ORIGINAL ARTICLE

Hyperuricemia in metabolic syndrome.

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ABSTRACT… Objective: To determine frequency of hyperuricemia among the patients having metabolic syndrome. **Study Design:** Cross Sectional study. **Setting:** Indus Medical College, Tando Muhammad Khan. **Period:** 28-06-2021 till 28-12-2021. **Material & Methods:** After informed consent, 246 cases of metabolic syndrome who met the inclusion criteria were included. Inclusion criteria were the known case of metabolic syndrome for more than six months, of age group 20 to 60 years and of either gender. Exclusion criteria were the non-consenting patients as well as the patients with history of hyperthyroidism and hypothyroidism, gout, congestive cardiac failure, chronic renal failure, Post myocardial infarction, chronic liver disease, stroke, COPD & Pregnancy. Data analyzed on IBM SPSS 22.0 and p value< 0.05 taken as statistically significant. **Results:** Out of 246 patients mean age in our study was 40.80 years with the standard deviation of ±7. Mean FBS, triglycerides, HDL, SBP, DBP and waist circumference was 115.64±10.16 mg/dl, 144.7±10.43 mg/dl, 41.61±4.03 mg/dl, 168.5±4.16, 98.2±2.78 and 101±8.16 cm respectively. 93 (37.8%) were male and 153 (62.2%) were female. Out of 246 patients, 81 (32.9%) had hyperuricemia and 165 (67.1%) did not have hyperuricemia in patients with metabolic syndrome. **Conclusion:** This study concluded that hyperuricemia is 32.9% common in metabolic syndrome patients.

Key words: Diabetes Mellitus, Dyslipidemia, Hypertension, Increased Uric Acid Levels, Metabolic Syndrome.

INTRODUCTION

The metabolic syndrome also said as insulin resistance syndrome, syndrome X, Reaven syndrome, and "the deadly quartet" is the term that has been specified to the collection of four clinical conditions that comprise abdominal obesity, insulin resistance (or diabetes mellitus type two), high blood pressure and dyslipidemia. It is a pro-thrombotic as well as pro-inflammatory condition that is described by amplified inflammatory cytokine activity.[1] Metabolic syndrome is a the most hazardous cardiovascular aspects i.e., prediabetes, diabetes, central obesity, increased cholesterol and raised arterial blood pressure.[2] An emerging possible biomarker for metabolic syndrome and associated obstacles is hyperuricemia.[3,4] The growing prevalence of metabolic syndrome has became a significant problem globally. The co-morbidities of hyperlipidemia, hypertension as well as obesity might lead to development of incident gout.[5]

Uric acid is formed as a result of purine metabolism and when its levels exceed the normal range then such condition is called hyperuricemia and this might progress to most familiar disease known as gout. Conversely, numerous research studies report that hyperuricemia can also lead to cardiac-renal-vascular system dysfunctions as well as metabolic syndrome.[6] Increased triglyceride levels combined with hypertension might be a powerful as well as independent predictor for hyperuricemia.[7] Lowering serum uric acid levels may be a helpful strategy for reducing metabolic syndrome as well as cardiovascular burden.[8]

Since many complications of metabolic syndrome are related to hyperuricemia, raised uric acid level may be considered as bad prognostic factor in metabolic syndrome. For this reason, it is important to identify and treat hyperuricemia

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especially when it leads to complications. This study will provide the estimate of prevalence of high serum uric acid in metabolic syndrome and help in better management and hence prognosis of metabolic syndrome, since local research studies in Pakistan provide limited data. This research study conceded out to determine high serum uric acid frequency in patients having metabolic syndrome.

MATERIAL & METHODS
Present study conducted on metabolic syndrome patients attending medical outpatient department at Indus medical college, Tando Muhammad Khan(IMV< TMK) from 28-06-2021 till 28-12-2021. Sampling technique was non probability consecutive. The required sample size came out to be 246 patients by taking the prevalence of 20%[3], confidence level 'C.I'=95%, d=0.05 using the WHO software. Inclusion criteria were the known case of metabolic syndrome for more than six months, of age group 20 to 60 years and of either gender. Exclusion criteria were the non-consenting patients as well as the patients with history of hyperthyroidism and hypothyroidism, gout, congestive cardiac failure, chronic renal failure, Post myocardial infarction, chronic liver disease, stroke, COPD & Pregnancy. NCEP, ATP III criteria used for diagnosing metabolic syndrome, including any three of the following:

- Abdominal obesity: Waist circumference > 90 cm (male), 80 (female) in South Asian population.
- Hypertriglyceridemia: serum triglyceride levels more than 150mg/dl.
- HDL: less than 40mg/dl (male) and <50mg/dl (female).
- Hypertension: When arterial blood pressure more than 130/85mmHg measured in sitting position at 2 readings 1 hour apart.
- Fasting plasma glucose >110mg/dl.

