J. Cardiovasc Disease Res., 2020; 11(3): 56 – 59
A Multifaceted Peer Reviewed Journal in the field of Cardiology
www.jcdronline.org | www.journalonweb.com/jcdr
P – ISSN: 0975 – 3583 Online: 0976 – 2833

Serum Uric Acid Levels in Type 2 Diabetes Mellitus

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ABSTRACT

Diabetes is in very commonly named as diabetes mellitus. Diabetes mellitus is a group of metabolic disorders characterized by a high blood sugar level over a prolonged period of time. Symptoms often include frequent urination, increased thirst, and increased appetite. Disease that is related to a variety of microorganisms, including cardiac complications, kidney complications, and metabolic syndrome. In present study predominated by male gender and age group more than 60 years. Type 2 Diabetes mellitus with elevated uric acid levels had microalbuminuria. There was positive correlation of uric acid levels with HbA1c. The study population had an elevated uric acid levels with microalbumiuria in type 2 Diabetes mellitus. Hence it is sensible to check uric acid and urine albumin levels in subjects with type 2 Diabetes mellitus to prevent renal complications.

Keywords: Diabetes, uric acid, sugar, mellitus, kidney

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Submitted: 03-06-2020
Revision: 25-06-2020
Accepted Date: 15-07-2020

DOI: 10.31838/jcdr.2020.11.03.14

INTRODUCTION

Diabetes mellitus (DM) is a chronic disease that is related to a variety of microorganisms, including cardiac complications, kidney complications, and metabolic syndrome. It is the most common non-communicable disease affecting society in both developing and developed countries. Diabetes Mellitus is a chronic disorder that is associated with cardiovascular complications, renal complications and various types of microangiopathies including metabolic syndrome. It is the most common non-communicable disease affecting society in both developing and developed countries.

The International Federation of Diabetes reported that around 415 million adults worldwide suffer from diabetes, and they estimated the number to be likely to reach around 642 million by 2040.[1] A global report on diabetes by the World Health Organization (WHO) has revealed that the number of adults living with diabetes has quadrupled since 1980 to 422 million adults.[2] The WHO estimated 26 deaths per 100,000 people due to diabetes in India.[3] The international diabetes federation reported 425 million people who have diabetes in world and among these 82 million are present in South East Asian (SEA) region. India being one of the countries of SEA region contributes to 72,946 cases of diabetes. In some studies, it has been assumed that serum uric acid (SUA) in healthy subjects is positively associated with serum glucose levels.[4] Recent studies have shown that serum uric acid levels are higher in subjects with prediabetes and early type 2 diabetes than in healthy controls.[5] Hyperuricemia has also been linked to a set of metabolic abnormalities related to insulin resistance or hyperinsulinemia in metabolic syndrome.[6,7,8]

Amongst the risk factors of Diabetes like family history, age, obesity and lack of physical exercise, raised or elevated serum uric acid (SUA) levels is also a very important risk factor which has been evaluated by many studies.[9]

Researchers also found that Serum uric acid plays an important role in cardiovascular diseases and also affecting other system which includes renal, vascular, ophthalmological, neurological and metabolic component, thus also contributing to the complications of Diabetes.[10]

Aim and Objectives

Aim of the study

To study the levels of serum uric acid in type 2 Diabetes Mellitus subjects

Objectives of the study

To assess the outcome of elevated serum uric acid levels in type 2 Diabetes mellitus subject. To find relation of serum uric acid levels with microalbuminuria and serum creatinine in subjects with type 2 Diabetes mellitus.

REVIEW OF LITERATURE

Diabetes mellitus is a non-communicable disease that has a worldwide distribution and varies between different populations. Diabetes is growing rapidly which is already an epidemic in India. The first edition of the International Diabetes Federation (IDF) diabetes atlas, which was released in 2000, had an estimated global diabetes prevalence of 151 million. Estimated 40 million people had diabetes in India in 2007 and the predicted number by 2025 is around 70 million people.[13] A perspective is necessary to prevent type 2 diabetes and its complications. In early life, when eating and physical activity habits are established and when long-term regulation of energy balance can be programmed, especially to prevent the development of overweight and reduce the risk of type 2 diabetes The key is from the window. Healthy lifestyles can improve health outcomes in later stages of life. Mainly two types of diabetes Type 1 and Type 2. Type 2 diabetes is very common phase of diabetes, which means that the body does not use insulin properly. And while some person may regulate their blood sugar levels by healthier diet and exercise, some will require medicine or insulin to better maintain their blood sugar levels. It doesn't matter, you have options and equipment, money, and assistance to help you battle.

