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Association between Serum Uric Acid Level andComponents of the Metabolic Syndrome

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Abstract

Introduction: Hyperuricemiaor elevated serum uric acid level is a biochemical entity that is gaining increasing importance not only as a cardiovascular risk factor but also play a role in the development of metabolic and life style related diseases. In this study we sought to determine the association between serum uric acid and the number of risk factors that contribute to the metabolic syndrome. **Method:** This is a cross-sectional study done from April 2019 to June 2020 in Shyam Shah Medical College and Sanjay Gandhi Memorial Hospital, Rewa ,M.P. The study included a total of 180 patients fulfilling inclusion criteria. **Observation and results:** Serum uric acid level statistically well correlated with Systolic blood pressure, Diastolic blood pressure, Fasting blood sugar, Serum triglyceride levels, serum HDL levels and Waist circumference with p value of 0.0001,<0.0001,<0.0001,0.0004,0.0285 and 0.026 respectively. **Conclusion:** Serum uric acid can be considered as an additional investigation who present with any of the metabolic syndrome components, and if hyperuricemia is found an active search for other risk factors to be made.
Keywords: Metabolic Syndrome, Hyperuricemia, Uric Acid.

Introduction

Metabolic syndrome is a cluster of cardiovascular risk factors characterised by central obesity, insulin resistance, atherogenic dyslipidemia and hypertension.Hyperuricemia or elevated serum uric acid level is a biochemical entity that is gaining increasing importance not only as a cardiovascular risk factor but also play a role in the development of metabolic and life style related diseases. Recently growing evidences suggest that uric acid may have a key role in the pathogenesis of metabolic syndrome and some scholars considers hyperuricemia as a component of metabolic syndrome.The prevalence of metabolic syndrome is estimated to be around 20–25 percent of the population[1].The prevalence increases with age, affecting less than 10 percent of people in their 20s and 40 percent of people in their 60s[2].In this study we sought to determine the association between serum uric acid and the number of risk factors that contribute to the metabolic syndrome, and which factor is associated most with higher serum uric acid level in patients.

Material and methods

This is a cross-sectional study done from April 2019 to June 2020 in Shyam Shah Medical College and Sanjay Gandhi Memorial Hospital, Rewa,M.P.The study included a total of 180 patients fulfilling inclusion criteria.Metabolic syndrome status was defined according to the criteria set in the Third report of the NCEP (National Cholesterol Education Program)ATP(Adult Treatment Panel)3.
Hyperuricemia is defined as the serum uric acid >7.0 mg/dl in adult

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males, >5.7 mg/dl in adult females.

Inclusion Criteria
1. Age > 18 yrs.
2. Patient fulfilling any criteria of Metabolic Syndrome (according to NCEP ATP 3 modified criteria)

Exclusion Criteria
1. Patients with renal disorders.
2. Patients on treatment with drugs altering uric acid levels.
3. Alcoholics
4. Gout

Data collection and methods: -Patient presenting to OPD as well as those admitted in the medicine ward, full filing the inclusion criteria, during the study period.

Statistical analysis: - The collected data would be analyzed using the computer programed Statistical Package for Social Sciences (SPSS 33.0) and word pad 10.0. Microsoft word and Excel would be used to generate graphs tables etc. Data will be analyzed using Correlation Study and appropriate statistical test.

Results

During this study following data was obtained; As shown in Table 1 majority of the patients in our study fall into the age group of 30 to 60 years (88 %). The occurrence of metabolic syndrome was also found to be higher in the age group of 30 years to 60 years (90 %).

As shown in Table 2 serum uric acid level statistically well correlated with systolic blood pressure(SBP), diastolic blood pressure (DBP), fasting blood sugar(FBS), serum triglyceride levels(TG), serum HDL levels and waist circumference(W.C) with p value of <0.0001,<0.0001,<0.0001,0.0004,0.0285 and 0.026 respectively.As shown in Table 3 odds ratio calculated showed an increased risk of developing various metabolic syndrome components among hyperuricemic patients with odds ratio between hyperuricemia and metabolic syndrome of 2.84 with p value- 0.0061.

