



Original Research Article

Prevalence of Hyperuricemia and Its Relation with Metabolic Syndrome in A Select Nomad Tribal Populations of Rajasthan, India

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ABSTRACT

Objectives: The prevalence of hyperuricemia has rarely been investigated among these populations. The purpose of the present study was to investigate the prevalence of hyperuricemia and the association between uric acid levels and the various metabolic syndrome risk factors.

Methods: This cross-sectional health examination survey was based on a population random sample from the select three districts of state of Rajasthan. It included 1440 subjects aged ≥ 18 years. Blood pressure (BP), Random blood glucose levels, body mass index (BMI), waist circumference, waist-to-hip ratio, total cholesterol and uric acid was measured. Data were analyzed using scatter plot smoothing techniques and linear regression models.

Results: Overall incidence rate of hyperuricemia among these populations were 13.5%. It was 14.4% in men and 12.8% in females. Hyperuricemia were associated with all the known metabolic syndrome and CVD factors but to a lesser degree.

Conclusion: Prevalence of hyperuricemia was high among these populations. Hyperuricemia may be considering as an independent indicator. It may enhance the risk for getting the diseases.

Key words: Hyperuricemia, hypertension, type 2 diabetes, WC and BMI

INTRODUCTION

Metabolic Syndrome is an assemblage of abnormalities that confers an increased risk of developing not only cardiovascular disease (CVD) but also type 2 diabetes mellitus. ^[1] It has reached to

pandemic proportions worldwide. ^[2] About 20-30% of adult population worldwide is suffering from this disorder. ^[3] Millions of people in developing countries are facing a double health burden that represents an unsettling modern-day paradox i.e. the impact of poverty-related diseases

(associated with contagious and nutrition) is being exacerbated by the increasing load of chronic non communicable diseases. [4]

According to a recent systematic review of studies published between 1998 and 2005, has shown the strong association between the metabolic syndrome and the risk of CVD. [5] Metabolic syndrome also increases incidence of coronary heart diseases and diabetes. [6] Apart from its association with cardiovascular disorder and diabetes mellitus, it is a common soil for numerous other clinical disorders too and so it has become a matter of great debate. [7] The prevalence of metabolic syndrome is rapidly increasing in developing countries due to changing lifestyle. The prevalence of hyperuricemia has been increasing in recent years, not only in advanced countries but also in developing countries, along with the development of their economies. It has been suggested that hyperuricemia is associated with metabolic syndrome. [8, 9] Nomad's tribal populations are moving faster towards urbanization and follow their lifestyles pattern and there seems to be no literature available regarding hyperuricemia and its correlation with metabolic disorders among these populations. So objective of this study was to estimate the prevalence of hyperuricemia with metabolic syndrome and the association between uric acid levels and the various metabolic syndrome components in our country.

MATERIALS AND METHODS

The present study was conducted in three select districts of Rajasthan. A total of 1440 subjects were included in the study, Out of which 807 were females (56%) and males 633 (44%). Height and body weight were measured with participants standing

without shoes and heavy outer garments. Body mass index (BMI) was calculated as weight divided by height squared (kg/m²). Hip and waist were measured to the nearest 1 cm. Family history, lifestyle habits and other possible metabolic syndrome risk factors were assessed by means of a standard questionnaire. Random plasma glucose, total cholesterol and uric acid levels, were measured by using Easy touch glucose, uric acid and cholesterol meter (GCU). We defined subjects as hyperuricemia if their serum uric acid concentration was >7.0mg/dl. Blood pressure was taken after a 10-min rest using a digital blood pressure machine. Classification of hypertension was based on American Diabetes Association guidelines. Healthy blood pressure was taken to be <120/80, early high blood pressure was taken to be between 120/80 and 140/90 while blood pressure 140/90 or higher was considered to be hypertension. The study was approved by the institutional human ethics committee at BITS, Pilani, Rajasthan, India and performed according to the Declaration of Helsinki. All study members were given detailed explanation of the study in their regional language before obtaining their written consent

RESULTS

The present study was carried out in 1440 subjects comprising of 807 females (mean age, 42.65±16.84) and 633 males (mean age, 42.58±19.37). Table 1 shows demographic, anthropometric and other clinical characteristics of the study population. Mean values of uric acid level of males were slightly higher than females as shown below in table.

