Original Article

Frequency of Metabolic Syndrome in Hyperuricemic Patients Attending Allied Hospital II, Faisalabad

Ammara Liaqat[1], Muhammad Irsalan Khalid[2]

[1,2]Allied Hospital II, Faisalabad

Corresponding Author: Dr. Ammara Liaqat, Post Graduate Resident, Allied Hospital II, Faisalabad
Email: ammaraliaqat22@gmail.com

Abstract

Background: Hyperuricemia has been increasingly recognized not only as a precursor to gout but also as a possible contributor to the development of metabolic syndrome.
Objective: To determine the frequency and association of metabolic syndrome in patients diagnosed with hyperuricemia presenting to a tertiary care hospital.
Methods: This cross-sectional study was conducted at the Department of Medicine, Allied Hospital II, Faisalabad, from July 2024 to January 2025. A total of 180 hyperuricemic patients aged 18 to 70 years were enrolled using non-probability consecutive sampling. Patients with kidney disease, hepatitis, alcohol intake, and pregnancy/lactation were excluded. After obtaining informed consent, clinical examination, anthropometric measurements, and laboratory investigations were performed.
Results: Out of 180 patients with hyperuricemia, 74 (41.1%) were found to have metabolic syndrome. The most frequent components were reduced HDL cholesterol (68.9%), elevated triglycerides (61.7%), and abdominal obesity (53.3%). Metabolic syndrome was significantly more common in females (47.4%) than in males (36.5%) ($p = 0.041$), and increased steadily with BMI and age. A trend of rising mean uric acid levels was observed with an increasing number of metabolic syndrome components.
Conclusion: It is concluded that a substantial proportion of patients with hyperuricemia also have metabolic syndrome, particularly those with higher BMI and advancing age. These findings suggest the need for routine screening and early intervention in hyperuricemic individuals to mitigate future cardiometabolic risks.
Keywords: Metabolic syndrome, hyperuricemia, Uric acid
Received: 27-03-2025 Revision: 15-06-2025 Accepted: 05-07-2025
How to cite: Liaqat A, Khalid MI. Prevalence of Metabolic Syndrome Among Patients with Hyperuricemia at Allied Hospital II, Faisalabad. Avicenna J Health Sci 2025;02(02): 70-74

Introduction

Excretion of nitrogenous waste from the body can manifest in three forms: urea, ammonia, and uric acid. The end product of purine breakdown (breakdown of adenine and guanine) is Uric acid, which is formed mainly by the endogenous synthesis and very little by the exogenous sources.[1] UA can also be useful to the human body and such property is attributed to the fact that UA is neuroprotective but it is also an antioxidant and it destroys free radicals. In addition, its platelet aggregation induction and systematic chronic inflammation are negative health impacts. An increase in the level of UA in serum is referred to as (pathologic) hyperuricemia. Hyperuricemia has several mechanisms that are considered; it could be exogenous where there is a diet high in purines or endogenous where there is higher production of uric acid and this is seen in malignancies and inborn errors of metabolism and it is also seen in reduced renal clearance.[2]

Other potential contributory factors of hyperuricemia are: alcohol excess intake, acute chronic kidney diseases which cause a decline in the uric acid excretion, the use of diuretics, hyperparathyroidism, acidosis, hypothyroidism and lead poisoning. Factors that promote hyperuricemia include those that promote an elevated rate of urate synthesis (glycogen storage diseases, excessive intake of ethanol or seafood) or those that decrease the urate clearance (sarcoidosis, diuretics).[3] Such comorbidities as hypertension, renal disease, and cardiovascular disease tend to be more common in individuals diagnosed with hyperuricemia.[2] The result of hyperuricemia does not only vary geographically in the world but also as per the development of the economy of the country. In the US, there is reported prevalence rate of hyperuricemia in around 20 percent of men and

