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Evaluation of Serum Uric Acid Levels and Microalbuminuria in Newly Diagnosed Type 2 Diabetics with and without Hypertension

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ABSTRACT

Objective: This study aims to evaluate the levels of Serum uric acid (SUA) and microalbuminuria in Healthy, Newly Diagnosed (N.D.) type 2 Diabetics and in N.D. type 2 Diabetics with hypertension.

Method: Cross sectional study involving a total of 343 Individuals of Bengaluru, India from January 2018 to November 2019 were considered for the study. Venous blood and 24-hour urine sample were collected from 100 healthy, 170 N.D. type 2 Diabetics, 73 N.D. type 2 Diabetics with hypertension and analyzed for Glycated hemoglobin (HbA1c) SUA and microalbuminuria along with their demographic details.

Results: There was significant increase in SUA levels and microalbuminuria in N.D. Type 2 Diabetics with hypertension compared to healthy and N.D. type 2 Diabetics.

Conclusion: Hypertensive Diabetics should be monitored periodically for SUA and microalbuminuria to prevent them from developing renal complication.

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Introduction

Type 2 Diabetes Mellitus (DM) characterized by Hyperglycemia due to inefficient insulin is one of the most important public health concern worldwide [1-4]. It is predicted that the countries with largest no. of people with diabetes mellitus will be from India, China, and USA in the year 2025 [5, 6]. Hyperglycemia can be determined by Glycated Hemoglobin (HbA1c) and Fasting Glucose (FBS). HbA1c reflects the blood glucose level over the previous 3 months [7]. Uric Acid is a product of purine catabolism. It is a powerful plasma soluble antioxidant within its normal range. 2-7 mg/dl in Men and 2-6 mg /dl in women [8]. Although several Investigators have reported SUA as biological marker for type 2 diabetes, their study results were contradictory. A few Researchers through their studies on type 2 diabetic population in USA, Sweden and Netherlands have reported elevated SUA [9-12]. Many Investigators have reported low serum uric acid levels within the Chinese type 2 Diabetic population [13-16]. While a few others have reported elevated serum uric acid levels [17, 18]. In addition, within the Japanese type 2 Diabetic population, few investigators have reported lowered SUA while a few other investigators have reported elevated SUA [19, 20]. Microalbuminuria is an important predictor of progression to overt proteinuria which results in decreased GFR that may progress into End Stage Renal Disease (ESRD) gradually [21, 22]. Due to these reasons, our study aims to evaluate SUA levels and microalbuminuria in N.D. Type 2 Diabetic Individuals with and without hypertension and to compare these parameters with those of Healthy population.

Materials and Methods

This was a cross sectional study conducted at the Shree Krishna Sevashrama Hospital, Bengaluru, India between January 2018 to November 2019. A total of 343 Adult Individuals were included in this study, in the age group 38 to 62 years of both the gender. After obtaining the Institutional Ethical committee approval, informed consent was taken from all the individuals participated in the study. Individuals were categorized into 3 groups, based on their Hb A1c levels as per W.H.O. criteria [23, 24].

Inclusion Criteria

Group I included 100 healthy individuals with HbA1c equal to or below 5.6

Group II included 170 N.D. type 2 Diabetics with HbA1c level 6.5 or above

Group III included 73 N.D. type 2 Diabetics with hypertension

with HbA1c level 6.5 or above and with blood pressure 140/90 or above.

Exclusion Criteria for all the above 4 groups included pregnant and lactating women, individuals taking medications.

Collection of Sample

After an overnight fast, blood samples were obtained for biochemical analysis. Sample collection involved venous whole blood sample. Portion of it was transferred to EDTA tubes for the analysis of HbA1c and FBS and the other portion was allowed to clot. Serum was separated and used for the analysis of SUA. 24-hour urine sample was also collected for detection and estimation of microalbuminuria.

Analysis

Analysis was performed using Olympus AV Auto analyser, using Diasys reagents manufactured by Diasys Diagnostic system, GmbH, Holzheim, Germany.

HbA1c was measured using particle enhanced Immuno turbidionetric method and the desirable range for healthy population was ≤ 5.6, for prediabetes 5.7 – 6.4, for diabetes, ≥ 6.5 [25]. SUA was analysed by enzymatic method and the desirable range for SUA was 2-7 mg/dl in men and 2-6 mg /dl in women [26]. Result of all the above parameters were expressed as mean with standard deviation.

Statistical Analysis

Data were analyzed using SPSS statistical version 24. One way Analysis of Variance (ANOVA) was performed to compare the means of the three groups. Statistical difference between any 2 groups among the total 3 groups was measured by 't' test. Results of all the tests with $p < 0.05$ were considered statistically significant and highly significant at $P < 0.01$.