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As shown in Table 4 mean number of metabolic syndrome components increased significantly among hyperuricemic patients, they had average 3.69 ± 1.14 components compared to 2.68 ± 1.04 components present in normouricemic subjects, which is statistically significant with a p-value of <0.0001.

In our study as per Table 5 prevalence of hyperuricemia was 50% among the patients with metabolic syndrome as compared to 26 % in patients with absent metabolic syndrome. Prevalence of hyperuricemia was found to be 43 % in our study.The possible cut of levels above which incidence of metabolic syndrome become high was found to be 7.0 mg/dL for males and 5.7 mg/dL for females.

Table 1 :Age wise distribution of Patients

Age(in years)	Metabolic Syndrome present [no. (%)]	Metabolic Syndrome absent [no. (%)]	Total no. of Patients [no. (%)]
< 30	6(3.3)	2(1.1)	8(4.4)
30-60	117(65)	43(23.8)	160(88.8)
>60	7(38.8)	5(2.8)	12(66.6)
Total	130(72.2)	50(27.8)	180(100)

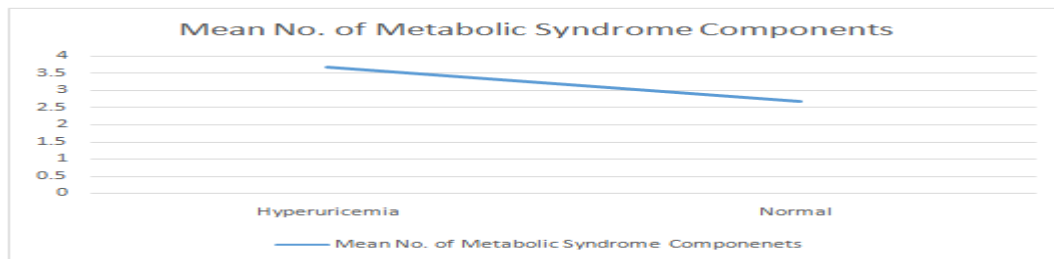**Table 2 :Correlation between serum uric acid and metabolic syndrome components**

Serum uric acid levels	SBP	DBP	FBS	TG	HDL	W.C
Hyperuricemia						
NO.	78	78	78	78	78	78
MEAN	142.09	86.82	143.1	162.35	45.74	93.16
S.D	9.08	4.57	42.21	21.56	12.49	7.48
Normal						
NO.	102	102	102	102	102	102
MEAN	132.35	83.29	106.56	150.37	50.20	90.21
S.D	14.76	4.85	23.10	22.79	14.1	9.6
Total NO.	180	180	180	180	180	180
P VALUE	<0.0001	<0.0001	<0.0001	0.0004	0.0285	0.026

Table 3: Odds ratio of metabolic syndrome and individual components according to serum uric acid levels

	Hyperuricemia Odds ratio	P value
Metabolic syndrome	2.84	0.0061
Components -		
Elevated SBP	6.54	<0.0001
Elevated DBP	3.42	<0.0001
Hyperglycaemia	3.13	0.0031
Hypertriglyceridemia	2.55	0.0066
Low HDL	2.41	0.0063
High Waist circumference	2.22	0.0131

Table 4:Correlation between Mean Number of Metabolic syndrome components to serum uric acid level

Serum uric acid	Mean No. of Metabolic Syndrome Components	Standard deviation
High	3.69	1.14
Normal	2.68	1.01

Fig 1: Correlation between Mean Number of Metabolic syndrome components to serum uric acid level

Table 5:Correlation between metabolic syndrome and serum uric acid level

Serum uric acid	Metabolic Syndrome present [no. (%)]	Metabolic Syndrome absent [no. (%)]	Total No. of patients [no. (%)]
High	65(36.1)	13(7.2)	78(43.3)
Normal	65(36.1)	37(20.6)	102(56.7)