TABLE.1 A description of various clinical, anthropometric and biochemical parameters in these lesser studied populations

	Males Mean±Std	Females Mean±Std	Total Mean±Std
Age of respondents (yrs)	42.58±19.37	42.65±16.84	42.62±17.99
Weight (kg)	56.88±11.02	51.40±10.71	53.81±11.18
Height(cm)	165.19±8.11	155.86±7.39	159.96±9.000
Waist circumference(cm)	76.37±12.06	74.58±12.10	75.36±12.11
Waist to height ratio(cm)	.4632±.0718	.4801±.07985	.4727±.0768
Body mass index(kg/m ²)	20.88±3.67	21.20±4.34	21.06±4.065
Hip circumference (cm)	84.41±10.38	84.05±12.07	84.21±11.36
Waist to hip ratio (cm)	.9043±.0737	.8890±.0790	.8957±.077
Systolic blood pressure mm/Hg)	129.45± 18.03	125.39±18.87	127.17±18.61
Diastolic blood pressure(mm/Hg)	81.08±12.55	80.01±12.27	80.48±12.40
Glucose test (mg/dl)	110.75±29.26	111.48±26.64	111.16±27.81
Cholesterol (mg/dl)	186.44±45.70	183.27±45.81	184.66±45.77
Uric (mg/dl)	4.91±2.24	4.77±2.33	4.83±2.296

Overall, the prevalence of Hyperuricemia was found 13.5%. Hyperuricemia was more frequent in men than women (14.4% Vs 12.8%).

Table No. 2: Showing prevalence of hyperuricemia

Sex	No. of subjects With SUA		Prevalence (%)
	Normal	Elevated	
Male	542	91	14.4
Female	704	103	12.8
Total	1246	194	13.5

It was found that the prevalence rate of hyperuricemia increases as the age rises .As it could be seen below from the table 3 the incidence rate of hyperuricemia was maximum at the highest level of age. Association between age and hyperuricemia was found to be statistically significant (p<0.05)

Table 3: Prevalence of uric acid level according to different age groups

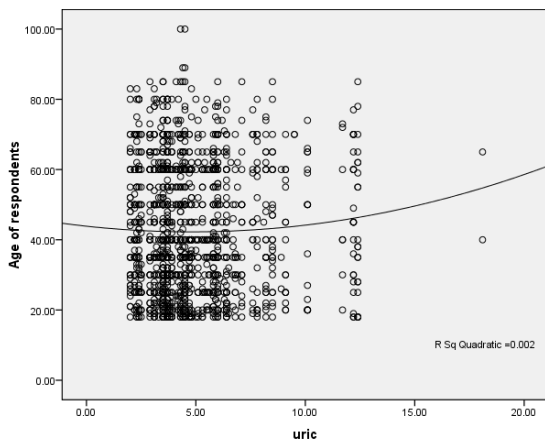
		Uric acid levels		Total
		Normal(2-7 mg/dl)	Abnormal (above 7)	
Age of respondents	18-27	326 (86.7%)	50 (13.3%)	376 (100%)
	28-37	261(90.3%)	28 (9.7%)	289(100%)
	38-47	190 (85.6%)	32 (14.4%)	222 (100%)
	48-57	150 (90.4%)	16 (9.6%)	166 (100%)
	58-67	187 (83.5%)	37 (16.5%)	224 (100%)
	68-77	88 (77.9%)	25 (22.1%)	113 (100%)
	78-87	40 (87.0%)	6 (13.0%)	46 (100%)
	88-97	2(100%)	0(0%)	2(100%)
Total		1246(86.5%)	194 (13.5%)	1440(100%)