women.[3] Metabolic syndrome (MetS) can be described as a combination of metabolic disorder related disorders such as insulin resistance, atherogenic dyslipidemia, hypertension and obesity. It was also discovered that people with MetS had a risk that was more than twice as high for cancer and cardiovascular diseases.[4] Hyperuricemia has been frequently associated with MetS. However, the precise connection between MetS and uric acid is still a mystery. In the past few years, hyperuricemia was attributed to the effects of insulin resistance, which reduced the urinary excretion of uric acid.[5] In spite of the fact that the SUA levels are frequently used in referring to MetS, hyperuricemia is not listed as one of the diagnostic criteria used internationally in defining this pathology. Nevertheless, the pro-oxidant effect of hyperuricemia can lead to inflammation and endothelial dysfunction due to the reduced access to nitric oxide and hence the occurrence of the MetS, cardiovascular disease, diabetes, hypertension, and kidney disease.[6,7] It remains unclear how exactly uric acid is related to MetS. It is seen in literature that between 28% and 73.3% of patients with hyperuricaemia were affected by metabolic syndrome. There is one study, were 35.4 percent of the patients with hyperuricemia had metabolic syndrome. The interaction between the levels of serum uric acid and the metabolic syndrome is controversial in literature. This research aims to clarify the precise association between hyperuricemia and metabolic syndrome, with the goal of facilitating early management of hyperuricemia and thereby reducing the growing burden of metabolic syndrome**.**

Methods

This cross-sectional study was conducted at the Department of Medicine, Allied Hospital II, Faisalabad, during July 2024 to January 2025 on the hyperuricemia population. The data were collected through Non-probability consecutive sampling while the sample size was calculated by using WHO sample size calculator as p= 35.4%[8], absolute precision required = 8%; the confidence level = 95%, thus the sample size calculated as 180.

The Inclusion criteria of the study were the patients having age range from 18 - 70 years of both genders having hyperuricemia (as per operational definition) were included while the exclusion criteria were the pregnant women and lactating mother, patients with kidney disease, having history of alcohol intake and the subjects having acute or chronic hepatitis

After obtaining approval from the hospital's ethical review committee, eligible patients presenting to the outpatient department were approached for participation. Following informed consent, each participant underwent a comprehensive clinical evaluation. A trained staff nurse measured waist circumference and blood pressure using standardized techniques. Fasting blood samples were collected from all patients and sent to the hospital pathology department for biochemical analysis, including fasting blood glucose, triglycerides, and HDL cholesterol. The diagnosis of metabolic syndrome was made using pre-defined operational criteria. All findings, including physical and biochemical parameters, were recorded on a structured proforma by the principal investigator to ensure consistency and accuracy in data collection. All collected data were entered and analyzed using SPSS version 25. Quantitative variables such as age, BMI, waist circumference, fasting blood glucose, triglycerides, HDL cholesterol, and blood pressure were described using means and standard deviations. Qualitative variables including gender, abdominal obesity, hyperglycemia, elevated triglycerides, low HDL, hypertension, and presence of metabolic syndrome were presented as frequencies and percentages. To assess the impact of potential effect modifiers like age, gender, and BMI, stratification was performed. A p-value of ≤ 0.05 considered statistically meaningful.

Results

Data were collected from 180 patients, with a mean age of 49.6 ± 12.4 years. The gender distribution showed 104 males (57.8%) and 76 females (42.2%). The average Body Mass Index (BMI) of the participants was 27.8 ± 4.6 kg/m², indicating that most patients were either overweight or obese. The mean waist circumference was 98.2 ± 9.1 cm, reflecting central obesity in a large proportion of patients. The mean systolic and diastolic readings were 138.5 ± 15.2 mmHg and 88.7 ± 10.3 mmHg, respectively, suggesting a high prevalence of hypertension. The average fasting blood glucose level was 109.4 ± 21.6 mg/dL, indicating that many patients had impaired glucose metabolism. The mean triglyceride level was elevated at 185.7 ± 38.9 mg/dL,

while the mean HDL cholesterol was low at 39.2 ± 7.5 mg/dL (Table 1).

