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"A Study on High Serum Uric Acid Levels in Type Ii Diabetes Mellitus"

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Abstract
Introduction: *Uric acid is the most abundant of antioxidant in plasma.Hyperuricemia associated withblood glucose reflects the role of hyperglycemia in the production of oxidative stress in the Type II DM patients.****Material and Methods****:Total 150 subjects were studied and divided into three groups, depending upon their glycosylated hemoglobin level:-Group 1 (Normal subjects): 50 patients with HbA1c level <6%, Group 2 (Well controlled diabetes): 50 patients with HbA1c level 6-8% and Group 3 (Poorly controlled diabetes): 50 patients with HbA1c level >8%.Serum uric acid levels were measured using Uricase-PAP Method.****Results****: High uric acid levels were found in poorly controlled group (7.12±0.57), compared to normal (1.96±0.52) and well controlled group (4.71±0.29), which is statistically highly significant(<0.0001).* ***Conclusion****:Prevalence of hyperuricemia has a key role in progression of Type II Diabetes Mellitus.*

Keywords: *Diabetes Mellitus Type II; Serum Uric Acid; Antioxidant.*

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I. Introduction

The term Diabetes Mellitus (DM) describes, a metabolic disorder of multiple aetiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism, resulting from defects in insulin secretion, insulin action or both. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.[1]

Type II DM is a heterogeneous group of disorders characterized by insulin resistance, impaired insulin secretion, and increased glucose production. In Type II DM, hyperglycemia can lead to the production of Reactive Oxygen Species (ROS)eg. superoxide, hydrogen peroxide, and hydroxyl radicals during either enzymatic ornonenzymatic pathways like glucose oxidative phosphorylation, polyol pathway, advanced-glycation end-products, outflow during mitochondrial respiratory chain, and nicotinamide adenine dinucleotide phosphate oxidase activation.[2] These free radicals may lead to oxidative stress in Type II DM, and as a preventive measure, the body may increase its preventive antioxidants as a defence mechanism.

Uric acid is the most abundant of antioxidant in plasma.[3]Urate, the soluble form of uric acid in the blood, can scavenge superoxide radicals, hydroxyl radicals, and singlet oxygen and also can chelate transition metals.[4]Recent researchers have shown that uric acid has extreme scavenging capability.[5]Increase in serum uric acidalso called as Hyperuricemia, is a condition in which individuals havehigher levels of serum uric acid concentration, particularlygreater than 7.2 and 6.0 mg/dl respectively for both maleand female adults.

Hyperuricemiaassociated withblood glucose reflects the role of hyperglycemia in the production of oxidative stress in the Type II DM patients.[6]Hence, uric acid as a biochemical parameter may be estimated to know its relation as an antioxidant in Type II DM. This study was conducted to understand the relation of serum uric acid levels in Type II DM cases.

II. Material And Methods

A prospective, analytical, case control study "A Study on high Serum Uric Acid levels in Type II Diabetes Mellitus"was carried out at AcharyaVinobaBhave Rural Hospital (AVBRH), Sawangi (Meghe), Wardha, during the period between January 2018 to January 2019. Permission from the college ethical committee was taken for the conduct of study.

The patients coming for plasma glucose estimation, to the central clinical laboratory from different outpatient department(O.P.D.) of AVBRH were selected.Informed consent of all patients for blood investigations was taken. Name, age, sex, height and weight were noted. 5 ml of fasting and post meal venous blood were collected from the patients for assessment of parameters like fasting and post meal plasma glucose, glycosylated hemoglobin and serum uric acid.

Parameter	Method of Estimation
Plasma Glucose (Fasting and Post meal glucose)	GOD-POD method
Glycated Hemoglobin (HbA1c)	Latex Agglutination Inhibition Assay
Serum Uric acid	Uricase-PAP method

Total 150 subjects were studied and divided into three groups, depending upon their glycosylated hemoglobin level:-Group 1 (Normal subjects): 50 patients with HbA1c level <6%, Group 2 (Well controlled diabetes): 50 patients with HbA1c level 6-8% and Group 3 (Poorly controlled diabetes): 50 patients with HbA1c level >8%.

