

Evaluation of Serum Uric Acid in Type II Diabetes Mellitus Patients

P Pramod Kumar¹, Penta Goud²

¹Assistant professor, Department of General Medicine, Dr V.R.K Women's college and Hospital, Hyderabad, Telangana, India.

²Assistant Professor, Department of General Medicine, Fathima Institute of Medical Sciences, Kadapa, Andhra Pradesh, India.

Abstract

Introduction: To evaluate serum uric acid as a risk factor for diabetes mellitus. **Subjects and Methods:** 105 type II diabetes mellitus patients of both genders were selected in this study. 10 ml of venous blood was obtained in a test tube containing anticoagulant. Assessment of fasting and random blood glucose level, glycated hemoglobin (HbA1c) and uric acid level was done. **Results:** Age group 40-50 years comprised of 14 males and 10 females, 50-70 years had 16 males and 12 females and >70 years had 25 males and 23 female patients. The difference was non-significant ($P > 0.05$). Hyperuricemia was present in 65 and absent in 40. The difference was significant ($P < 0.05$). **Conclusion:** Most of the patients of type 2 diabetes mellitus had high serum uric acid level.

Key Words: Diabetes Mellitus, glycated hemoglobin, uric acid.

INTRODUCTION

Diabetes mellitus is a common metabolic disease characterized by alteration in fat, proteins and carbohydrates metabolism resulting in hyperglycemia. The underlying pathogenesis is defects in insulin secretion or insulin action or both.^[1]

The characteristics feature of DM is polydipsia, polyphagia and polyuria. The complications in patients with DM is quite common. The most common are diabetic nephropathy, diabetic neuropathy, diabetic foot ulcer etc. These complications are consequence of macro vascular and micro vascular damages of the target organs.^[2,3] The interaction between metabolic, genetic susceptibility and environmental factors are leading physiopathological process.

Uric acid is a product of purine metabolism; and elevated serum uric acid concentration can result from increased generation, caused by ingesting a purine-rich diet or alcohol, or decreased elimination. It has been found that serum uric acid (UA) is positively correlated with serum glucose levels in healthy individuals. Researches revealed that prediabetes and early type II diabetics possess higher UA levels as compared to healthy individuals. A correlation between serum uric acid (SUA) level and the severity of diabetic retinopathy in type 2 diabetic patients has been established. SUA concentration has also been found to be linked with diabetic nephropathy and subclinical atherosclerosis.^[4-6] Further some, it is found that an elevated UA levels often precedes the establishment of hyperinsulinemia, obesity and diabetes. Hyperuricemia is also associated with development of hypertension and metabolic syndrome. Considering this, the present study was conducted to evaluate serum uric acid as a risk factor for diabetes mellitus.

Address for correspondence*

Dr. P Pramod Kumar,

Assistant professor,

Department of General Medicine

Dr V.R.K Women's college and Hospital,

Hyderabad,

Telangana, India.

MATERIALS AND METHODS

A sum total of 105 type II diabetes mellitus patients of both genders were selected in this study. Ethical approval for the study was obtained from institutional ethical review committee. All subjects were informed regarding the study and written consent was obtained

Demographic characteristics such as name, age, gender etc. was recorded. 10 ml of venous blood was obtained in a test tube containing anticoagulant. Assessment of fasting and random blood glucose level was performed. Estimation of glycated hemoglobin (HbA1c) and uric acid level was done. Results thus obtained were subjected to statistical analysis using chi-square test. P value less than 0.05 was considered significant.

RESULTS

Table 1: Age wise distribution of subjects

Age group (Years)	Male	Female	P value
40- 50	14	10	0.72
50-70	16	12	
>70	25	23	

Age group 40-50 years comprised of 14 males and 10 females, 50-70 years had 16 males and 12 females and >70 years had 25 males and 23 female patients. The difference was non-significant ($P > 0.05$) [Table 1].

Table 2: Assessment of hyperuricemia

Hyperuricemia	Number	P value
Present	65	0.03
Absent	40	

Hyperuricemia was present in 65 and absent in 40. The difference was significant ($P < 0.05$) [Table 2].