High serum uric acid was defined as the serum uric acid levels ≥seven mg/dl in males and ≥six mg/dl in ladies.[3] Hypertension was defined as increased systolic blood pressure ≥ 140 mmHg and diastolic blood pressure (DBP) ≥ 90 mmHg. Individuals taking medications to control high blood pressure currently also considered in this category.[7] Diabetes mellitus includes the known type 2 diabetic patients on treatment taking medicines regularly as per physician's advice for at least 7 days in a week. While, the patients taking medicines regularly as per physician's advice for at least seven days in a week and have any one of the following were used to label dyslipidemia; if cholestrol>200mg/dl, Low Density Lipoproteins > 100 mg/dl, triglyceride > 150 mg/dl and High Density Lipoproteins < 40 mg/dl.

Consenting cases, meeting inclusion criteria were included in this research study from the OPD of Medicine of Indus medical college hospital. Permission from Ethical Review Committee and participating patients were taken for conducting this research study. Patients having metabolic syndrome as per operational definition were enrolled. Brief history, regarding the duration of diabetes, hypertension, dyslipidemia, use of diuretics, aspirin or alcoholism (2 or more packs/ week for more than 6 months). Blood samples obtained in a sterile manner by the researcher and then transferred to IMCH laboratory TMK, for analysis of serum uric acid level.

Data was analyzed on IBM SPSS, 22.0. Mean and standard deviation was calculated for continuous variables like age, FBS, TG, HDL, SBP, DBP and waist circumference. Frequency and percentage was computed for qualitative variables like gender, alcoholism, smoking status, diabetes mellitus, high blood pressure, dyslipidemia and high serum uric levels. Effect modifiers were controlled through stratification of age, gender, alcoholism, smoking , diabetes mellitus, hypertension, dyslipidemia, impaired FBS, HDL level, TG level, waist circumference to see the effect of these modifiers on the outcome variable. Post stratification chi-square test was applied taking p value of ≤0.05 as significant.

RESULTS
Out of 246 patients, mean age in our study was 40.80 years with the SD of ±7. Mean FBS, triglycerides, HDL, SBP, DBP and waist circumference was 115.64±10.16 mg/dl, 144.7±10.43 mg/dl, 41.61±4.03 mg/dl, 168.5±4.16, 98.2±2.78 and 101±8.16 cm respectively. Frequency distribution

showed that among 246 patients, 181 (73.6%) had type 2 diabetes mellitus, 120 (48.8%) patients had hypertension and 108 (43.9%) patients had dyslipidemia. Out of 246 patients, 93 (37.8%) were male and 153 (62.2%) were female. As shown in Table-I

Out of 246 patients, 81 (32.9%) had high serum uric acid levles and 165 (67.1%) did not have high serum uric acid levels in patients with metabolic syndrome. As shown in Figure-1.

Presence of high serum uric acid levels compared on the basis of gender(p value=0.37), diabetes mellitus (p-value=0.48), hypertension (p-value=0.08), dyslipidemia (p-value=0.20). FBS levels (p-value=0.14), High Density Lipoproteins level (p-value=0.29) and waist circumference (p-value=0.36). Elaborated in Table-II.

DISCUSSION
Nowadays, prevalence of high serum uric acid has been observed as increasing in developing countries as well as also in developed countries. This has been suggested that hyperuricemia is linked to metabolic syndrome and furthermore, it is also well related risk agent for progression to atherogenic cardiovascular ailments.

Variable	Mean ± SD	Frequency %
Age (in years)	40.80±7.00	--
Diabetes Mellitus	--	181(73.58%)
FBS (mg/dl)	115.64±10.16	
Triglycerides (mg/dl)	144.7±10.43	--
HDL (mg/dl)	41.61±4.03	--
Dyslipidemia	--	108(43.90%)
SBP mmHg	168.5±4.16	--
DBP mmHg	98.2±2.78	--
Hypertension	--	120(48.78%)
Waist circumference(cm)	101±8.16	--

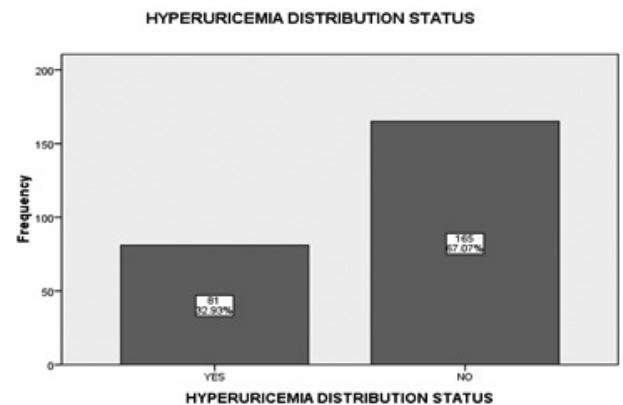**Table-I. Descriptive statistics of study population (n=246)**

Figure-1. Hyperuricemia distribution (n=246)

