



Correlation between serum uric acid and renal function in diabetes with normalalbuminuria

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Abstract

Background: Diabetes mellitus (DM) is one of the most prevalent health issues worldwide. The present study was conducted to assess correlation between serum uric acid and renal function in diabetes with normalalbuminuria.

Materials & Methods: The present study was conducted on 256 diabetic patients of both genders. The level of urinary creatinine was assayed using the same method as that for serum creatinine. Evaluation of GFR (eGFR) was done according to the CKD-EPI formula.

Results: out of 256 patients, males were 146 and females were 110. Out of 146 males, 30 males and out of 110 females, 22 females had hyperuricemia. The mean BMI (kg/m²) in group I was 24.1, in group II was 24.3, in group III was 25.1 and group IV was 25.4. Mean FBG (mmol/L) in group I was 8.6, in group II was 7.5, in group III was 7.4 and in group IV was 7.1, Mean urine pH was 5.9 in group I, 5.7 in group II, 5.6 in group III and 5.1 in group IV, Mean UACR in group I was 10.8 in group I, 9.02 in group II, 9.08 in group III and 10.2 in group IV. Mean eGFR (ml/min/1.73m²) in group I was 89.2, in group II was 85.3, in group III was 82.5 and in group IV was 79.4. The difference was significant (P< 0.05). A correlation of FBG (mmol/L), urine pH, SUA (μmol/L) and UACR with eGFR was found.

Conclusion: Authors suggested that hyperuricemia should be controlled efficiently to prevent the GFR decrease and protect the renal function in these patients.

Keywords: diabetes, hyperuricemia, GFR

Introduction

Diabetes mellitus (DM) is one of the most prevalent health issues worldwide. Its prevalence is increasing, with more than 180 million people worldwide and it is supposed that it would be prevalent in 366 million people by the year 2030 [1, 2]. It is a metabolic disease characterized by an increase in chronic blood glucose levels due to defects in insulin secretion and action, causing multisystem damage. Type-2 diabetes mellitus (DM) is correlated with a higher threat of cardiovascular disorders and atherosclerotic load [3].

Prevalence of Type-2 diabetes mellitus is 13.14%. Uric acid is produced by the enzymatic activity of xanthine oxidase and is the final product of purine metabolism. During uric acid production, oxygen free radicals are generated and therefore, uric acid may be a simple and useful clinical indicator of excess oxidative stress [4].

Albuminuria is defined as the presence of a surplus quantity of serum proteins in the urine. This excessive amount of protein usually makes the urine frothy. Albuminuria is an indicator of renal injury [5]. The existence of excessive amount of serum proteins in urine exhibits the inadequacy of reabsorption or impaired filtration by the kidneys. This condition, if prolonged, may impair nephrons and may lead to development of albuminuria in diabetics [6]. The present study was conducted to assess

correlation between serum uric acid and renal function in diabetes with normalalbuminuria.

Materials & Methods

The present study was conducted in the department of General Medicine. It comprised of 256 diabetic patients of both genders. All were informed regarding the study and written consent was obtained. Ethical clearance was obtained prior to the study.

General data such as name, age, gender etc. was recorded. A thorough clinical examination was performed in all patients. All patients were subjected to blood and urine examination. Height, weight, waist circumference, hip circumference, and blood pressure were measured. The level of urinary creatinine was assayed using the same method as that for serum creatinine. The eGFR value was calculated according to the CKD-EPI formula: eGFR [ml·min⁻¹·(1.73m²)⁻¹] = 141 × (Scr/K) a × (0.993)^{age} × 1.018 (female). hyperuricemia serum uric acid ≥ 420 μmol /L in male, ≥ 360 μmol / L in female. Normoalbuminuria: according to UACR, it was normal albuminuria (ACR<30 mg/g). 4 groups were made based on serum uric acid level. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant (P< 0.05).

Results

Table 1: Distribution of patients

Total- 256		
Gender	Males	Females
Number	146	110

Table I shows that out of 256 patients, males were 146 and females were 110.

Table 2: Hyperuricemia in patients

Total	Males	Females
Number	146	110
Hyperuricemia	30	22

Table II shows that out of 146 males, 30 males and out of 110 females, 22 females had hyperuricemia.

