



EFFECT OF PURINE RICH DIET ON HYPERURICEMIA & ITS ASSOCIATION WITH RENAL DYSFUNCTION IN DIABETES MELLITUS

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ABSTRACT **BACKGROUND** – Hyperuricemia ie increased serum uric acid level, is a novel risk factor for the development of Diabetes.[1] Uric acid is the end product of purine metabolism.[2] It is a product of purine degradation catalysed by the enzyme xanthine oxidase. So diet rich in purines tends to increase serum uric acid level ie Hyperuricemia.[3] Hyperuricemia is defined as the serum uric acid level more than 6 mg/dl for women and 7 mg/dl for men [4] . SUA mainly affects diabetes and its complications through inflammation, oxidative stress, endothelial function damage, and other effects, so high levels of serum uric acid is closely related to diabetes and its complications [5]. Kidney plays an important role in the regulation of blood uric acid level. As Uric acid is end product of Purine metabolism, diet rich in purines (Non Veg) in diabetes tends to develop hyperuricemia which further aggravate risk factors of developing diabetic nephropathy [6,7] while Diabetics with low purine diet like consumption of egg,nuts, vegetables, fruits,milk dairy products etc have protective effect from developing complicated diabetes & renal dysfunction [8]

MATERIALS & METHODS – In this hospital based Analytical cross sectional study, 100 diabetic patients were selected of which 50 High purine (non veg diet) 50 low purine (Veg diet) diabetics were included. Blood investigations including serum uric acid, creatinine & blood Urea level was estimated in all patients. All these parameters were compared between the two groups that is Group I included 50 Nonvegetarian Diabetic patients and Group II included 50 age & sex matched vegetarian diabetic patients. This Study included all Diabetic patients attending Biochemistry OPD, IGGMC, Nagpur for routine Blood sugar check up. History was taken as per designed proforma and consent form was obtained. Blood Urea level, serum creatinine & Serum Uric acid level were estimated on Autoanalyser EM 460 in clinical Biochemistry Laboratory. Results were compared & correlated. The data was analysed & Student's t-test was used for the calculation. P<0.05 was considered significant.

RESULT – Mean serum uric acid level was higher among patients with High purine Diabetes (6.866 ± 0.5465) compared to Low purine diabetic (4.120 ± 0.6273) which was statistically significant (P value < 0.05). Serum creatinine level & Blood Urea level in High purine Diabetic was also found to be 1.256 ± 0.323 & 44.22 ± 7.226 resp compared to Low purine diabetic 0.846 ± 0.107 & 29.32 ± 4.479 resp. which was statistically significant and high & reflect renal impairment in hyperuricemia with high purine diet diabetic patients. So High Serum Uric acid level due to high purine diet can be an additional risk factor for development of renal impairment in diabetes.

CONCLUSION – In this study we want to correlate association of Hyperuricemia with Serum creatinine & Blood urea (kidney function tests) in Diabetes which is due to consumption of High purine diet (Non veg, sea foods, fish, red meat, excess alcohol, tea etc) which are further risk factors for renal dysfunction in Diabetic patients & cause of progression of disease.

KEYWORDS : Serum Uric acid, Hyperuricemia, Blood Urea, Creatinine, Diabetes, Renal failure.

INTRODUCTION

Diabetes mellitus commonly called as Diabetes is a metabolic disease associated with abnormally high blood sugar level. Multiple factors involved in development, progression and complications of Diabetes.

Hyperuricemia act as potential biomarker for diabetes and its chronic complications like Diabetic nephropathy.[9,10] Diabetic nephropathy is a progressive kidney disease caused by the damage to the capillaries in the kidney glomeruli. Uric acid can serve as an inflammatory factor and is attributed to bring about endothelial dysfunction.[11] Uric acid act as an antioxidant and is a marker of oxidative stress, tissue injury and renal dysfunction. So increased serum uric acid level further aggravate & progress diseased condition like renal dysfunction in Diabetes.[12,13]

As Uric acid is end product of Purine metabolism, diet rich in purines in diabetes tends to develop hyperuricemia which further aggravate risk factors of developing diabetic nephropathy[14] while Diabetics with low purine diet like consumption of egg,nuts, vegetables, fruits,milk dairy products etc have protective effect from developing complicated diabetes & renal dysfunction. [15,16]

Uric acid can lead to the activation of the renin-angiotensin-aldosterone System (RAAS), through increasing the production of juxtaglomerular renin. UA-induced ROS stimulated the increase of plasma angiotensin II which induced aldosterone release, leading to activation of RAAS [16]. RAAS activation induced afferent renal arteriopathy and tubulointerstitial fibrosis in rodent models. In diabetes, RAAS activation causes a range of pathological changes

including vascular dysfunction, high intraglomerular pressure, inflammation, and so on, leading to cardiovascular and renal complications [17].

