
Study of Serum Uric acid Level in Diabetic Patients

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Abstract

Objective: Is to identify the state of uricemia in type 1 and 2 Diabetes Mellitus and its relation with glucose level, age of patient, and duration of disease.

Methods : The study was include 86 diabetic patients (30 had IDDM and 56 had NIDDM) with mean age 50– 15 years, and 49 individual as healthy control with mean age 46 – 12 years, serum uric acid and blood glucose level were measured on fasting state. **Results** serum uric acid level is higher in diabetic patients as compared to control, mean SD \pm (5.5 \pm 1.8 mg/dl, 4.9 \pm 0.7 mg/dl respectively) , IDDM patient had lower level mean \pm SD (4.5 \pm 1.6 mg/dl) while NIDDM patient had significantly higher level as compared to control and IDDM patients mean \pm SD (6.6 \pm 1.8 mg/dl). The study revealed that serum uric acid level had weak positive correlation with age ($r=0.2$ $p < 0.05$) of diabetic patients.

Conclusion: these results indicate alteration in serum uric acid level in diabetic patients and the state of uricemia depend on type of diabetes and glycemic state.

Key words: serum uric acid, Diabetes mellitus

Introduction

D iabetes Mellitus is a clinical syndrome characterize by hyperglycemia due to absolute or relative deficiency of insulin^[1] . Epidemiological studies in various parts of the world have provided evidence that genetic and environmental factors play a role in the etiology of D.M^[2].

The main causes of DM are unknown but obesity, racial susceptibility, hereditary factors and autoimmunity may be etiological factors.^[3]

In chronic hyperinsulinaemic state, the insulin spares sodium and uric acid from excretion by the kidney^[4].

In type 1 DM there is an absolute deficiency of insulin (IDDM) and in type 2 DM there is insulin resistance and an inability of the pancreases to compensate^[5].

Uric acid is the final breakdown products of purin metabolism^[6].

Hyperuricaemia is a result of excessive production or ineffective excretion of urate via the kidneys^[7].

Nearly all (98.8%) of serum uric acid present as monosodium urate , at the pH of plasma , urate is relatively insoluble and at level about 6.4 mg /dl the plasma is saturated and urate crystal may form and precipitate in the tissue^[8].

Hyperuricaemia (as plasma (urate) is greater than 7.2 mg /dl in men and greater than 6.0 mg /dl in women)^[9] may be the result of increased synthesis of purin, increased nucleic acid turnover and reduced rate of renal excretion of urate.^[10]

Although the kidney is not considered to be an insulin sensitive tissue , two features of syndrome(x) hypertension and Hyperuricaemia are likely to be dependent on the retention of normal insulin action on the kidney , more specifically the elevated plasma insulin concentration may enhance

renal sodium retention and decrease urinary uric acid clearance, so it is possible that normal kidney response to the compensatory hyperinsulinaemia with insulin resistance, contribute to the development of Hyperuricaemia in such patient^[11]

A number of studies have shown that Hyperuricaemia is associated with an increased incidence of coronary heart disease; it has been proposed that elevated serum uric acid levels are linked to other risk factors such as hypertension, dyslipidemia and diabetes mellitus^[12]

Aim of the study

Is to identify the state of uricemia in type 1 and 2 DM and its relation with glucose level, age of patient, and duration of disease.

Material & method

The study was conducted during Jun 2003 to Oct. 2003 in Salah Al- din at the Tikrit Teaching Hospital. Thirty patients had IDDM, fifty – six had NIDDM and fourty-nine individual, were healthy controls.

Fasting blood was aspirated and serum uric acid level measured by uricase enzymatic reaction^[13] and blood glucose were estimated by enzymatic oxidation in the presence of glucose oxidase^[14, 15]

Statistical analysis is done by using t-test, $P < 0.05$.

Results

This study included (135) individuals: Eighty – six (47.6%) of them were suffered from D.M while 49 (36.2%) were healthy control as shown in table (1).

The frequency distribution of DM in relation to the type was showed higher prevalence of IDDM in male (19.7%) as compared to female (15.1%) while in NIDDM both male and female are affected

equally as shown in table (2). Table (3) shows that serum uric acid level in diabetic patients is higher as compared to control (but not significant) mean SD ($5.5 \pm 1.8\text{mg/dl}$, $4.9 \pm 0.7\text{mg/dl}$ respectively) while, the IDDM patients have lower serum uric acid as compared to control mean \pm SD (4.5 ± 1.6 , $4.9 \pm 0.7 \text{ mg/dl}$ respectively) (but not significant) table (4), the NIDDM patients had significantly higher serum uric acid level as compared to both control and IDDM patient $P < 0.0005$, mean \pm SD

($6.5 \pm 1.8\text{mg/dl}$, $4.9 \pm 0.7 \text{ mg /dl}$ and $4.5 \pm 1.6\text{mg/dl}$ respectively) as show in table (5) and (6)

This study revealed that serum uric acid in diabetic patient had significant positive correlation with age of the patients ($r= 0.2$ $p < 0.05$, and had no significant correlation with both glucose level and duration of disease.

