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Original article

Study of serum uric acid levels in acute ischemic stroke in type 2 diabetes mellitus

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Abstract:

Introduction: In stroke the role of serum uric acid levels as an independent risk factor is being analyzed recently. Raised SUA predict susceptibility for stroke by substantial evidence through epidemiological research.

Methodology: Patients who were known diabetes on oral hypoglycemic drugs and newly diagnosed with type 2 diabetes. Patients with first episode of ischemic stroke and ischemic stroke are documented with CT scan or MRI taken within 48 hours of onset of symptoms of focal neurological deficit. patients willing to participate in the study by giving written informed consent

Results: Multiple regression analysis showed only significant effect of HDL with serum UA. Rest of all variable like BMI, smoking, alcohol, duration of diabetes and HTN, BSL R and F, Hba1c, total cholesterol, trigyceride, LDL, and VLDL did not have any effect on serum UA.

Conclusion: From our study we conclude that SUA can be considered as a marker for risk of stroke. Current data suggested that SUA could be correlated to the advancement of nephropathy and HTN in patients with DM in the study.

Keywords: Serum uric acid, Type 2 diabetes mellitus

Introduction

In stroke the role of serum uric acid levels as an independent risk factor is being analyzed recently.[1] Raised SUA predict susceptibility for stroke by substantial evidence through epidemiological research.[2,3] Therapeutic interventions with reducing SUA levels have shown significantly decrease Cerebrovascular disease mortality and morbidity.[4] The incidence of adverse vascular events like cerebrovascular accidents confers 2 to 4 fold higher risk in DM patients. Hyperinsulinemia pathological effect of DM has only been partially attributed for the increased risk. Recently it has been found that insulin resistance has been related with SUA.[5] One study shows that hyperuricemia is reliable predictor of CV events in senior diabetic patients independent of the remaining CV risk factors.[6] The role of raised SUA levels in the etiopathogenesis of CV disease is to be confirmed whether if it is just a co-incidental finding.[7] NHANES I study shows data which support a positive relation between SUA and stroke in middle age people, after including the other confounding factors [Fang J]. To start primary preventive measures raised SUA levels can be useful for predicting patients at risk for stroke.[8] With this dispute and lack of Indian data, current study is done to estimate SUA levels and its association in DM subjects with AIS.

Material and Methods:

This was an observational cohort study conducted at Dr. D.Y.Patil Medical College, Hospital and Research Centre, Dr.D.Y.Patil Pimpri, Pune for two years duration .

Sample size: 40 cases

Method of study:

- DM was diagnosed by plasma glucose >=11.1 mmol/l (200 mg/dl), confirmed on a next day by 1) FPG >=7 mmol/l (126mg/dl), 2) an OGTT with 2h post load value >= 11.1 mmol/l (200 mg/dl), or 3) symptoms with plasma glucose >=11.1 mmol/l (200mg/dl), justify diagnosis of diabetes. An HbA1c of 48mmol/mol (6.5%) is recommended as the cut off point for diagnosing diabetes.
- CT scan or MRI scan done within 48 hr of focal neurological deficit.
- Serum uricacid was done to the presenting with AIS in Type 2 DM patients.
- A full history was taken of patients who met the diagnostic criteria.
- Each participant was followed up until the end of hospitalization (defined either as death of a patient or discharged alive).

Inclusion criteria:

- Patients who were known diabetes on oral hypoglycemic drugs and newly diagnosed with type 2 diabetes.
- Patients with first episode of ischemic stroke and ischemic stroke are documented with CT scan or MRI taken within 48 hours of onset of symptoms of focal neurological deficit.
- patients willing to participate in the study by giving written informed consent

Exclusion criteria:

- Patients with type 1 DM
- Nondiabetic patients with ischemic stroke
- Patients who are on thiazide diuretics(Chlorothiazide, chlorthalidone, Indapamide, Hydrochlorothiazide, Methyclothiazide, Metolazone)
- Patients with previously diagnosed with Transient ischemic attack/Cerebrovascular accident
- Patients who are known cases of gout or show clinical evidence of gout.
- Patients with chronic renal failure.
- Patients whose CT manifest with space occupying lesions or hemmorage other than infarct.
- Patients with myeloproliferative disorders or with hematological abnormalities like leukemia.

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program.

Results

In the study, 60-70 years age groups (42.5%) patients were higher noticed followed by 50-60 age groups (30%), 40-50 age groups (17.5%) and > 70 age groups (10%). Male (75%) were higher as compared to female (25%) Smoker patients (52.5%) were more in number as compared to non smoker (47.5%) Alcoholic patients (55%) were more in number as compared to non alcoholic (45%). Higher BMI was recorded 25-29.9 category in followed by 30-34.9 category. Weakness felt on right side was 57.5% and Weakness felt on left side was 42.5%. Almost all patients were having same duration of diabetes. i.e 5-10 year duration of diabetes in 37.5% patients, 1-5 year duration of diabetes in 32.5% patients and >10 year duration of diabetes in 30% patients . 75% patients have history of HTN. 5-10 year of HTN (46.7%) was higher as compared to 1-5 year (26.6%) and > 10 year

(26.6%) HTN. BMI and serum UA was showed statistically non significant results because BMI category was showed same UA levels in each category.