So in this study we want to see association of Hyperuricemia with Serum creatinine & Blood urea level (kidney function tests) in Diabetes and also effect of High purine diet (Non veg, sea foods, fish, red meat, excess alcohol etc) on hyperuricemia in Diabetic patients which are further additional risk factors for renal dysfunction in diabetic patients with progression of disease.[18]

So reducing these risk factors like restriction of consumption of high purine diet, would surely helpful in preventing development of renal impairment in diabetic patients [19]

AIMS & OBJECTIVES

- 1) To study association of High purine diet with Serum uric acid level (hyperuricemia) in Diabetic patients
- 2) To study association of hyperuricemia with Serum creatinine & Blood Urea (marker of renal dysfunction) in Diabetics.
- 3) To Study association of High Purine diet with renal dysfunction in diabetics compared to Low purine diet diabetics.

Method of collection of data & selection of subjects:

METHODOLOGY

Total 100 diabetic patients attending Biochemistry OPD in tertiary health care centre of central India, were selected for study on their diet habit (Purine diet).

Diet history of all diabetics was taken & all patients were categorized into 2 Groups based on High Purine & Low purine based diet.

Group I include 50 diabetics on High purine diet like consumption of Non Vegetarian diet (sea foods, fish, meat etc) Excess of Alcohol etc while Group II include 50 diabetics on habit of low purine diet like consumption of nuts, eggs, vegetables, fruits, dairy products, milk products etc

All details of study was explained to the subject and informed consent was taken & clinical examination & history was taken as per the proforma.

Selection of the Subject:

a) Inclusion Criteria

- 1) All diagnosed cases of diabetics attending Biochemistry OPD for routine Blood Sugar level check up were included in the study
- 2) On diet history (Purine based) all diabetics categorized into 2 groups out of them 50 High purine diet diabetics & 50 low purine diet diabetics were included in the study
- 3) All diabetics of age group >30 years of age (Type II DM)

b) Exclusion Criteria –

- 1) Diabetic with pre-existing hypertension, heart disease
- 2) Past history of hyper uricemia, Renal dysfunction, Liver Dysfunction, Chronic Hypertension, Gout, History of Drug abuse.
- 3) Pregnant women with gestational diabetes mellitus

Independent 't' test was used to compare the blood parameters & P value less than 0.05 was considered statistically significant.

Collection Of Sample:

Informed consent of each patient (both groups) was taken.

About 5 ml venous blood sample required from each patient from antecubital vein for the estimation of Serum uric acid, Urea & Serum creatinine. It was taken easily by disposable syringe and needle with all aseptic precautions

For estimation of serum Uric acid, Urea & Creatinine - venous blood sample was collected in plain bulb.

METHODS

For Serum Uric acid Estimation –

Kit based on Uricase method (Normal range – 3 to 7 mg%)

For renal function: Serum Creatinine & Blood Urea level estimated.

For Serum Creatinine Estimation: Kit based on Jaffes method (Autoanalyser) (Normal range – 0.8 to 1.5 mg%)

For Blood Urea Estimation: Kit based on GLDH method (Autoanalyser) (Normal range – 10 to 50 mg%)

Analysis was carried on Autoanalyser EM – 460 in clinical Biochemistry lab in IGGMC for Blood Urea, creatinine & serum Uric acid estimation. All estimations were carried out in 100 Diabetic patients including high purine diet and low purine diet. Their values were compared & correlated

Before start of study, approval from Institutional Ethics Committee was Obtained.