Uric Acid

Uric acid is formed by purine breakdown. Uric acid is more soluble in urine as compare to water due to presence of urea, protein and mucopolysaccharides.[11] Uric acid chemical composition was discovered by fischer to be 2,6,8 trioxypurin. Uric acid oxidation with neutral alkaline solution leads to breakdown of purine ring and removal of carbon at 6th position as carbon dioxide which leads to

formation of allontoin and other products. When uric acid oxidised with acidic solution the final product will be alloxan. The reducing property of uric acid is used for the colorimetric procedure. Although purine nucleotides are synthesised and metabolised in all cells in the body but urate is produced inside the cells containing xanthine oxidase such as small bowel and liver. The synthesis of uric acid depends upon the daily purine intake in diet, synthesis of purins from nonpurines prescursors, nucleic acid turnover and salvage by phosphoribosyl transferase activity. Nucleic acid formed due to the metabolism of food in the intestinal tract the proteases enzyme degrade the nucleoproteins. The nucleases enzyme depolymerise the polynucleotide and split into reactive nucleotides in the small intestine. The nucleotidase acts on these nucleotides and converts it into the phosphoric acid, purine and pyrimidine nucleotides.[12]

PATHOPHYSIOLOGY OF DIABETIC KIDNEY DISEASE

Due to chronic hyperglycemia there is impaired renin-Angiotensin aldosterone function which leads to increased glomerular and systolic blood pressure. The other factors causing renal damage includes insulin like growthfactor-1, TGF- beta and vascular endothelial growth factor. Increase in kidney volume and hyper infiltration leads to decreased renal function.[13] There are more chances of developing hypertension in type 1 Diabetes Mellitus patients developing diabetic nephropathy individuals with Type 2 Diabetes mellitus along with Chronic Kidney Disease are more prone developing acute kidney injury. Tubular basement membrane and glomerular basement membrane thickening increases as the duration of Diabetes increases.[14] There will be afferent and efferent glomerular hylinosis. In type 1 Diabetes Mellitus persistent microalbuminuria more than 5 years (30mg to 300mg Urinary albumin excretion / day for 3 months) are prone for developing diabetic nephropathy. About 20% to 30% diabetic patients develop microalbuminuria within 15 years. End stage renal disease occur within 10 years in 20% of patients with microalbuminuria and 60% macroalbuminuria patients. The patients with microalbuminuria the glomerular filtration rate decreases progressively which causes decrease in renal function in DM type 1.[15-16]

Tejinder talwar et al in 2017 conducted study on subjects diagnosed of type 2 Diabetes mellitus in the age group 30-70 years. Strength of association between the FBS, RBS, HbA1c and Uric acid is high and they are negatively correlated. Mean value of uric acid was highest (4.472mg/dl) if the HbA1c values were less than 7% and it decreased thereafter.[17]

MATERIAL AND METHODS

Source of data

Diagnosed subjects of type 2 diabetes mellitus were enrolled for study from outpatient department (OPD) and Inpatient Department (IPD) of Krishna Hospital Medical Research Centre.

Subjects were interviewed to obtain the demographic characteristics such as age and sex, presenting complaints, diabetic history and history of other co- morbidities. These subjects were subjected to clinical examination and the findings including vitals and systemic examination findings were noted. These findings were recorded on a predesigned and pretested proforma. Protocol and ethics committee improvement was taken from university.