Table 1: *Demographic and baseline values of patients (n = 180)*

Variable	Mean ± SD / n (%)
Age (years)	49.6 ± 12.4
Gender (Male Female)	104 (57.8%) / 76 (42.2%)
BMI (kg/m²)	27.8 ± 4.6
Waist Circumference (cm)	98.2 ± 9.1
Systolic Blood Pressure (mmHg)	138.5 ± 15.2
Diastolic Blood Pressure (mmHg)	88.7 ± 10.3
Fasting Blood Glucose (mg/dL)	109.4 ± 21.6
Triglycerides (mg/dL)	185.7 ± 38.9
HDL Cholesterol (mg/dL)	39.2 ± 7.5

Among the 180 hyperuricemic patients studied, reduced HDL cholesterol was the most frequently observed component of metabolic syndrome, present in 124 individuals (68.9%). Elevated triglycerides were noted in 111 patients (61.7%), followed closely by hypertension in 105 cases (58.3%). Abdominal obesity was found in 96 patients (53.3%), while hyperglycemia was observed in 89 patients (49.4%) (Table 2).

Table 2: *Frequency of Metabolic Syndrome Components in Hyperuricemic Patients*

Component	Frequency (n)	Percentage (%)
Abdominal Obesity	96	53.3%
Hyperglycemia	89	49.4%
Elevated Triglycerides	111	61.7%
Reduced HDL Cholesterol	124	68.9%
Hypertension	105	58.3%

Stratified analysis showed that the frequency of metabolic syndrome increased with age, from 31.0% in the 18–40 age group to 46.5% in those aged 61–70 years, with a statistically significant association (p = 0.048). Gender-wise comparison revealed a higher prevalence in females (47.4%) than in males (36.5%), also statistically significant (p = 0.041). Notably, BMI had a strong association with metabolic syndrome: only 23.1% of patients with BMI <25 kg/m² had metabolic syndrome compared to 65.0% among those with BMI >30 kg/m² (p = 0.003), indicating that obesity is a major contributing factor in this population (Table 3).

Table 3: *Stratification of Metabolic Syndrome Frequency by Age, Gender, and BMI*

Stratification Variable	Metabolic Syndrome n (%)	p-value
Age 18–40	18 (31.0%)	0.048
Age 41–60	36 (45.6%)	0.048
Age 61–70	20 (46.5%)	0.048
Male	38 (36.5%)	0.041
Female	36 (47.4%)	0.041
BMI <25	12 (23.1%)	0.003
BMI 25–30	36 (40.9%)	0.003
BMI >30	26 (65.0%)	0.003

Out of the total 180 patients with hyperuricemia, 74 individuals (41.1%) were found to have metabolic syndrome, while 106 patients (58.9%) did not meet the criteria (Table 4, Figure 1).

Table 4: *Prevalence of Metabolic Syndrome among Hyperuricemic Patients*

Presence of Metabolic Syndrome	Frequency (n)	Percentage (%)
Yes	74	41.1%
No	106	58.9%
Total	**180**	**100%**

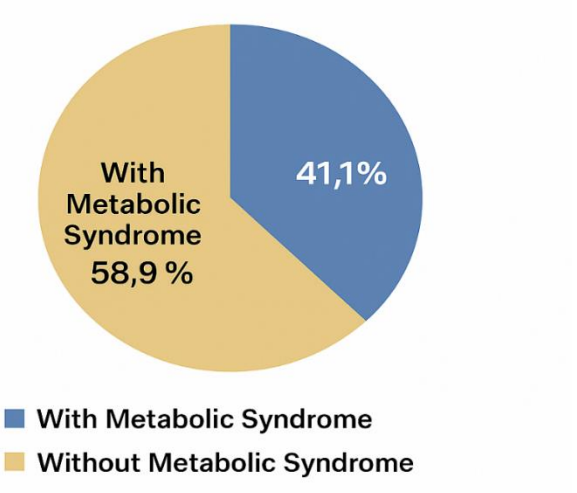

Figure 1: *Presence of Metabolic Syndrome in Hyperuricemic Pateints*

Patients with 0–1 component had a mean uric acid level of 6.5 ± 1.1 mg/dL, which increased to 6.9 ± 1.2 mg/dL in those with 2 components and 7.4 ± 1.3 mg/dL in those with 3 components. The level further rose to 7.7 ± 1.4 mg/dL in patients with 4 components and reached 8.1 ± 1.5 mg/dL in individuals exhibiting all 5 components (Table 5, Figure 2).