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Total No. of patients	130(72.2)	50(27.8)	180(100)

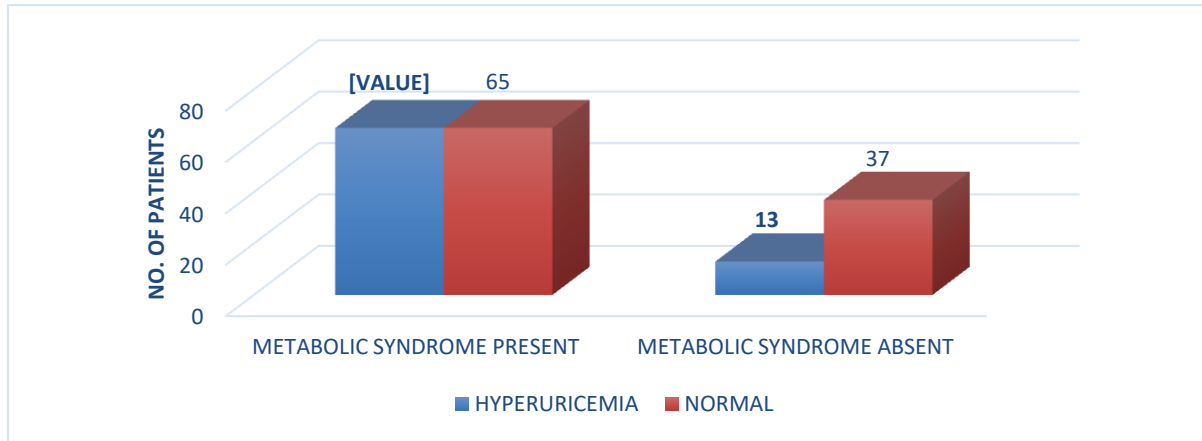Fig 2: Correlation between metabolic syndrome and serum uric acid level

Discussion

Metabolic syndrome, is a cluster of risk factors for bothcardiovascular and cerebrovascular events, and should be identified early and appropriate preventive measures should be taken. Recent studies suggest importance of uric acid as a component of the metabolic syndrome. Its correlation with various components have been studied separately all over the world, but there are only limited studies available taking all components of metabolic syndrome into consideration.In my study I have made an attempt to find a correlation between serum uric acid levels and the various components of metabolic syndrome. Out of five components of metabolic syndrome, systolic bloodpressure, diastolic blood pressure, fasting blood glucose, triglyceride level and waist circumference showed significant positive correlation with serum uric acid levels while HDL level showed significant negative correlation with serum uric acid levels. Similar results were found in study conducted by Khichar et al [3],Kumari et al [4] ,Sachdev et al [5], Yalla et al [6]. , Lin et al [7].Odds ratio calculated showed an increased risk of developing various metabolic syndrome components among hyperuricemic patients. Similar results were found in study conducted by Ismail et al [8].

Hyperuricemia has been reported to be associated with several components of metabolic syndrome and authors have postulated that increased concentrations of uric acid may be another important component of the syndrome[9].

Conclusion

Serum uric acid level statistically well correlated with Systolic blood pressure, Diastolic blood pressure, Fasting blood sugar, Serum triglyceride levels, serum HDL levels and Waist circumference.Number of metabolic syndrome components increased significantly among hyperuricemic patients. Serum uric acid can be considered as an additional investigation who present with any of the metabolic syndrome components, and if hyperuricemia is found an active search for other risk factors to be made.

Limitation

The study was carried out in a limited population which cannot represent the entire population of the world. Our study was a cross sectional study which showed direct relationship between increased uric acid level and metabolic syndrome. However with this study we cannot inferred that whether increased uric acid level leads to metabolic syndrome or vice versa.

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Conflict of Interest: Nil
Source of support:Nil