OBSERVATION AND RESULTS

Table 1: Frequency distribution of age in subjects with 2 Diabetes mellitus

Age group (Year)	n=120	Percent
<30	4	3.33
31-40	9	7.5
41-50	14	11.67
51-60	36	30
61-70	38	31.67
71-80	16	13.33
81-90	3	2.5
Total	120	100
Mean =59.04 years; SD ±13.47 years		

The mean and standard deviation for age in the study subjects was 59.04 years ±13.47 years respectively. Majority subjects were from age group of 61 - 70 years [120(31.67%)], followed by 51 – 60 years [120 (30%)], 71-80 years was [120(13.33%)], 41-50 years was [120(11.67%)], 31-40 years was [120(7.5)] and <30 years was [120(3.33%)] (Table 1)

Table 2: Fasting blood sugar in subjects with type 2 Diabetes mellitus

Fasting blood glucose (mg/dl)	n=120	Percent	Mean	SD (±)
<100	14	11.67	83.31	13.37
100-125	13	10.83	112.77	9.12
>126	93	77.5	210.61	69.01
Total	120	100	186.10	77.53

The fasting blood sugars (FBS) of the subjects had mean of 186.10 ±77.53 mg/dl. Majority number of subjects (77.50%) had elevated fasting blood sugar levels, some (11.67%) had fasting blood sugar levels of less than 100 mg/dl while few (10.83%) had between 100-125 mg/dl range. (Table2)

Table 3: Postprandial blood sugar in subjects with type 2 Diabetes mellitus

Postprandial blood sugar (mg/dl)	n=120	Percent	Mean	SD (±)
<140	14	11.67	116.29	14.24
140-199	21	17.5	176	14.97
>200	85	70.83	325.54	86.07
Total	120	100	274.94	108.66

The postprandial blood sugars (PPBS) of the subjects had mean of 274.94 ±108.66 mg/dl. Significant number of subjects (70.83%) had raised PPBS (>200 mg/dl), some (17.50%) had PPBS of 140–199 mg/dl while few (11.67%) had less than 140 mg/dl. (Table 3)

Table 4: Uric acid levels in subjects with type 2 Diabetes mellitus

Uric acid levels(mg/dl)		n=120	Percent	Mean	SD (±)
Males	3-7.4	24	34.78	5.87	0.77
	≥ 7.4	45	65.22	11.61	3.68
	Total	69	100	9.69	4.09
Females	2.1-6.3	10	19.61	5.6	0.36
	≥ 6.3	41	80.39	10.24	4.91
	Total	51	100	9.33	4.77

The uric acid of majority number of our study participant males (65.22%) had level of ≥7.4, rest (34.78%) had levels of 3 – 7.4.The uric acid of maximum number of our study participant females (80.39%) had level of ≥6.3, rest(19.61%) had levels of 2.1– 6.3. (Table 4)

DISCUSSION

The study showed effect of uric acid levels in type 2 Diabetes mellitus and correlation with creatinine and microalbuminuria. The age group wise distribution in the study observed mean age 59.04 years ±13.47 years. Majority subjects were from age group of 61–70 years (31.67%). The study by Saeed et al observed mean age similar to the current study it was 57 years ±8.3 years. The study by Prabhuswamy et al observed mean age less than current study, which was 54.29 ±11.23 years.[18] There were males (57.50%) and females (42.50%) in our study. Similar to the study by Prabhuswamy et al males were more in comparison to female. The study by Nagendra.S et al had higher males than females similar to the current study.[19]

CONCLUSIONS

In present study predominated by male gender and age group more than 60 years. Levels of uric acid have been increased in people with high blood sugar levels as seen in the glycemic index. Serum creatinine levels were raised in subjects with type 2 Diabetes mellitus with elevated uric acid levels. About two-third subjects with type 2 Diabetes mellitus with elevated uric acid levels had microalbuminuria. There was positive correlation of uric acid levels with HbA1c. The study population had an elevated uric acid levels with microalbumiuria in type 2 Diabetes mellitus. Hence it is sensible to check uric acid and urine albumin levels in subjects with type 2 Diabetes mellitus to prevent renal complications.

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Cite this article: Virendra C. Patil Serum Uric Acid Levels in Type 2 Diabetes Mellitus. J. Cardiovascular Disease Res. 2020; 11 (3): 56 – 59