Table 5: *Association between Number of Metabolic Syndrome Components and Mean Uric Acid Level*

Number of Metabolic Syndrome Components	Patients (n)	Mean Uric Acid Level (mg/dL) ± SD
0–1 component	38	6.5 ± 1.1
2 components	47	6.9 ± 1.2
3 components	49	7.4 ± 1.3
4 components	29	7.7 ± 1.4
5 components	17	8.1 ± 1.5

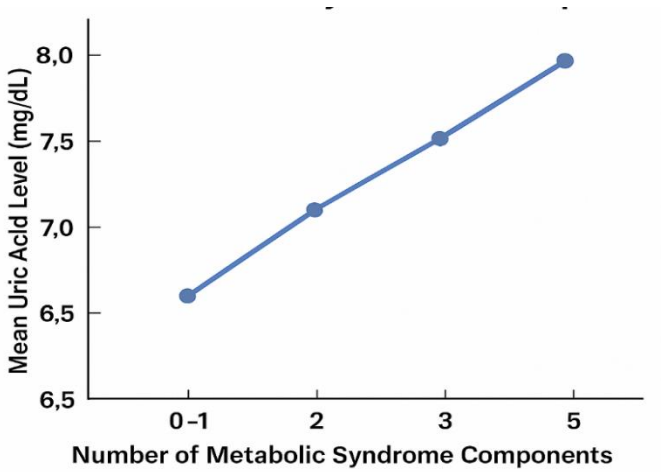

Figure 2: *Mean Uric Acid Level by Number of Metabolic Syndrome Components*

Discussion:

This study aimed to determine the frequency of metabolic syndrome among patients with hyperuricemia in a tertiary care setting. The study demonstrated that 41.1% of individuals with hyperuricemia met the diagnostic criteria for metabolic syndrome, highlighting a significant association between elevated serum uric acid levels and underlying metabolic disturbances.[9] This prevalence aligns with both regional and international evidence identifying hyperuricemia as a potential early marker and contributing factor to the development of metabolic syndrome.[10] Among the various components of metabolic syndrome observed in the hyperuricemic group, abdominal obesity (53.3%), reduced HDL cholesterol (68.9%), and elevated triglycerides (61.7%) were the most common.[11] These findings reinforce the hypothesis that uric acid may influence lipid metabolism abnormalities, potentially mediated through pathways involving oxidative stress and insulin resistance.[12] This suggests a dose-response pattern, where a greater burden of metabolic abnormalities is associated with progressively higher uric acid levels.[13] It remains to be clarified whether hyperuricemia is a cause or consequence of metabolic syndrome. Metabolic syndrome was more prevalent in females (47.4%) than in males (36.5%), with this difference being statistically significant. This finding aligns with existing literature suggesting that hormonal changes, particularly in post-menopausal women, may increase susceptibility to both hyperuricemia and metabolic syndrome.[14]

Stratification by BMI showed that patients classified as obese (BMI >30 kg/m^2) had the highest frequency of metabolic syndrome at 65.0%, reinforcing the strong connection between obesity, insulin resistance, and hyperuricemia.[15-17] This supports the need for aggressive metabolic risk screening and early intervention in overweight individuals with elevated uric acid levels.[18] The cross-sectional nature of the study limits the ability to determine causality between hyperuricemia and metabolic syndrome. Nevertheless, the significant associations observed suggest that serum uric acid could be used as a clinical marker for identifying patients at risk of metabolic syndrome. Longitudinal studies are recommended to better understand the directionality and mechanisms of this relationship.

