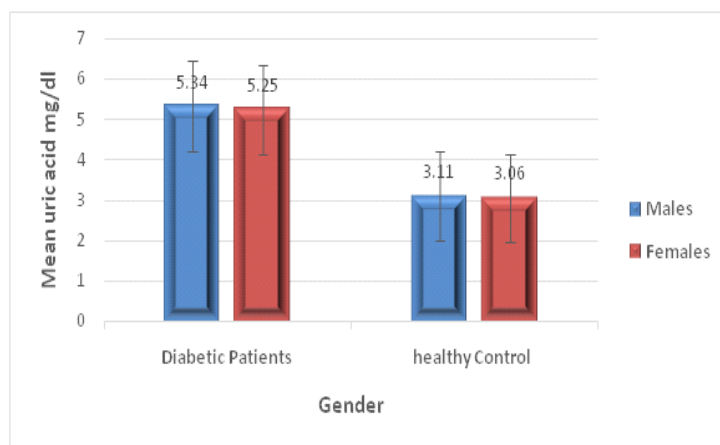
**Table 1: Mean difference in blood parameters between diabetics and controls**

NO	Blood parameter	Mean $\pm$ SD		P value
		Diabetic	Control	
1.	Uric Acid mg /dl	$5.4 \pm 1.8$	$3.0 \pm 0.9$	0.00
2.	BUN mg/dl	$15.7 \pm 9.7$	$14.8 \pm 7.8$	0.34
3.	Creatinine mg /dl	$1.0 \pm 0.8$	$0.97 \pm 0.79$	0.990
4.	HbA <sub>1c</sub> %	$9.69 \pm 2.92$	$5.48 \pm 0.687$	0.00
5.	FBS mg/dl	$203.58 \pm 81.54$	$77.94 \pm 11.07$	0.00

**Table 2: Correlation of serum uric acid with glycemic control (HbA<sub>1c</sub> & FBS) in diabetic and healthy controls**

	Diabetic patients		Healthy controls	
	Uric Acid r value	Uric Acid p value	Uric Acid r value	Uric Acid p value
HbA <sub>1c</sub>	- 0.135	0.026	0.037	0.665
FBS	- 0.211	0.000	- 0.139	0.106

uncontrolled hyperglycemia in diabetic patients may be related to the inhibition of uric acid reabsorption in the proximal tubule by high glucose levels in diabetic individuals<sup>16,17</sup>. A study conducted by Bandaru et al was designed to clarify the independent relation between serum uric acid levels and diabetes mellitus, has reached to a conclusion that there was statistically a non-significant negative correlation between uric acid and FBS and a positive correlation with HbA<sub>1c</sub><sup>18</sup> which agrees with



**Fig. 1: Gender variation in mean serum uric acid (mg/dl) in diabetic and healthy controls**

our study in which we also found that there is negative correlation between serum uric acid and FBS in the diabetic group of patients. There was slight difference in BUN values which is statistically insignificant between the diabetic group and the healthy control subjects. Similarly, statistically insignificant difference in mean creatinine concentration was found. Wang, Ji-Guang, et al<sup>19</sup> examined the relation of serum creatinine and uric acid to mortality and cardiovascular disease in older (aged  $\geq 60$  years) Chinese patients with isolated systolic hypertension (systolic/diastolic blood pressure  $\geq 160 / < 95$  mm Hg). They found that, in older Chinese patients with isolated systolic

hypertension, serum creatinine and serum uric acid were predictors of mortality.

We found that there was a slight gender variation in mean serum uric acid level which was more evident in diabetics than healthy controls (table 2). Chou, Pesus, et al in their study reached to a conclusion that the serum uric acid level was associated with insulin resistance and plasma glucose levels more strongly in females than in males [20]. In conclusion, in type II diabetic patients, serum uric acid level has an adverse effect on glycemic control. Further studies are needed to evaluate the effect of uric acid lowering drugs on the glycemic control of type 2 diabetic patients

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