Results

Table No. I – Serum Uric Acid Levels in Three Different Populations. Significant at P< 0.05.
Highly significant at P < 0.01

Serum uric acid mg/dl	N	Mean	Std Deviation	F	Sig.
Healthy	100	4.212	0.589	249.510	0.000
N.D. Type 2 Diabetics	170	4.119	0.621		
N.D. Type 2 Diabetics with Hypertension	73	7.730	0.876		

Table No.2- Microalbuminuria in Three Different Populations. Significant at p <0.05.Highly significant at P<0.01

Microalbuminuria mg/24 hours	N	Mean	Std. Deviation	F value	Sig. P
Healthy	100	14.20	1.99	363.804	0.000
N.D. type 2Diabetics	170	16.96	2.03		
N.D. type 2 Diabetics with hypertension	73	45.61	38.35		

Table No. 3 Comparison of SUA Levels between the above 2 Groups. Significant at P < 0.05. Highly significant at P < 0.01.

Group		N	Mean	Std Deviation	t	Sig.
Serum uric acid mg/dl	N.D. type 2 Diabetics with Hypertension	73	7.730	0.876	17.856	0.000
	N.D. type 2 Diabetics	170	4.319	0.621		

Table No. 4 Comparison of SUA Levels between the above 2 Groups.Significant at P < 0.05. Highly significant at P < 0.01.

Group		N	Mean	Std Deviation	t	Sig.
Serum uric acid	Diabetics with Hypertension	73	7.730	0.876	20.741	0.000
	mg/dl	100	4.212	0.589		

Table No. 5 Comparison of SUA levels between the 2 Groups. Significant at P < 0.05.Highly significant at P < 0.01

Group		N	Mean	Std Deviation	t	Sig.
Uric acid	Healthy	100	4.212	0.589	0.38	0.790
	mg/dl	170	4.319	0.621		

Table No.6 Comparison of Microalbuminuria between the 2 Groups. Significant at P < 0.05. Highly significant at P < 0.01

	Group	N	Mean	Std Deviation	t	Sig.
Microalbuminuria	Healthy	100	14.20	1.99	0.55	0.727
mg/24 hours	N.D. Diabetics	170	16.96	2.03		

Table No.7 Comparison of Microalbuminuria between the 2 Groups. Significant at P < 0.05. Highly significant at P < 0.01.

	Group	N	Mean	Std Deviation	t	Sig.
Microalbuminuria	N.D. Diabetics	170	16.96	2.03	56.240	0.000
mg/24 hours	N.D. Diabetics with hypertension	73	45.61	38.35		

Table No. 8 Comparison of Microalbuminuria between the 2 Groups. Significant at P < 0.05. Highly significant at P < 0.01

	Group	N	Mean	Std Deviation	t	Sig.
Microalbuminuria	Healthy	100	14.20	1.99	56.937	0.000
mg/dl	N.D. Diabetics with hypertension	73	45.61	38.35		

Table 1 displays the level of SUA in 3 different populations. Among these, only in N.D. Diabetics with hypertension group, SUA is above the normal range (7.730 ± 0.876). SUA levels are within the normal range in Healthy group (4.212 ± 0.589) and in N.D. Type 2 Diabetics group (4.319 ± 0.621). Significant difference(P=0.000) is noted in SUA levels between N.D. Diabetics group and N.D. Diabetics with Hypertension groups (Table 3).Significant difference (P=0.000) is noted in SUA levels between Healthy group and N.D. Diabetics with Hypertension

groups (Table No. 4). No significant difference (P=0.790) is noted in SUA levels between Healthy group and N.D. Diabetics group (Table 5)

Table 2 displays the amount of microalbuminuria in 3 different populations.) Increased Microalbuminuria was noted only in N.D. type 2 Diabetics with hypertension group. No significant difference (P=0.727) is noted in microalbuminuria between Healthy group and N.D. Diabetics group (Table 6).Significant difference (P=0.000) is noted in microalbuminuria between N.D. Diabetics group and N.D. Diabetics with Hypertension groups (Table 7).Significant difference in (P=0.000) is noted in Microalbuminuria levels between Healthy group and N.D. Diabetics with Hypertension groups (Table No. 8).

Discussion

We have observed elevated SUA levels above the normal range only in N.D. type 2 Diabetics with hypertension population and not in N.D. type 2 diabetics population. Reason may be that our diabetic population is a newly diagnosed one. Elevated SUA in N.D. type 2Diabetics with hypertension may be due to the defect in the urate transporter, which leads to enhanced renal reabsorption of uric acid resulting in elevated SUA levels. In addition, we have noted significantly increased microalbuminuria in N.D. type 2Diabetics with hypertension compared to the other 2 Groups. There was neither significant increase in its amount in the other 2 groups nor significant difference in the amount of microalbuminuria between the same 2 groups. Increased microalbuminuria in N.D. type 2 Diabetics with hypertension group may be an indicator of the condition progressing into Diabetic Nephropathy due to increased vascular permeability and endothelial dysfunction [21, 22].

Conclusion

Elevated SUA and increased microalbuminuria were observed in N.D. type 2 diabetics with hypertension population. Hence, periodic monitoring of these two parameters while monitoring the case of hypertensive diabetics may prevent their condition from developing renal complication. In addition, early detection and timely action reduces the economic burden associated with Diabetes in developing countries.

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Disclosure Statement

The authors have no conflict of interest to declare.

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