Association between Serum Uric Acid Levels and Type 2 Diabetes Mellitus- A Prospective Study

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ABSTRACT

Introduction: Uric acid level is considered as early indicator of renal complications in type 2 diabetes mellitus. Therefore aim of present study was to correlate the uric acid levels with serum creatinine levels and microalbuminuria in type 2 Diabetes mellitus subjects.

Material and methods: Present study was conducted in Government Allopathic Medical College & Associated Hospital Banda (U.P.) over the period of one year (January 2019-December 2019). Present study included 90 subjects which were diagnosed type 2 Diabetes mellitus and having age more than 18 years. Patients having renal failure and creatinine levels >1.5 mg/dl, renal stones, drugs affecting renal function were excluded from the study. History was taken and investigations like FBS, PPBS, HbA1c, serum creatinine levels, 24 hours urine albumin was conducted. Data was collected and analyzed by using SPSS-10 (Statistical Package for the Social Sciences).

Results: Maximum cases (32.2%) belonged to age group 61-70 years followed by age group 51-60 years (27.8%) and males (56.7%) outnumbered the females (43.3%). Majority of subjects (78.9%) had elevated fasting blood sugar levels (>126 mg/dl) and about two third subjects (73.3%) had raised PPBS (>200 mg/dl). More than three fourth (82.2%) of the cases had HbA1c levels of more than 6.5. About two third (64.4%) cases had serum creatinine levels more than 1.3 mg/dl. In present study, 71.1% cases had 24 hours urinary albumin level between 30-300 while 14.4% cases had >300 urinary albumin levels (24 hours).

Conclusions: There was significant statistical association between uric acid levels and serum creatinine levels (p value < 0.001). Uric acid levels had statistically significant relationship with fasting blood sugar and PPBS (P value <0.05). Uric acid levels also had statistically significant relationship with twenty four hours urinary albumin levels (p value < 0.05).

Keywords: Uric Acid Levels, Serum Creatinine Levels, Fasting Blood Sugar, Diabetes Mellitus.

INTRODUCTION

Previous various epidemiological studies[1-3] had shown that serum uric acid is associated with increased risk of cardiovascular disease, hypertension and chronic kidney disease. Diabetes Mellitus is also associated with cardiovascular complications, renal complications and metabolic syndrome. Several studies [4-6] have demonstrated positive association between serum uric acid levels and diabetes mellitus while some other studies[7-8] shown no association or inverse association. Therefore aim of present study was to evaluate the level of serum uric acid in type 2 Diabetes mellitus patients and to correlate the uric acid levels with serum creatinine levels and microalbuminuria in type 2 Diabetes mellitus subjects.

MATERIAL AND METHODS

Present study was an observational, descriptive cross sectional study conducted in Government Allopathic Medical College & Associated Hospital Banda (U.P.) over the period of one year (January 2019-December 2019). Present study included 90 subjects which were diagnosed type 2 Diabetes mellitus and having age more than 18 years. Patients having renal failure and creatinine levels >1.5 mg/dl, renal stones, drugs affecting renal function were excluded from the study. History was taken and investigations like FBS, PPBS, HbA1c, serum creatinine levels, 24 hours urine albumin was conducted. Data was collected and analyzed by using SPSS-10 (Statistical Package for the Social Sciences). Chi-square test was used to find out the association between in variables and p value less than 0.05 were considered as statistically significant.

RESULTS

Table 1 shows the demographic profile of cases in present study. Maximum cases (32.2%) belonged to age group 61-70 years followed by age group 51-60 years (27.8%). Least number of cases (3.33%) belonged to age below 30 years. In present study, males (56.7%) outnumbered the females (43.3%).

