Study of Serum Uric Acid levels in Type 2 Diabetes Mellitus without Complications

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Abstract

Background: To compare serum uric acid levels in type 2 diabetes mellitus patients with no obvious complications and healthy controls.
Methods: 50 non-diabetics as controls and 50 clinically diagnosed type 2 diabetics with no obvious complications as cases were included in the study. Serum uric acid was estimated by Uricase/POD, End point assay method. The results were analyzed by using stat fax semi auto analyzer 3300 for serum uric acid.
Results: The mean serum uric acid in type 2 diabetics is 6.48mg/dL as compared to controls which is 4.94mg/dl . The difference is significant statistically. ($p = 0.01$)
Conclusion: Hyperuricemia is significantly associated with type-2 diabetes mellitus.

Introduction

Diabetes mellitus is a clinical syndrome characterised by hyperglycaemia due to relative or absolute deficiency of insulin [1]. Diabetes is a global public health problem. In India prevalence of diabetes is 2.4% in rural and 11.6% in urban population [2]. Currently India has 40.9 million people with diabetes and the projected estimate for the year 2025 is 69.9 million people.

Oxidative stress and defects in antioxidant defense system are recognized as the causative factors for the development of major diabetic complications [1].

Hyperuricemia is a common finding in type 2 diabetes mellitus [2]. Hyperuricemia is a biochemical entity that is gaining importance as it plays a role in the development of renal and metabolic disorders [3].

Uric acid is a final oxidation product of purine catabolism. Excess serum uric acid accumulation can lead to various diseases. Thus, there are plausible mechanisms to suggest that serum uric acid as a potential direct mediator of cardio-metabolic and other chronic diseases which include type 2 diabetes mellitus. Uric acid can act as prooxidant, particularly at an increased concentration and may thus be a marker of oxidative stress [4]. So we studied comparison of serum uric acid levels in healthy controls and type 2 diabetics with no obvious complications.

Materials and Methods

Ethical clearance was obtained from the ethical committee of the institution. We briefed about the purpose of the study and written consent was obtained from all the subjects. Confidentiality and anonymity of patients were maintained.

Cases: 50 Patients attending SNMC Hospital, Bagalkot with clinically diagnosed type 2 diabetes mellitus and with no obvious complications were included in the study. Controls: 50 healthy subjects.

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Inclusion criteria

In this study we included people of age between 40-55 years of either sex and cases of established type 2 diabetes since 5 years.

Exclusion criteria

In this study we have excluded patients of Gout, Ischaemic Heart Disease, HIV, Hepatic infection and with concurrent sickness due to chronic liver diseases, thyroid dysfunction and renal disorders. We have also excluded patients on drugs like thiazide diuretics, antihypertensives , cytotoxic drugs, antitubercular drugs, allopurinol, oral contraceptives and NSAIDS like ibuprofen. We have also excluded people who have taken alcohol recently or starving and patients with wasting diseases.Venous blood samples were collected. Samples centrifuged and serum was separated. Serum uric acid levels were estimated by Uricase/POD, End point assay method. The kit is a product of Span Diagnostics. The results were analysed by using stat fax semi auto analyser 3300 . Serum blood glucose estimated by Trinder's method, End Point/ Fixed time. The kit is a product of Erba Diagnostics. Statistical analysis was done by SPSS software system version 11. p value < 0.05 was considered significant.

Results

Table 1 shows the various clinical and biochemical parameters considered in cases and controls in this study.

Table 1. Clinical and biochemical parameters in cases and controls

Parameter	Controls		Cases
Number	50		50
Sex(M/F)	25/25		27/23
Age group(yrs) (Mean)	46.3± 3.6 years		47.9± 2.5 years
BMI(kg/m2)	24.5± 3.7		26.4±4.1
Duration of diabetes(yrs)			4.2±1.7
Fasting blood glucose(mg/dL)	76 ± 19		154 ± 22
Hb A1c(%)	5.9 ± 1.5		9.9 ± 1.7
Urea(mg/dL)	23.3 ± 6.4		26.4 ± 4.6
Creatinine(mg/dL)	0.9 ± 0.2		1.0 ± 0.2

Table 2 shows the mean age of cases and controls. The p value is not significant

Table 2. Mean age of the subjects in both the groups

Group	Mean age in years	p	Significance
Cases	47.9 ± 2.5	0.458	Not significant
Controls	46.63 ± 3.6		

Table 3 shows the Serum uric acid levels separately in both cases and controls sex wise. In both controls and cases there were no significant variation in the levels of uric acid sex wise.