DISCUSSION

Diabetes mellitus is most challenging health problem among adults. Complications due to diabetes are a major cause of disability and it reduces quality of life. The number of patients diagnosed with complications is on rise.^[7,8] Among various complications, diabetic nephropathy is the leading cause of mortality. Management mainly concentrates on maintaining close to normal blood sugar levels without causing

hypoglycemia. Patient with good glycemic control has less complications. It has been observed that habits like smoking, increased cholesterol, fat, high BP should be controlled in order to avoid serious complications. It has been shown that hyperuricemia induced endothelial dysfunction, glomerular hypertension and renal hypertrophy. The main pathophysiologic mechanism by which uric acid causes renal dysfunction involves an inhibition of endothelial nitric oxide bioavailability, activation of the rennin angiotensin system and direct actions on endothelial cells and vascular smooth muscle cells. Considering this, we performed this study to evaluate serum uric acid as a risk factor for diabetes mellitus.^[9-14]

Our results showed that age group 40-50 years comprised of 14 males and 10 females, 50-70 years had 16 males and 12 females and >70 years had 25 males and 23 female patients. Fukui et al,^[15] in their study observed significantly positive association between SUA concentration and the degree of urinary albumin excretion in males with type II DM. They found a statistically significant relationship between SUA concentration and the severity of albuminuria.

Our results indicated that hyperuricemia was present in 65 and absent in 40. Kodama et al,^[13] found that out of 120 cases of type II diabetes mellitus, there were 69 males (57.5%) and 51 females (42.5%). The mean age found to be 59.04 ± 13.47 years. The mean FBS was 186.10 ± 77.53 mg/dl with majority of the subjects having elevated FBS. The mean PPBS of 274.94 ± 108.66 mg/dl and of HbA1c 8.15 ± 1.7 was observed. The uric acid of majority number of participant males (65.22%) had level of ≥ 7.4, with a mean of 9.53 ± 4.38. Mean blood urea and serum creatinine levels were 46.91 ± 15.13 and 1.44 ± 0.29 respectively. There was significant association seen between uric acid levels and urine albumin, serum creatinine, twenty- four hours urinary albumin, FBS and PPBS levels and HbA1c levels.

Behradmanesh et al evaluated the relationships between serum uric acid level and level of proteinuria in type 2 diabetic (T2D) patients. Mean age of the patients was 57 ± 8.3 years. Mean ± standard error (SE) of serum creatinine was 0.98 ± 0.028 mg/dL, mean ± SE of serum uric acid was 4.5 ± 0.15 mg/dL, and mean ± SE of proteinuria was 388 ± 28.7 mg/day. There was no significant difference in serum uric acid, HbA1c, and creatinine level between males and females. There was a significant positive association between body mass index (BMI) and serum uric acid levels. A significant positive association of serum uric acid with level of proteinuria was seen.^[16,17]

Siu et al demonstrated that lowering uric acid in individuals with hyperuricemia was associated with slower progression of renal disease which suggests a pathogenic role of uric acid in the renal abnormalities and implies a possible efficacy to lower the degree of urinary albumin excretion in diabetic patients by lowering serum uric acid concentration. It is true that elevated serum uric acid concentration can be a consequence of renal dysfunction.^[18,19]

Bo et al reported that hyperuricemia is associated with the insulin resistant syndrome and with early onset or increased progression to overt nephropathy in patients with type 2 diabetes mellitus.^[20]

CONCLUSION

It was found that most of type II diabetes mellitus patients had high serum uric acid level.

