



A Study of Correlation of Serum Uric Acid Levels With Diabetic Complications

Mahitha M, Mahendra Kumar K*

Department of Medicine, Saveetha Medical College, Saveetha Nagar, Thandalam, Chennai- 602105, Tamil Nadu, India



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ABSTRACT

Diabetes is the leading cause of adult blindness, end stage renal disease, coronary heart disease, stroke, foot ulcers and lower limb amputations. Serum uric acid levels independently predict the development of macro vascular and micro vascular complications. In this study we analyse the association of serum uric acid with the macro and micro vascular complications of diabetes. In this hospital based observational study, hundred diabetic patients were included; of which fifty had complications, the remaining fifty had no complications. Blood investigations including fasting and post prandial blood sugars, glycosylated haemoglobin, serum creatinine, micro albuminuria, lipid profile, serum uric acid were done in all patients. All the parameters were compared between the two groups. Males with complications had significant high uric acid than females with complications. HbA1c, total cholesterol levels, micro albuminuria, serum creatinine had a positive correlation with the serum uric acid. Uric acid levels were higher among patients with complications compared to patients without complications which was statistically significant ($p = 0.00001$). Patients with nephropathy, retinopathy and coronary heart disease had elevation in serum uric acid levels which was statistically significant. Patients with complications had higher uric acid levels than patients without complications.

*Corresponding Author

Name: Mahendra Kumar K

Phone:

Email: mahindran1985@gmail.com

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INTRODUCTION

Diabetes Mellitus is the most challenging health problem in the world. It is the leading cause of adult blindness, coronary heart disease, end stage kidney disease, stroke, foot ulcers and lower limb amputations. Uric acid is primarily a purine metabolic

waste product. About 70% of it gets excreted by the kidneys. Hyperuricemia is a feature of insulin resistance. It has gained importance as many studies have reported that it has an important role in the development of metabolic syndrome in a study by Chen JH et al [1]. Many studies have suggested that inflammation and oxidative stress results from the metabolism of uric acid, leading to vascular injury. The rate limiting step of uric acid production is an enzymatic reaction of the xanthine oxidase enzyme that oxidises hypoxanthine- xanthine into uric acid. Its synthesis is accompanied by the generation of reactive oxygen species. Xanthine oxidase in the vascular endothelium is associated with ischemic reperfusion injury according to a study by Santni Manickam et al [2]. In recent years there has been a debate regarding the association of hyperuricemia with diabetic complications. If this association is conclusively established, therapeutic interventions aiming to reduce uric acid synthesis might help to

retard the progression of micro and macro vascular complications of diabetes. Hence this study was conducted aiming to show the association of uric acid levels with diabetic complications.

MATERIALS AND METHODS

This is a hospital based observational study conducted in a tertiary care hospital from January to March 2020. Patients with Type 2 Diabetes Mellitus of the age group of 20 to 80 years admitted in the medical wards were included in the study. Patients admitted with acute complications like diabetic ketoacidosis and hyperosmolar coma and patients with gestational diabetes were excluded from the study. Permission was obtained from ethics committee. Informed consent was obtained from the patients.

A detailed history and physical examination was done. Baseline investigations including fasting and post prandial blood sugars, HbA1c, lipid profile, serum creatinine, micro albuminuria were done. The diagnosis of diabetes was based on American Diabetic Association criteria. The presence of micro vascular and macro vascular complications was established by fundus examination by an ophthalmologist to assess retinopathy, Urine spot Protein/ creatinine ratio (PCR) to assess nephropathy, nylon monofilament test to assess neuropathy and ECG, ECHO and Cardiac evaluation to assess coronary heart disease. Serum uric acid was done in all patients. Hyperuricemia was defined as serum uric acid greater than 7 mg/dl. High HbA1c was taken as levels above 6.5%. For micro albuminuria it was taken as levels above 30 mg. Total cholesterol levels above 170 mg/dl. Serum creatinine level of greater than 1.2 mg/dl for women and greater than 1.4 mg/dl for men were taken.