Table 1: correlation of the serum UA with blood reports

		PRE
DM	Pearson Correlation value	-.103
	P value	.526
HTN	Pearson Correlation value	-.058
	P value	.720
HB	Pearson Correlation value	.045
	P value	.782
TLC	Pearson Correlation value	-.073
	P value	.654
ESR	Pearson Correlation value	-.123
	P value	.451
Platelets	Pearson Correlation value	.178
	P value	.271
S billurubin	Pearson Correlation value	-.192
	P value	.236
SGOT	Pearson Correlation value	-.099
	P value	.543
SGPT	Pearson Correlation value	-.021
	P value	.897
ALP	Pearson Correlation value	-.137
	P value	.399
B UREA	Pearson Correlation value	-.077
	P value	.639
S creatinine	Pearson Correlation value	-.067
	P value	.681

Diabetes, HTN, haemoglobin, TLC, ESR, platelets, serum bilirubin, SGOT, SGPT, ALP, blood urea and serum creatinine did not any correlation with serum uric scid.

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Table 2: Fundus and serum UA wise distribution of the study

Pre			Fundus		Total
			Normal	Retinopathy	
S UA	5-10	N	5	0	5
		%	100.0%	0.0%	100.0%
	10-15	N	10	15	25
		%	40.0%	60.0%	100.0%
	>15	N	3	7	10
		%	30.0%	70.0%	100.0%
Total		N	18	22	40
		%	45.0%	55.0%	100.0%

P value=0.02 (S)

Out of 25, 15 patients have retinopathy in 10-15 serum UA level and out of 10, 7 patients have retinopathy in >15 serum UA level. Comparison of serum UA and fundus showed statically significant results.

Table 3: Carotid doppler and serum UA wise distribution of the study

			Carotid doppler				Total
			Bilateral 30% stenosis	Bilateral 50% stenosis	Bilateral 60% stenosis	Normal	
S UA	5-10	N	0	0	0	5	5
		%	0.0%	0.0%	0.0%	100.0%	100.0%
	10-15	N	3	6	6	10	25
		%	12.0%	24.0%	24.0%	40.0%	100.0%
	>15	N	5	2	1	2	10
		%	50.0%	20.0%	10.0%	20.0%	100.0%
Total		N	8	8	7	17	40
		%	20.0%	20.0%	17.5%	42.5%	100.0%

P value=0.03 (S)

Out of 25, 12 patients have 50% and 60% bilateral stenosis in 10-15 serum UA level and out of 10, 5 patients have 30% bilateral stenosis in >15 serum UA level. Comparison of serum UA and Carotid doppler showed statically significant results.

Table 4: Multiple regression analysis for serum UA

	Unstandardized Coefficients		P value	95.0% Confidence Interval for B	
	B	Std. Error		Lower Bound	Upper Bound
BMI	-.116	.127	.371	-.377	.146
Smoking	.279	.688	.688	-1.134	1.693
Alcohol	-1.288	.743	.095	-2.816	.241
Duration of DM	-.099	.121	.423	-.348	.150
Duration of HT	.096	.103	.359	-.116	.309
BSL R	-.017	.011	.141	-.039	.006
BSL F	.007	.009	.419	-.011	.026
Hba1C	-.080	.209	.704	-.509	.349
Total cholesterol	-.010	.015	.517	-.040	.020
Triglyceride	.002	.008	.818	-.014	.018
LDL	.009	.012	.482	-.016	.033
VLDL	.056	.031	.084	-.008	.119
HDL	-.277	.111	.01 (S)	-.505	-.048
Duration of stay	0.23	0.16	0.11	-.07	0.62

Multiple regression analysis showed only significant effect of HDL with serum UA. Rest of all variable like BMI, smoking, alcohol, duration of diabetes and HTN, BSL R and F, Hba1c, total cholesterol, trigyceride, LDL and VLDL did not have any effect on serum UA.

Discussion

In our study, SUA level was found insignificantly higher in males (13.59) as compared to females (13.16). Framingham heart study[9] also showed higher SUA levels in males. Nearly same observation was seen in study conducted by Milionis HJ (2012)[10] et al and in the other study.[9]

In our study, there was no notable association among SUA level HTN, DM, smoking, alcohol, total cholesterol, triglyceride, LDL, VLDL and Hba1C. Mehrpour M (2012)[11] et al also showed no notable association between SUA level and HTN, DM, and smoking. The contrast results given by Bonora E (1996)[12] et al. In this study, we found a only notable negative correlation with HDL cholesterol and SUA levels (P <.009, r = -0.4,). The results were not support by Mapoure Y (2019)[13] et al. they have found that SBP, DBP, creatinine, urea, triglycerides and LDL cholesterol showed a positive correlation with SUA levels. According to Kaur I (2017)[14], TG, LDL, HDL and total cholesterol did not show any significant difference with serum UA. One of the study found that SUA was notably associated with triglyceride levels (P < .01, r = 0.14,) and HDL cholesterol (P < 0.01, r = -0.25). Another study[15] has seen a notable correlation between triglyceride (P < 0.05) and SUA. In one study conducted by Qin et al (2014),[16] in Shanghai, which is a population based cross sectional

study, SUA levels were positively related with BMI, triglycerides, waist circumference and negatively related with HDL-cholesterol. IN one the studies raised levels of total cholesterol has increased the risk of ischemic stroke.[17] A meta-analysis[18]conducted on 90000 patients has shown taking of statins lower the risk of stroke in patients with coronary artery disease and that risk lowering is primarily related to magnitude in which LDL-C levels are reduced.

Conclusion

From our study we conclude that SUA can be considered as a marker for risk of stroke. Current data suggested that SUA could be correlated to the advancement of nephropathy and HTN in patients with DM in the study.

Limitation

The main limitation of this study was the sample size, which was relatively smaller. Hence, a similar study with larger number of patients can be carried out.

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