Statistical data was expressed as Mean ± SD.For statistical analysis, SPSS Version 16 was done. Anova test was applied for comparison between more than two groups &student 't'test for comparison between two groups.'p' value of less than 0.05 was considered statistically significant.

III. Results

Table 2: Age-wise distribution

Age in years	Normal	Well controlled	Poorly controlled
21 – 30	8	0	0
31 – 40	8	10	11
41 – 50	13	14	15
51 – 60	14	11	14
61 – 70	2	10	9
> 70	5	5	1
Total	50	50	50

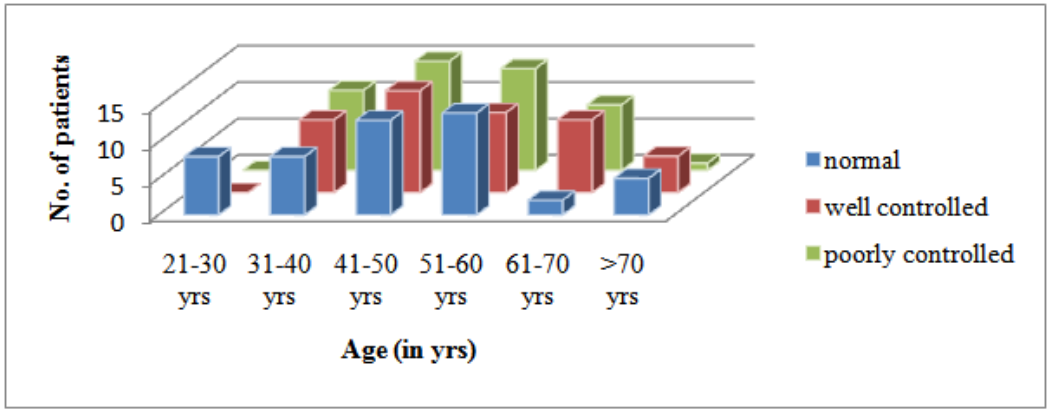

Table 3: Sex-wise distribution

Sex	Normal	Well controlled	Poorly controlled
Male	26	28	29
Female	24	22	21
Total	50	50	50

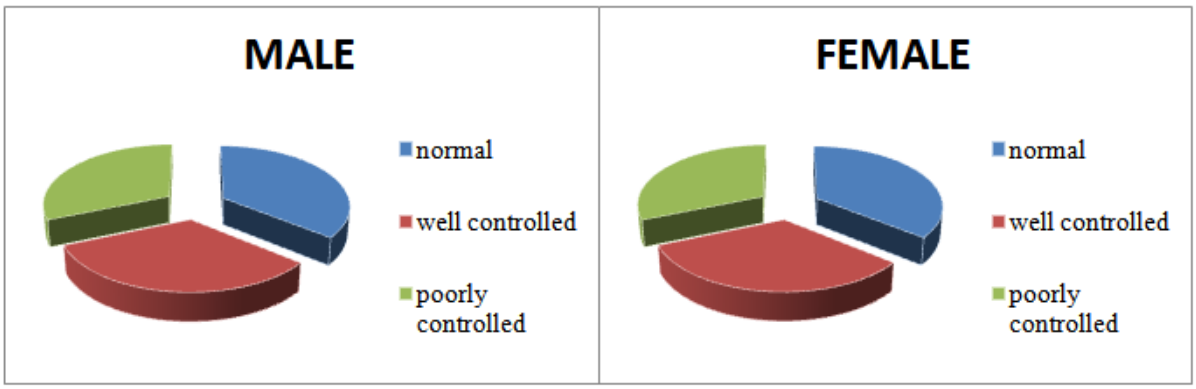

Figure 2: Sex-wise distribution of patients in study groups

Table 4: Fasting plasma glucose(FPG)& Post meal plasma glucose(PMPG) in study groups