Variables		Hyperuricemia		Total	P-Value
		Yes	No		
Age (Years)	20-40	36 (44.4%)	63(38.2%)	99(40.2%)	0.21
	41-60	45 (55.6%)	102(61.8%)	147(59.8%)	
Gender	Male	29 (35.8%)	64(38.8%)	93 (37.8%)	0.37
	Female	52 (64.2%)	101(61.2%)	153(62.2%)	
Diabetes Mellitus Type 2	Yes	59 (72.8%)	122(73.9%)	181(73.6%)	0.48
	No	22 (27.2%)	43(26.1%)	65(26.4%)	
Hypertension	Yes	34 (42%)	86(52.1%)	120(48.0%)	0.08
	No	47 (58%)	79(47.9%)	126(51.2%)	
Dyslipidemia	Yes	32 (39.5%)	76(46.1%)	108(43.9%)	0.20
	No	49 (60.5%)	89(53.9%)	138(56.1%)	
Impaired Fasting Blood Sugar(MG/DL)	110-120	39 (48.1%)	66 (40%)	105(42.7%)	0.14
	121-130	42 (51.9%)	99 (60%)	141(57.3%)	
HDL Levels (MG/DL)	< 40	32 (39.5%)	44(26.7%)	76(30.9%)	0.29
	> 40	49 (60.5%)	121(73.3%)	170(69.1%)	
Waist Circumference (CM)	< 100	43 (53.1%)	93(56.4%)	136(55.3%)	0.36
	>100	38 (46.9%)	72(43.6%)	110(44.7%)	

Table-II. Hyperuricemia according to age, gender, diabetes, hypertension, dyslipidemia, HDL and waist circumference (n=246)

There is a remarkable increase in the number of individuals with metabolic syndrome as a result of the global epidemic of diabetes mellitus and obesity. Increasing evidence suggest that serum uric acid levels might play a part in metabolic syndrome.[9] A research study conducted on Korean adults have revealed more prevalence of high serum uric acid levels in men as compared to women.[10] But present research study interestingly revealed augmented prevalence of high srum ruic acid levels in female patients.

A total 246 diagnosed patients of metabolic syndrome visiting Medicine Department, Indus medical college, Tando Muhammad Khan, were included in the study. Out of 246 patients, mean age in our research study was 40.8 ± 7 years. Mean FBS, triglycerides, HDL, SBP, DBP and waist circumference was 115.64±10.16 mg/dl, 144.7±10.43 mg/dl, 41.61±4.03 mg/dl, 168.5±4.16, 98.2±2.78 and 101±8.16 cm respectively. 93 (37.8%) were male and 153 (62.2%) were female. Out of 246 patients, 81 (32.9%) had hyperuricemia and 165 (67.1%) did not have hyperuricemia in patients with metabolic syndrome.

According to Cheserek MJ et al.[11] hyperuricemia was more common especially in those working in administration and revealed at augmented danger of metabolic syndrome. It is imperative to screen, prevent and manage metabolic syndrome among the individuals diagnosed with hyperuricemia at the workplace. Mahajan A, et al.[12] also revealed considerable prevalence of hyperuricemia among the patients suffering from metabolic syndrome. Serum uric acid levels can also be considered as a part of regular follow up of patients with any of the metabolic syndrome components. Furthermore, majority of patients in metabolic syndrome group were males (65%) vs females (35%) and prevalence of hyperuricemia in metabolic syndrome was 64%. Similarly, Ali N, et al[13] also revealed significant association of serum uric acid levels with the prevalence of metabolic syndrome and its components. Suthar RK, et al.[14] also revealed significant relation of hyperuricemia with dyslipidemia (one of the components of metabolic syndrome)

Although being the most common entity, the precise underlying cause of high serum uric acid levels in metabolic syndrome has been remained still unclear. Renal under-excretion of urate in metabolic syndrome is the underlying etiology.[15] The escalating medical problem across the globe in near future would be metabolic syndrome. Instead of high blood pressure and diabetes mellitus, high serum uric acid levels might be implicated in the deterioration of renal function in such patients.[16]

It is concluded from this study that serum uric acid levels were significantly elevated in patients with metabolic syndrome adding to the morbidity and mortality of these patients. Fascinatingly, serum uric acid levels were increased in female population than their male counterparts. Since, addressing prevalence of high serum uric acid levels in patients and its contributing part in diabetes and its complications, more preference should be given to this danger agent for causing metabolic and cardiovascular illness in clinical practices in our country.

CONCLUSION
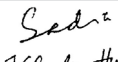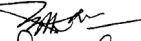This research study concluded that hyperuricemia is frequent in metabolic syndrome patients.
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AUTHORSHIP AND CONTRIBUTION DECLARATION

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1	Sadia Nizamani	Concept, Data collection and Data analysis.	
2	Khadim Hussain	Data collection.	
3	Ramesh Kumar	Data collection and Data Analysis.	
4	Saajan Sawai	Drafting and critical revision.	
5	Doulat Singh	Critical revision and Finalizing of article.	