Chi-square=15.489, p=0.05

Linear regression analysis was carried out to find out the correlation ship between age of respondents and level of uric acid. It was found to be positively correlated (r=0.03) based on t-value (1.321). (Fig 1)

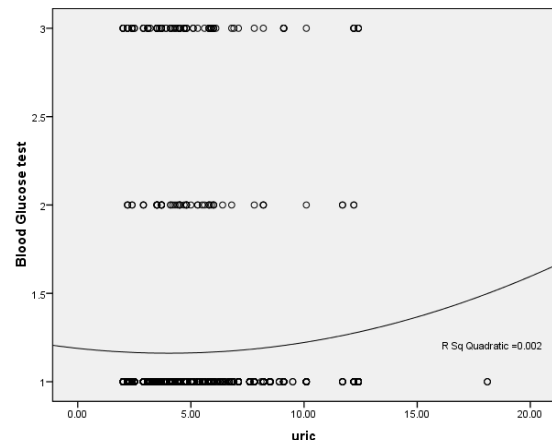
2 diabetes and hyperuricemia and it was found to be positively correlated (r=0.04) based on t value (1.528) but not statistically significant as shown below in scatter plot diagram.(Fig 2)

Figure 1: Shows the correlation ship between the age of respondents and hyperuricemia



Co relational analysis was done to find out the significant correlation ship between type

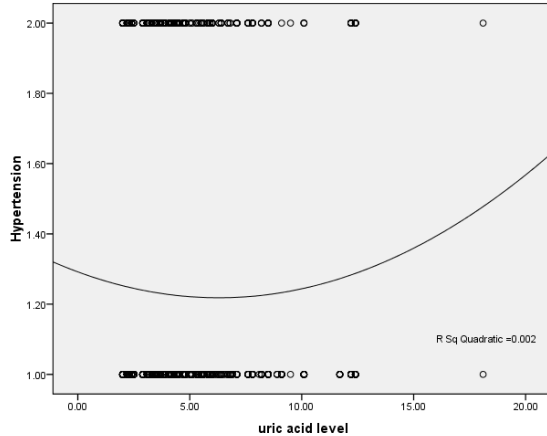
Figure: 2 Scatter plot diagram to show the correlation ship between type 2 diabetes and uric acid level



Linear regression analysis was carried out to get to know the positive correlation between

hypertension and hyperuricemia .It was found to be positively correlated($r=0.009$) but again the correlation was statistically insignificant (Fig 3)

Figure 3: Correlation ship between hypertension and hyperuricemia



Linear regression analysis was done to find out the correlation between general (BMI) and central (WC) obesity. It was found to be positively correlated with both the adiposities($r=0.01$) based on t values (0.393) and (t-value (0.718) but statistically non-significant (Fig 4 a, b)

Figure 4 (a): Scatter plot diagram to show the correlation ship between adiposities and level of uric acid