REFERENCES

1. Cirillo P, Sato W, Reungjui S, et al. Uric acid the metabolic syndrome and renal disease. *J Am Soc Nephrol* 2006;17(12 Suppl 3): 165-168.
2. Heinig M, Johnson RJ. Role of uric acid in hypertension, renal disease and metabolic syndrome. *Cleve Clin J Med* 2006;73(12):1059-1064.
3. Gagliardi AC, Miname MH, Santos RD. Uric acid: A marker of increased cardiovascular risk. *Atherosclerosis* 2009; 202(1):11-17.
4. Zoppini G, Targher G, Chonchol M, et al. Serum uric acid levels and incident chronic kidney disease in patients with type 2 diabetes and preserved kidney function. *Diabetes Care* 2012;35(1):99-104.
5. El-Wakf AM, Abbas TM, El-Baz RA, et al. Role of hypertension and metabolic abnormalities in the development of diabetic nephropathy among Egyptian patients with type 2 diabetes. *Nature and Science*, 2011; 9(7):220-226.
6. Fu, C.C.; Wu, D.A.; Wang, J.H.; Yang, W.C.; Tseng, C.H. Association of C-reactive protein and hyperuricemia with diabetic nephropathy in Chinese type 2 diabetic patients. *Acta Diabetol.* 2009; 46: 127–134.
7. Gheissari A, Mehra P, Merricki A, Madihi Y. Acute kidney injury: A pediatric experience over 10 years at a tertiary care center. *J Nephropathology.* 2012;1:101–8. [PMC free article] [PubMed] [Google Scholar]
8. Baradaran A, Behradmanesh S, Nasri H. Association of body mass index and serum vitamin D level in healthy Iranian adolescents. *Endokrynol Pol.* 2012;63:29–33. [PubMed] [Google Scholar]
9. Nasri H. Association of serum lipoprotein (a) with hypertension in diabetic patients. *Saudi J Kidney Dis Transpl.* 2008;19:420–7. [PubMed] [Google Scholar]
10. Nasri H, Yazdani M. The relationship between serum LDL-cholesterol, HDL-cholesterol and systolic blood pressure in patients with type 2 diabetes. *Kardiol Pol.* 2006;64:1364–8.
11. Cai, X.L.; Wang, F.; Ji, L.N. Risk factors of diabetic retinopathy in type 2 diabetic patients. *Chin. Med. J.* 2006; 119: 822–826.
12. Krizova, L.; Kalousova, M.; Kubena, A.; Benakova, H.; Zima, T.; Kovarik, Z.; Kalvoda, J.; Kalvodova, B. Increased uric acid and glucose concentrations in vitreous and serum of patients with diabetic macular oedema. *Ophthalmic Res.* 2011;46: 73–79.
13. Saggiani F, Pilati S, Targher G, Branzi P, Muqgeo M, Bonora E. Serum uric acid and related factors in 500 hospitalized subjects. *Metabolism* 1996;45:1557-61.
14. Chapman PT, Yarwood H, Harrison AA, et al. Endothelial activation in monosodium urate monohydrate crystal-induced inflammation: in vitro and in vivo studies on the roles of tumor necrosis factor alpha and interleukin-1. *Arthritis Rheum* 1997;40:955-65.

15. Johnson RJ, Kang DH, Feig D, et al. Is there a pathogenetic role for uric acid in hypertension and cardiovascular and renal disease? *Hypertension* 2003;41:1183-90
16. Fukui, M.; Tanaka, M.; Shiraishi, E.; Harusato, I.; Hosoda, H.; Asano, M.; Kadono, M.; Hasegawa, G.; Yoshikawa, T.; Nakamura, N. Serum uric acid is associated with microalbuminuria and subclinical atherosclerosis in men with type 2 diabetes mellitus. *Metabolism* 2008; 57: 625–629.
17. Kodama S, Sugawara A, Saito K, et al. Association between serum uric acid and development of type 2 diabetes. *Diabetes Care* 2009;32(9):1737-1742.
18. Behradmanesh S, Horestani MK, Baradaran A, Nasri H. Association of serum uric acid with proteinuria in type 2 diabetic patients. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences*. 2013;18:44.
19. Siu YP, Leung KT, Tong MKH, Kwan TH. Use of allopurinol in slowing the progression of renal disease through its ability in lowering serum uric acid level. *Am J Kidney Dis* 2006;47:51-9.
20. Bo S, Cavallo-Perin P, Gentile L, Repetti E, Pagano G. Hypouricemia and hyperuricemia in type 2 diabetes: two different phenotypes. *Eur J Clin Invest* 2001;31:318-21.