Variable	Normal	Well controlled	Poorly controlled	p-value
FPG	92.82 ± 8.43	117.3 ± 22.67	173.66 ± 52.73	<0.0001**
PMPG	136.82 ± 20.52	185.72 ± 40.37	289.8 ± 83.58	<0.0001**

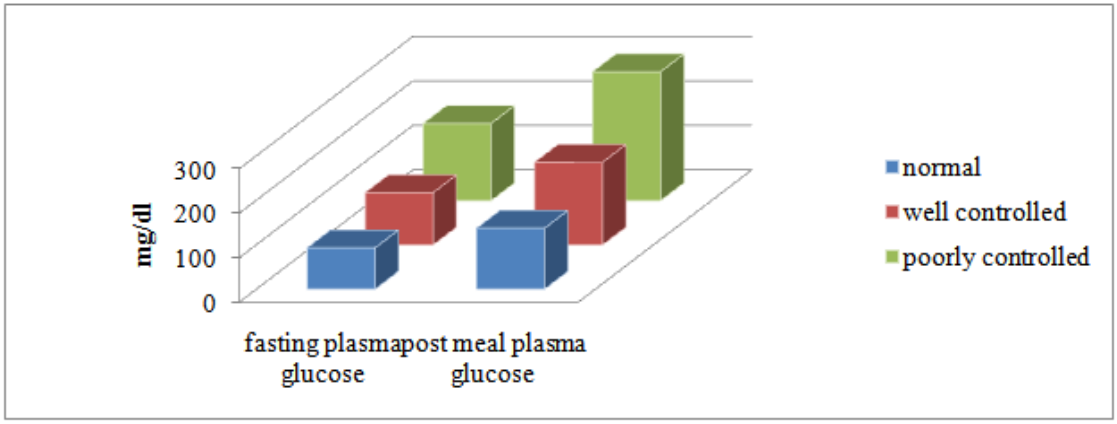

Figure 3: FPG and PMPG values in study groups

Table 5: HbA1C (glycosylated hemoglobin) levels in study groups

Variable	Normal	Well controlled	Poorly controlled	p-value
HbA1C	5.10 ± 0.42	7.00 ± 0.52	10.32 ± 1.52	<0.0001**

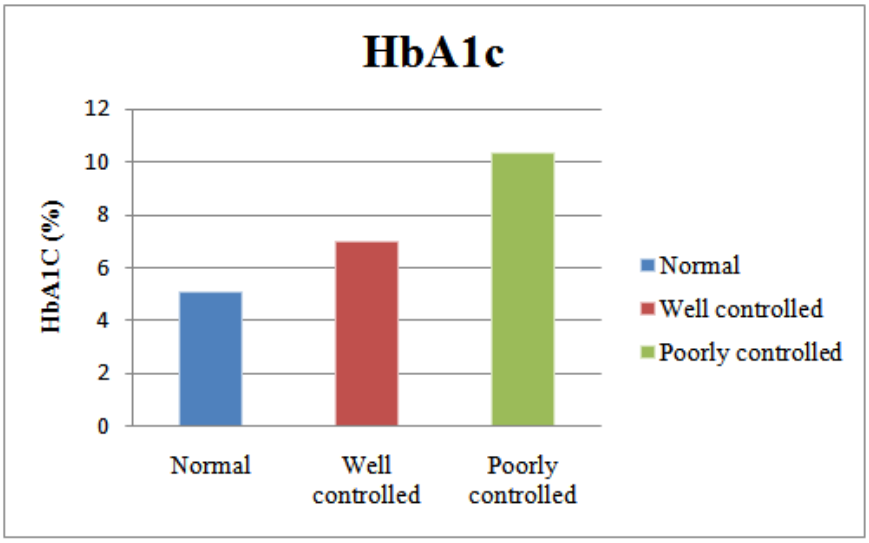

Figure 4: HbA1c levels in study groups

Table 6: Mean values of serum uric acid in study groups.