Table 3. Serum uric acid levels of the subjects in both the groups

Group	Gender	Uric acid (mg/dL)	p	Significance
Controls	Males (n=25)	4.08±0.7	0.07	Not significant
	Females (n=25)	5.62±1.04		
Cases	Males (n=27)	6.01±1.76	0.06	Not significant
	Females (n=23)	6.93±1.5		

Table 4 shows the comparison of the serum Uric acid levels in cases and controls. There is a significant increase in the serum uric acid levels in the cases

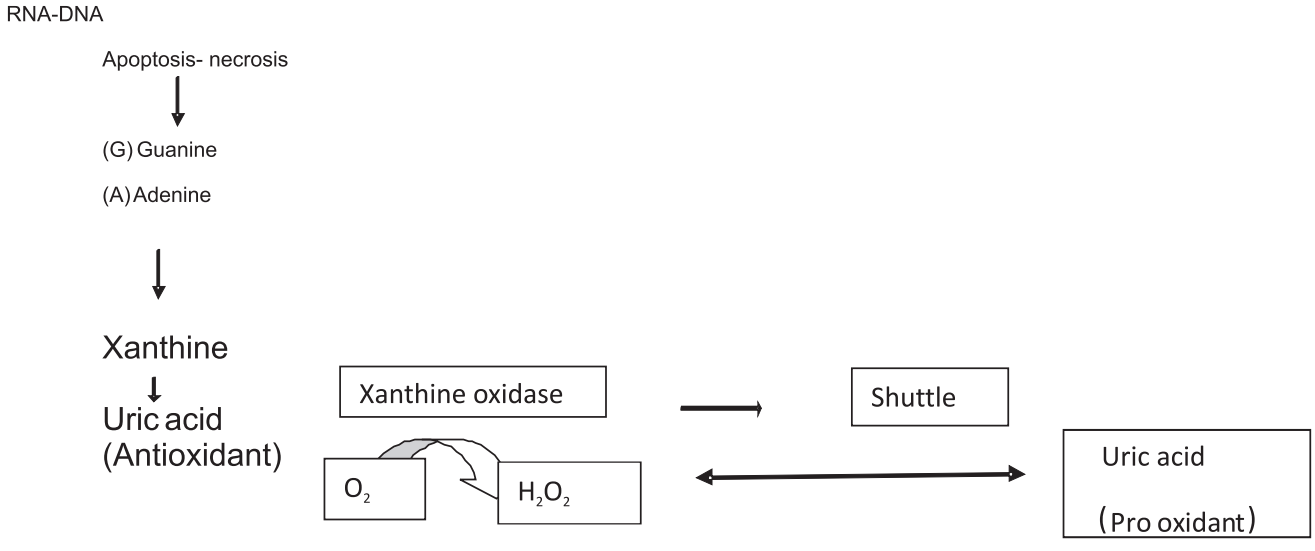
Table 4. Serum uric acid levels in cases and controls

Group	Uric acid (mg/dL)	t	p	Significance
Cases	6.48±1.6	**8.2**	**<0.05**	**Significant**
Controls	4.94±1.19			

Discussion

Serum uric acid levels did not show gender difference among controls as well as among cases. This is in line with studies by Kodama S[5] et al. This study showed that the mean serum uric acid level was significantly higher in type 2 diabetics compared to non-diabetics. This is in accordance with studies by Safi A J [6] et al.

Hyperglycemia induces oxidative stress by ROS oxidation and reductive stress through pseudohypoxia by production of NADH and NADPH. Under the conditions of increased oxidative stress, there is depletion of local antioxidants like superoxide dismutase, peroxidise and catalase. This results in increased production of ROS [8]. Production of superoxide ions, subsequently favours antioxidant- prooxidant urate redox shuttle. Uric acid which was previously physiological antioxidant paradoxically becomes pro-oxidant [9].



The dual effect of uric acid per se as an oxidant-anti oxidant agent could be beneficial if it is explored and exploited. Several studies point to a qualitatively and quantitatively important role of uric acid as an anti oxidant [10,11].

Conclusion

The study reveals Uric acid is higher in type 2 diabetes mellitus patients with no obvious complications. Uric acid is an antioxidant at lower levels of blood glucose and becomes prooxidant due to ROS oxidative stress. This is a paradoxical effect shown by uric acid due to the operation of the uric acid antioxidant- prooxidant redox shuttle. This increased uric acid level itself may lead to complications of diabetes mellitus. The dual effect of uric acid per se as oxidant- antioxidant agent could be harnessed in both improvement and long term prevention of complications of diabetes mellitus.

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