Table 2 shows the blood sugar profile in present study. Majority of subjects (78.9%) had elevated fasting blood sugar levels (>126 mg/dl) followed by 14.4% subjects had fasting blood sugar levels between 100-125 mg/dl. Only 6.67% cases had blood sugar levels below 100 mg/dl. About two third subjects (73.3%) had raised PPBS (>200 mg/dl)

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S.No.	Variable	No. of cases	% of cases
1	Age group (in years)		
	< 30 years	3	3.33%
	31-40 years	7	7.77%
	41-50 years	12	13.3
	51-60 years	25	27.8
	61-70 years	29	32.2%
	71-80 years	14	15.6
2	Gender		
	Male	51	56.7%
	Female	39	43.3%

Table-1: Demographic Profile of Cases

S. No.	Variable	No. of cases	% of cases
1	Fasting Blood Sugar Level (FBS)		
	>126 mg/dl	71	78.9%
	100-125 mg/dl	13	14.4%
	< 100 mg/dl	06	6.67%
2	Postprandial Blood Sugar Level (PPBS)		
	>200 mg/dl	66	73.3%
	140-199 mg/dl	15	16.7%
	< 140 mg/dl	09	10.0%
3	Hb1Ac level		
	< 6.5	16	17.8%
	6.5-7.0	8	8.9%
	7.1-7.5	10	11.1%
	7.6-8.0	9	10.0%
	>8.0	47	52.2%

Table-2: Blood Sugar Profile of Cases

followed by 16.7% subjects having PPBS levels between 140-199 mg/dl. Only 10% cases had PPBS levels below 140 mg/dl. More than three fourth (82.2%) of the cases had HbA1c levels of more than 6.5 while 17.8% had <6.5 HbA1c levels.

Table 3 shows the association between uric acid level and blood creatinine levels. In present study, 38.9% cases had uric acid level less than 7.4 while 61.1% cases had uric acid more than 7.4. About two third (64.4%) cases had serum creatinine levels more than 1.3 mg/dl. There was significant statistical association between uric acid levels and serum creatinine levels. (p value < 0.001)

Table 4 shows the association between uric acid level and blood sugar levels. In present study, 54.4% cases having uric acid level >7.4 had fasting blood sugar levels of more than 125 mg/dl while only 8.8% cases had fasting blood sugar levels less than 125 mg/dl. 42.2% cases having uric acid level >7.4 had postprandial blood sugar (PPBS) levels of more than 125 mg/dl while only 13.2% cases had postprandial blood sugar levels less than 125 mg/dl. Uric acid levels had

Uric acid (mg/dl)	Serum creatinine (mg/dl)		Total
	< 1.3	>1.3	
< 7.4	17 (18.9%)	18 (20%)	35 (38.9%)
>7.4	15 (16.7%)	40 (44.4%)	55 (61.1%)
Total	32 (35.5%)	58 (64.4%)	90
X^2= 11.41, p value < 0.001			

Table-3: Association between Uric acid levels and blood creatinine levels

Uric acid (mg/dl)	Fasting Blood Sugar (mg/dl)			Total
	< 100	100-125	>125	
< 7.4	02 (2.2%)	09 (10%)	22 (24.4%)	33 (36.7%)
>7.4	04 (4.4%)	04 (4.4%)	49 (54.4%)	57 (63.3%)
Total	06 (6.6%)	13 (14.4%)	71 (78.9%)	90
X^2= 11.07, p value = 0.003				
Uric acid (mg/dl)	Postprandial Blood Sugar (mg/dl)			Total
	< 140	140-199	> 200	
< 7.4	04 (4.4%)	08 (8.9%)	28 (31.1%)	40 (44.4%)
>7.4	05 (5.5%)	07 (7.8%)	38 (42.2%)	50 (55.6%)
Total	09 (10%)	15 (16.7%)	66 (73.3%)	90
X^2= 6.52, p value = 0.03				
Uric acid (mg/dl)	HbA1c level (%)			Total
	< 6.5	>6.5		
< 7.4	10 (11.1%)	24 (26.7%)		34 (37.7%)
>7.4	6 (6.66%)	50 (55.6%)		56 (62.3%)
Total	16 (17.8%)	74 (82.2%)		90
X^2= 18.62, p value < 0.001				

Table-4: Association between Uric acid levels and blood sugar levels (FBS, PPBS, HbA1c levels)