Variable	Normal	Well controlled	Poorly controlled	p-value
Serum uric acid	1.96 ±0.52	4.71 ± 0.29	7.12± 0.57	<0.0001**

p value <0.05: considered as significant, *: significant, **: highly significant.

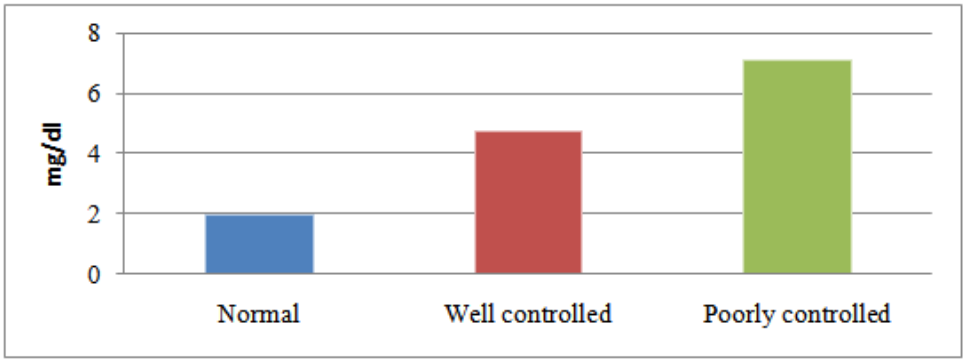

Figure 5: Serum uric acid values in study groups

IV. Discussion

This study found high serum uric acid levels in poorly controlled group (7.12±0.57), compared to normal (1.96±0.52) and well controlled group (4.71±0.29), which is statistically highly significant(<0.0001).

Similar results were observed in various other studies. SudhindraRao M, et al in 2012[7], have reported that high serum levels of uric acid are strongly associated with prevalent health conditions such as obesity, insulin resistance, metabolic syndrome, essential hypertension and renal disease. They found that, the serum uric acid level being higher in pre-diabetes than controls and lower in diabetes mellitus than pre-diabetes may serve as a potential inexpensive biomarker of deterioration of glucose metabolism.According to Abbas Dehghan, et al one quarter of diabetic cases can be attributed to a high serum uric acid level.[8]Recognition of high serum uric acid as a risk factor for diabetes has been a matter of debate for a few decades, since hyperuricemia has been presumed to be a consequence of insulin resistance rather than its precursor, concluded in a study by Butler R, et al.[9]

Hyperuricemia has been found to be associated with obesity and insulin resistance and consequently with type II diabetes mellitus, given by Idonije, et al.[10] Hyperuricemia induces endothelial dysfunction which results in nephropathy in type II DM patients and study done by Tseng also says that, even mild hyperuricemia will result in kidney injury.[11] Theuric acid is very good diagnosticmarker for detection of kidney injury in initial stage ofdisease, stated by both CAI Xiao-lingand Saeed Behradmanesh.[12.13]

V. Conclusion

This study showed significantly elevated serum uric acid (UA) levels in patients with Type II diabetes, as compared to normal and well controlled subjects. This is in line with some previous studies, which suggest a possible link between UA levels and Type II DM. Interestingly, UA is a risk factor for developing metabolic, cardiovascular and kidney disease in Type II Diabetes mellitus patients. We, thereby, conclude that, Prevalence of hyperuricemia has a key role in progression of Type II Diabetes Mellitus.However, considering the potential link of elevated serum uric acid with insulin resistance, impaired glucose tolerance, and progression to diabetes, further research still needed to determine whether it is effective to utilize UA levels as a predictor in prevention of Type II DM.

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