Table 3

Parameters	Group I	Group II	Group III	Group IV	P value
SUA	Less than 295	295-347	348-406	More than 407	
BMI (kg/m ²)	24.1	24.3	25.1	25.4	0.01
FBG (mmol/L)	8.6	7.5	7.4	7.1	0.05
Urine pH	5.9	5.7	5.6	5.1	0.05
UACR	10.8	9.02	9.08	10.2	0.12
SUA (μmol/L)	256.2	324.5	375.1	452.6	0.001
eGFR (ml/min/1.73m ²)	89.2	85.3	82.5	79.4	0.05

Table III shows that mean BMI (kg/m²) in group I was 24.1, in group II was 24.3, in group III was 25.1 and group IV was 25.4. Mean FBG (mmol/L) in group I was 8.6, in group II was 7.5, in group III was 7.4 and in group IV was 7.1, Mean urine pH was 5.9 in group I, 5.7 in group II, 5.6 in group III and 5.1 in group IV, Mean UACR in group I was 10.8 in group I, 9.02 in group II, 9.08 in group III and 10.2 in group IV. Mean eGFR (ml/min/1.73m²) in group I was 89.2, in group II was 85.3, in group III was 82.5 and in group IV was 79.4. The difference was significant (P< 0.05).

Table 4: Correlation between eGFR and parameters including SUA

Parameters	R value	P value
BMI (kg/m ²)	-0.01	0.17
FBG (mmol/L)	0.115	0.01
Urine pH	0.94	0.02
SUA (μmol/L)	-0.412	0.05
UACR	-0.32	0.24

Table IV shows correlation of FBG (mmol/L), urine pH, SUA (μmol/L) and UACR with eGFR.

Discussion

Diabetes mellitus is a multi-organ disease characterized by elevated blood glucose level [7]. It has deleterious effect on all organs of body such as eye, kidneys, heart, pancreas etc. Zoppini and colleagues reported that in patients having type-2 diabetes with conserved renal function, hyperuricemia seems to be an

individual risk factor for the development of incident chronic kidney disease (CKD) [8]. Unlike patients without hyperuricemia, the study found that CKD was extremely higher in patients having hyperuricemia [9]. The present study was conducted to assess correlation between serum uric acid and renal function in diabetes with normalalbuminuria.

In present study, out of 256 patients, males were 146 and females were 110. Qiaojing et al [10] found that the prevalence of hyperuricemia was 21.10%. Levels of WC and triglyceride (TG) increased and the levels of HbA1c, high density lipoprotein-cholesterol (HDL-C), eGFR, and urine PH decreased while the levels of SUA increased. Moreover, negative correlation of eGFR with age, WC, leukocyte, and SUA was observed via Pearson correlation analysis. It indicates the strong association between SUA and eGFR. Furthermore, eGFR independently associated with SUA, age, leukocyte, hemoglobin (Hb), and fasting blood glucose (FBG) was confirmed by multiple linear stepwise regression analysis.

We found that out of 146 males, 30 males and out of 110 females, 22 females had hyperuricemia. The mean BMI (kg/m²) in group I was 24.1, in group II was 24.3, in group III was 25.1 and group IV was 25.4. Mean FBG (mmol/L) in group I was 8.6, in group II was 7.5, in group III was 7.4 and in group IV was 7.1, Mean urine pH was 5.9 in group I, 5.7 in group II, 5.6 in group III and 5.1 in group IV, Mean UACR in group I was 10.8 in group I, 9.02 in group II, 9.08 in group III and 10.2 in group IV. Mean eGFR (ml/min/1.73m²) in group I was 89.2, in group II was 85.3, in group III was 82.5 and in group IV was 79.4.

Latif et al [11] conducted a cross-sectional study on 200 patients. Serum uric acid and microalbuminuria by albumin to creatinine ratio (ACR) in random urine sample was measured at the time of inclusion of patients. All the information was collected through a pre-defined proforma. 29%(n=58) were between 16-40 years of age while 71%(n=142) were between 41- 65 years of age, Mean ± SD was calculated as 48.1±10.26 years, 48.5% (n=97) were male and 51.5% (n=103) were females, Mean serum uric acid level was calculated as 6.99±1.01 mg/dL while microalbuminuria was calculated as 5.63±1.08 mg/mmol, r value was 0.0838 which is a positive correlation.

Behradmanesh et al [12] established in a study that serum uric acid had an important affirmative correlation with diabetic nephropathy (Mean ± SE and median of proteinuria was 388 ± 28.7 mg/day and 303.5 mg/day respectively, while Mean ± SE of serum uric acid level was found to be 4.5 ± 0.15 mg/dL) in Type-2 diabetic patients. They concluded that in Type-2 diabetic patient's uric acid level in serum plays a momentous role in causing nephropathy.

Conclusion

Authors suggested that hyperuricemia should be controlled efficiently to prevent the GFR decrease and protect the renal function in these patients.

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