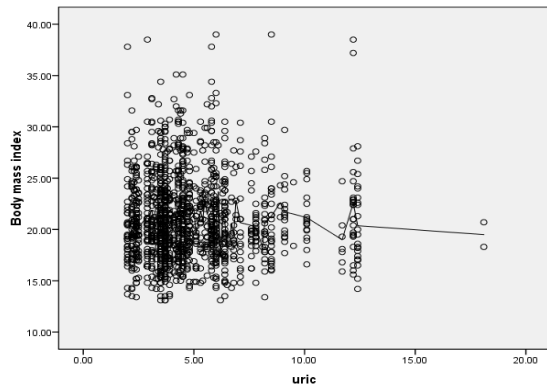
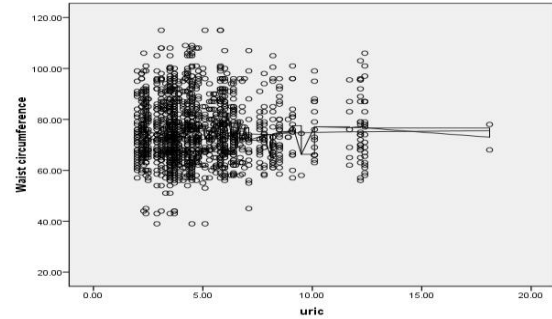
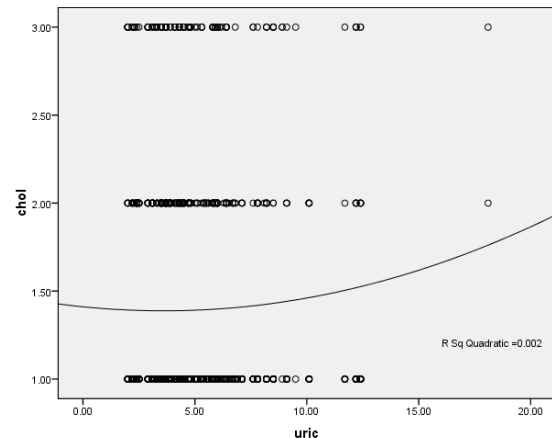


Figure 4. (b)



Lastly correlation ship was carried between cholesterol levels and uric acid levels Positive correlation was found ($r=0.03$) based on t-value (1.473). But it was not found statistically significant. (Fig 5)

Figure 5: Correlation ship between cholesterol levels and hyperuricemia



DISCUSSION

Elevated serum uric acid levels are commonly seen in association with glucose intolerance, hypertension and dyslipidemia, a cluster of metabolic and hemodynamic disorders which characterize the so-called metabolic syndrome. [10] Similar results have been found in the present study. In the past several decades, the prevalence varied greatly and appeared to be increasing. There was lots of information that demonstrated the importance of serum uric acid to the clinical prognosis, so the importance of hyperuricemia (HU) is increasing. It

reported that 18.8% of the patients with HU developed into gout in a 5 year follow-up. [11] Independent association between HU and cardiovascular disease has been found in many studies. [12, 13] Hyperuricemia has been reported to be associated with several components of metabolic syndrome (MS) and authors have postulated that increased concentrations of uric acid may be another important component of the syndrome. [14] Similar findings have been observed in the present study that hyperuricemia have shown positive correlation with each metabolic syndrome factors but correlation was not strongly significant. Significant association between age of respondents and hyperuricemia was observed in the present study. Similar results have been noted in other studies that with increasing age, the level of uric acid increases. Serum uric acid concentration increases with age and further increases after menopausal in women. Uric acid levels are often increased in subjects with MS, [15] further suggesting that uric acid could be included in the definition of MS. [16] Subjects with persistent hyperinsulinemia related to MS may have an additional effect on renal target organ damage and cause both arise in UAE and uric acid during the early stages. The results of the present study have reveal the facts that hyperuricemia has been positively correlated with the known risk factors for MS like central and visceral adiposities, elevated cholesterol levels, hypertension and type 2 diabetes. Males have higher level of uric acid as compared to females but statistically the differences was not significant. [17, 18] With rapid industrial development and due to that hike in financial status possibility of improved nutrition and promotion of successful health and medical care programs in India, life expectancy has been prolonged and the elderly population has increased; thus prevention and control of chronic diseases

have become more important than before. Hyperuricemia may induce many complications, such as chronic gout, distortion of joint and renal failure, which may increase medical care costs. Therefore, it is important to study the hyperuricemia in India, in all developing countries, even in the whole world at large scale. In view of the rapid increase in the prevalence of various clinical, anthropometric and biochemical parameters in these lesser studied populations, high-risk screening and effective public-intervention educational programs are urgently needed.

CONCLUSION

This study shows serum uric acid is markedly associated with metabolic syndrome and its components. Considering the growing incidence of obesity and metabolic syndrome worldwide and the potential link to hyperuricemia, more emphasis should be put on the evolving morbidity prevalence of hyperuricemia in our country specifically among these lesser studied groups.

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