Tab. (1) the total number of subjects in relation to sex (normal and diabetic Patients).

Subject	M	F	Total
Normal	33	16	49
D.M	45	41	86
Total	78	57	135

Tab. (2) frequency and distribution of (DM) in relation to types of (DM)

Type of DM	Total	%	M	%	F	%
IDDM	30	34.8	17	19.7	13	15.1
NIDDM	56	65.2	28	32.5	28	32.5
Total	86	100	45	52.3	41	47.6

Tab (3).Biostatistical calculation and t-test for serum uric acid in healthy control and diabetic patients.

Subject	Serum uric acid(mg \dl)		SE	t-test
	mean	\pm SD		
Control (49)	4.9673	0.7846	0.1121	t=0.959
Total samples(86)	5.5372	1.8763	0.2023	Not sig.

Table (4). Biostatistical calculation and t-test for serum uric acid in healthy control and IDDM patients.

Subject	Serum uric acid (mg\dl)		SE	t- test
	Mean	±S.D.		
IDDM(30)	4.5933	1.6981	0.3100	t=1.79
Control(49)	4.9673	0.7846	0.1121	(NS)

Table (5).Biostatistical calculation and t-test for serum uric acid in healthy control and NIDDM patients.

Subject	Serum uric acid (mg\dl)		SE	t- test
	Mean	±S.D		
NIDDM(56)	6.5821	1.8903	0.2526	t=3.1
Control(49)	4.9673	0.7846	0.1121	P<0.005

Table (6). Biostatistical calculation and t-test for serum uric acid in IDDM and NIDDM patients.

Subject	Serum uric acid(mg\dl)		SE	t- test
	Mean	±S.D.		
IDDM(30)	4.5933	1.6981	0.3100	t = - 2.32
NIDDM(56)	6.5821	1.8903	0.2526	P<0.005

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Discussion

DM is a common metabolic disorder all over the world. DM may affect many systems and organs of the body in different pathological processes [16]

Overproduction of uric acid occurs when there is excessive cell breakdown and catabolism, excessive production and destruction of cells, or

inability to excreta the substance produced [17] A number of studies have shown that hyperuricaemia is associated with an increased incidence of cardiovascular disease; it has been proposed that elevated serum uric acid level is linked to other risk factors such as dyslipidemia and DM. [12].

Altered uric acid metabolism in DM was observed by Wasada- T, et.al 1997[18].

In this study, serum uric acid level was higher in diabetic patients as compared to control group, this variation could be due functional alteration and due to a defective metabolic control^[19], this diabetic hyperuricaemia could be dependent on the retention of normal insulin action on the kidney with decrease urinary uric acid clearance which contribute to the development of hyperuricaemia in such patients^[11]

Our IDDM patients had lower serum uric acid level as compared to control group table(4), although this difference is not significant statistically, this findings is consistent with result reported by Gonzalez, Sicilia – L – et. al^[19] who concluded that when patients with IDDM with poor glycemic control show hypouricemia with hyperuricosuria when urinary excretion of uric acid was directly correlated to glycemic.

The NIDDM patients show significantly higher serum uric acid level as compared to control group, this result is consistent with Letho S. et.al 1998^[20], they said that NIDDM patients were at increased risk of stroke and hyperuricaemia is a common finding in them, this hyperuricaemia appear to be an indirect part of the insulin resistance syndrome through its association with hyperlipidemia^[21], and higher insulin levels are associated with the component of metabolic- x- syndrome^[22].

These NIDDM patients had higher significant serum uric acid level as compared to IDDM patients, this finding was consistent with result reported by Iannello-S-et al 1998^[23] who said that hyperuricaemia are often associated with hyperinsulinaemia in NIDDM as a part of X-syndrome, in which increased break down of adenosine to urate and increased renal urate retention could explain this hyperuricaemia.^[24]

This diabetic uricemic state which was observed in study group is consistent with results reported by Masyer – C- et al 2000 and Nukanishi – N, ET. al 1999^[25,26] they said that high HbA_{1c} (poor glycemic control) had negative effect for the incidence of hyperuricaemia and as a part of significant reduction of total antioxidant capacity which could be due to that oxidative stress condition in DM with consequent reduction of serum free radical scavenging^[27,28]

The serum uric acid level in our diabetic patients has significant positive correlation with age; this observation goes with the finding reported by Amm. Diabetes Ass.^[17] Which said that serum uric acid level was increasing with age which could be related to excessive cell break down and catabolism by aging process?

Conclusion

1-IDDM had lower serum uric acid level than both control and NIDDM patients.

2-NIDDM patients had significant higher level serum uric acid than both control and IDDM patients.

3-There is alteration in uricemic state in both diabetic group.

4-There is significant positive correlation of serum uric acid with age of the diabetic patients.

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