Uric acid (mg/dl)	24 hours urinary albumin levels			Total
	< 30	30-300	>300	
< 7.4	07 (7.8%)	19 (21.1%)	06 (6.7%)	32 (35.6%)
>7.4	06 (6.7%)	45 (50.0%)	07 (7.8%)	58 (64.4%)
Total	13 (14.4%)	64 (71.1%)	13 (14.4%)	90
X^2= 7.214, p value = 0.03				

Table-5: Association between Uric acid levels and 24 hours urinary albumin levels

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statistically significant relationship with fasting blood sugar and PPBS. (P value <0.05) In present study, in 55.6% cases having uric acid level >7.4 had HbA1c levels more than 6.5 and showed statistically significant relationship between uric acid levels and HbA1c levels. (p value < 0.001)

Table 5 shows the association between uric acid level and 24 hours urinary albumin levels. In present study, 71.1% cases had 24 hours urinary albumin level between 30-300 while 14.4% cases had >300 urinary albumin levels (24 hours). Uric acid levels had statistically significant relationship with twenty four hours urinary albumin levels. (p value < 0.05)

DISCUSSION

In present study, we evaluated the association of serum uric acid with blood sugar levels, serum creatinine and 24 hours urine albumin levels. Maximum cases (32.2%) belonged to age group 61-70 years followed by age group 51-60 years (27.8%). Similar results were observed by the study done by various authors (Sirsath et al.[9] and Behradmanesh S et al.[10]) In present study, males (56.7%) outnumbered the females (43.3%). Study done by Prashant et al.[11] and Prabhuswamy et al.[12] also observed male predominance over females in their studies.

In present study, Majority of subjects (78.9%) and 73.3% had high fasting and postprandial blood sugar levels respectively. The results of present study are in accordance with study done by sirsath et al.[9] Study done by Talwar et al.[13] had higher mean FBS in comparison of present study. The uric acid of majority number of present study participant females (80.39%) had level of ≥ 6.3, rest (19.61%) had levels of 2.1–6.3. Blood urea of majority number of subjects (91.1%) had values of more than 26 mg/dl while 8.89% had values of 10-26 mg/dl. Study by Prabhuswamy et al.[12] had mean urea level (22.8) lower than current study.

About two third of subjects (64.4%) had creatinine levels more than 1.3 while rest had level less than 1.3. Study done by Prabhuswamy et al.[12] had mean creatinine level (0.805) which is lower than the levels of present study. In present study, twenty four hour urinary albumin levels were maximum in the range of 30-300 mg/dl levels (71.1%) followed by levels of >300 mg/dl in 14.4% cases. Suryawanshi et al.[14] found increased microalbuminuria in diabetics in accordance to present study while in contrast to present study, Wen CP et al.[15] had lower levels of microalbuminuria.

In present study, there was statistically significant association between 24 hours urine albumin and Uric acid levels (p value=0.03). Similar findings were observed by Goyal B et al, Sirsath et al.[9] and Prabhuswamy et al.[12] Microalbuminuria is considered as good predictor of diabetic nephropathy and it is helpful in detection of renal diseases at earlier stage. In present study, statistically significant correlation was observed between serum creatinine levels and uric acid levels (p<0.001). Similar results were also observed in study done by Goyal B et al.[16] Uric acid levels is used as an indicator of cardiac risk which further increases the cardiac risk in cases of type 2 diabetes mellitus.

CONCLUSION

The present study is predominated by age group 61-70 years and male outnumbered female. Elevated uric acid levels were observed in subjects with high blood sugar levels as there is positive correlation between them. There was statistically significant correlation between serum creatinine levels and uric acid levels in subjects having type 2 Diabetes mellitus. There was statistically significant correlation between uric acid levels and 24 hours urine albumin levels. In present study, positive correlation of uric acid levels with HbA1c was seen. Therefore it is wise to check uric acid and urine albumin levels in subjects having type 2 Diabetes mellitus to prevent renal complications.

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