This Research work is ICMR approved (REFERENCE ID : 2020-09075)

Type of Study Design : Analytical Cross Sectional Study

RESULT

Table 1

Parameter	Type of diet in diabetics		t value	p value
	High Purine N= 50 Mean SD	Low Purine N= 50 Mean SD		
Serum Uric acid	6.866 ± 0.5465	4.120 ± 0.6273	23.34	< 0.0000001

Table 2

Group Statistics						
	Group	N	Mean	Std. Deviation	Std. Error Mean	t value
Uric Acid	Non Veg	50	6.866	0.546	0.077	23.34
	Veg	50	4.120	0.627	0.078	
Creatinine	Non Veg	50	1.256	0.323	0.046	8.5
	Veg	50	0.846	0.107	0.015	
Urea	Non Veg	50	44.22	7.226	1.022	12.39
	Veg	50	29.32	4.479	0.633	

P' value < 0.05 = statistically significant, 'p' value < 0.001 = statistically highly significant

Table 3

Correlations Serum Uric Acid			
		Non Veg	VEG
Creatinine	Pearson Correlation	-0.287 [*]	0.025
	Sig. (2-tailed)	0.043	0.865
	N	50	50
Urea	Pearson Correlation	0.071	0.113
	Sig. (2-tailed)	0.623	0.434
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

DISCUSSION

As shown in Table 1, mean serum uric acid level was higher among patients with High purine diabetic (6.866 ± 0.5465) compared to Low purine diabetic (4.120 ± 0.6273) which was statistically significant (P value < .05). These findings correlate with Choi HK, Liu S, Curhan G, et al (18) & Schmidt, J.A., Crowe, F.L., Appleby, P.N., Key, et al (20)

While result of our Table 2 shows Serum creatinine level & Blood Urea level in High purine Diabetic was found to be 1.256 ± 0.323 & 44.22 ± 7.226 resp compared to Low purine diabetic 0.846 ± 0.107 & 29.32 ± 4.479 resp. These findings correlate with the Yalamati P, Bhongir AV, et al [21] and Pratik Shah, Petter Bjornstad, Richard J Johnson et al [22]. In their study, they show that there was a significant association between diabetic nephropathy and the levels of uric acid in the patient's serum and stated that Hyperuricemia as a potential risk factor for type 2 diabetes and diabetic nephropathy. Serum uric acid has recently received attention as a potential biomarker independently predicting the development of hypertension, diabetes mellitus, and chronic kidney disease. [22]

UA-mediated oxidative stress-induced lipid peroxidation, DNA damage, and activation of inflammatory factors finally lead to cellular damage. Oxidative stress also can affect the expression of insulin gene, causing a decrease in insulin secretion, Qing Xiong, Jie Liu, and Yancheng Xu [23]

Mohamed Fouad; Hoda Fathy; Amal Zidan et al [24,25] in their Study demonstrated that higher levels of SUA were associated with declines of eGFR and identify the onset of rapid progression of CKD, furthermore at a cutoff level of > 6.5 mg/dl may link to progression of CKD in T2DM patients. Our results were consistent with previous findings, which registered that hyperuricemia seemed to be an independent risk factor for the development of incident CKD rather associated with overt nephropathy and even in normal albuminuria patients with T2DM

In this study, we measured serum uric acid level in high purine diet diabetic (Non veg) and compared with low purine (Veg) diabetic groups. We found that the patients with High purine diabetes had significantly increased serum uric acid level compared to low purine diabetic individuals which was statistically significantly high (p < 0.05) and there was impairment in their renal function test like level of serum creatinine and blood Urea level was higher in high purine nonvegetarian diabetics compared to low purine vegetarian. The results of this study suggest that increased blood Urea and serum creatinine level which are markers of Renal impairment in diabetic might be associated with increased serum uric acid in patients with diabetic with High purine ie consumption of Non vegetarian diet.

CONCLUSION

This study confirmed the positive correlation between High purine diet and serum uric acid level in diabetes mellitus.

SUA mainly affects diabetes and its complications through inflammation, oxidative stress, endothelial function damage, renal damage which causes increased Serum creatinine and Urea level (markers of renal failure) in Diabetic patients . This can be prevented by restriction of purine diet , avoiding high purine like Nonveg & tea etc in diabetics and encouraging to take consumption of Low purine diet.

This study may be useful in patient care in the following way: The derangement of serum uric acid level can be corrected by proper diet (Low purine) which may delay the Renal complications of Diabetes. Alterations in SUA level pose an added risk of Renal complications in diabetics in addition to hyperglycemia. So, along with carbohydrate restricted diet, high purine restriction like nonvegetarian, tea, coffee etc may be helpful in prolonging Renal complications in Diabetics.

Note : This study (Research Work) is approved by ICMR and Institutional Ethics Committee, IGGMC, Nagpur.

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