The study population was divided into two groups: group I patients with diabetes and without any vascular complications; group II patients with diabetes and any one or more of vascular complications. The data collected were entered in a Microsoft excel sheet and analysed using spss software. P value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Among the 100 diabetic patients studied, there were 64 males (64%) and 36 females (36%) out of which 50 (50%) had presented with complications and 50 (50%) had no complications in the study group. Out of 50 with diabetes related complications, there were 33 (66%) males and 17 (34%) females. Out of 50 patients with complications 12

patients had Retinopathy, 16 patients had coronary heart disease, 22 patients had nephropathy. The complications were higher among age group I (41-80 years) than group II (20-40 years) which was statistically significant (Table 1). HbA1c, total cholesterol levels, serum creatinine, micro albuminuria had positive correlation with high uric acid levels (Table 2). Males presented with higher complications compared to Females which was not significant. Patients with complications had statistically significant HbA1c, total cholesterol levels, serum creatinine and micro albuminuria than patients without complications. Hyperuricemia was more prevalent among patients with complications than without complications which was statistically significant ($P= 0.00001$) (Table 2). Hyperuricemia was significantly higher in males with complications than in females with complications ($p= 0.0004$) (Table 4). Patients with nephropathy had significant elevation in serum uric acid levels ($p= 0.00001$) (Table 3). Patients with retinopathy had significant elevation in serum uric acid levels ($p=0.0004$) (Table 3). Patients with coronary heart disease had significant elevation in serum uric acid levels ($p=0.0005$) (Table 3).

This is an observational study conducted in a Tertiary care hospital regarding the correlation of serum uric acid levels with macro vascular and micro vascular complications. In this study it was found that patients with complications had significant high uric acid levels than patients without complications similar to study by Xu Y et al [3] and Bo S et al [4]. In present study Males 33 (66%) presented with higher complications than females 17 (34%) which was not significant and in contrast to study by Santni Manickam et al [2]. Complications were significantly high in patients with age group between 41-80 years which was similar to study by Mathew George et al [5]. HbA1c had positive correlation with high uric acid levels similar to study by Kodama et al [6]. Total cholesterol levels had positive correlation with high uric acid levels. Other studies consistent with the results were by Chen JH et al [1], Merjanian R et al [7] and Zoppini G [8]. Micro albuminuria had positive correlation with high uric acid levels which was similar to study findings by Chuengsamarn S et al [9]. Serum creatinine also had positive correlation with high uric acid levels similar to study by Om Shankar Prasad Sah [10]. Patients with nephropathy had significant elevation in serum uric acid levels. This was similar to findings of studies by Nazir Shah et al [11], Kim WJ et al [12], Obermayr RP et al [13], Li L et al [14] and Behradmanesh S et al [15]. Patients with coronary heart disease had positive correlation with

Table 1: Comparison of age in diabetics with and without complications

Age	Diabetes with complications	Diabetes without complications	P= value
20-40 years	13(26%)	28(56%)	P= 0.002
41-80 years	37(74%)	22(44%)	

Table 2: Comparison of HbA1c, uric acid, total cholesterol, serum creatinine, microalbuminuria levels in diabetes patients with and without complications

	Diabetes with complications	Diabetes without complications	P= value
HbA1c	31(62%)	12(24%)	P= 0.001
Uric acid	37(74%)	11(22%)	P= 0.00001
Total cholesterol	16(32%)	32(64%)	P= 0.002
Serum creatinine	39(78%)	29(58%)	P= 0.003
Micro albuminuria	41(82%)	12(24%)	P= 0.00001

Table 3: Comparison of serum uric acid levels in patients with complications

Complications	Serum Uric acid levels (mg/dl)	P= value
Diabetic Retinopathy	Present	75%
	Absent	25%
Diabetic Nephropathy	Present	77.2%
	Absent	23%
Coronary Heart Disease	Present	69%
	Absent	31.2%

Table 4: Comparison of sex with uric acid levels in patients with complications

Sex	Serum Uric acid levels (mg/dl)	P= value
Males with complications	Present (97%)	P= 0.0004
	Absent (12.1%)	
Females with complications	Present (38.4%)	
	Absent (69.2%)	

hyperuricemia. Similar findings were seen in studies by Cad- Zoppini G et al [8] and Gagliardi A.C.M et al [16]. Patients with retinopathy had positive correlation with hyperuricemia which was similar to studies by Qing Xiong et al [17] and Xia J et al [18]. In this study it was found that the uric acid levels were significantly higher in males than females with diabetic complications.

CONCLUSIONS

Diabetic patients with macro vascular and micro vascular complications have higher serum uric acid levels than those without complications. Males with complications presented with hyperuricemia than females with complications and it was statis-

tically significant. Also there was positive correlation between HbA1c, total cholesterol, serum creatinine, micro albuminuria with serum uric acid levels. Patients in age group between 41 to 80 years had more complications than age group between 20 to 40 years which was statistically significant.

Patients with complications like nephropathy, retinopathy, coronary heart disease had significantly higher uric acid levels. This suggests that serum uric acid acts as a risk factor in developing macro vascular and micro vascular complications of type 2 diabetes mellitus.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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