Conclusion:

It is concluded that a substantial proportion of patients with hyperuricemia are affected by metabolic syndrome, with a frequency of 41.1% observed in this study. The findings demonstrate that elevated uric acid levels are commonly associated with metabolic syndrome, abdominal obesity, dyslipidemia, hypertension, and impaired glucose monitoring. The study further reveals a rising trend in uric acid levels with an increasing number of metabolic syndrome components, indicating a potential dose-response relationship. Female gender, higher age groups, and increased BMI were also found to be significantly associated with the presence of metabolic syndrome in hyperuricemic individuals.

Ethical Permission: The Ethical Review Committee, Faisalabad Medical University, Faisalabad approved this study vide No. 48 ERC/ FMU/ 2023-24/442.

Conflict of Interest / Disclosure: Nil.

Funding Source: Nil.

Authors' contribution:

AL: Concept & design, acquisition of data, drafting of article, final approval of the version to be published

MIK: Analysis & interpretation, critical revisions

References

1. Gherghina M, Peride I, Tiglis M, Neagu TP, Niculae A, Checherita IA. Uric acid and oxidative stress: relationship with cardiovascular, metabolic and renal impairment. Int J Mol Sci. 2022;23(6):3188. Doi: 10.3390/ijms23063188.
2. Goli P, Riahi R, Daniali SS, Pourmirzaei M, Kelishadi R. Association of serum uric acid concentration with components of pediatric metabolic syndrome: a systematic review and meta-analysis. J Res Med Sci. 2020;25:43. Doi: 10.4103/jrms.JRMS_733_19.
3. Tu Y, Liu Y, Chen S, Su HM. Metabolic syndrome and its components are associated with new-onset hyperuricemia in a large Taiwanese population follow-up study. Nutrients. 2023;15(5):1083. Doi: 10.3390/nu15051083.
4. Lin CR, Tsai PA, Wang C, Chen JY. The association between uric acid and metabolic syndrome in a middle-aged and elderly Taiwanese population: a community-based cross-sectional study. Healthcare (Basel). 2024;12:113. Doi: 10.3390/healthcare12010113
5. Fawzy MS, Abu AlSel BT. Association of serum uric acid levels with components of metabolic syndrome: a cross-sectional study in a Saudi adult population. Int J Biomed. 2020;10(4):457-66.
6. Raya-Cano E, Vaquero-Abellan M, Molina-Luque R, De Pedro-Jimenez D, Molina-Recio G, Romero-Saldana M. Association between metabolic syndrome and uric acid: a systematic review and meta-analysis. Sci Rep. 2022;12:18412. Doi: 10.1038/s41598-022-22025-2.
7. Yanai H, Adachi H, Hakoshima M, Katsuyama H. Molecular biological and clinical understanding of the pathophysiology and treatments of hyperuricemia and its association with metabolic syndrome, cardiovascular diseases and chronic kidney disease. Int J Mol Sci. 2021;22(17):9221. Doi: 10.3390/ijms 22179221.
8. Rajadhyaksha A, Sarate N, Raghorte N, Ingawale S. A clinical profile of patients with hyperuricemia and the relationship between hyperuricemia and metabolic syndrome: a cross-sectional study at a tertiary hospital in the Indian population. J Assoc Physicians India. 2022;70(5):11-2. Doi: 10.0102/japi.2022.05
9. Dawood N, Ahmad MS, Hussain S, Riaz S. Hyperuricemia as an independent risk factor for acute coronary syndrome in patients without metabolic syndrome. Pak Postgrad Med J. 2025. Doi: https://doi.org/10.51642/ppmj.v36i01.727
10. Khatri KC, Mangal AK, Singh B. A prospective study to assess the prevalence of nonalcoholic fatty liver disease and metabolic syndrome in psoriasis in a tertiary care center. Int J Acad Med Pharm. 2025;7(2):212-5. Doi: 10.47009/jamp.2025.7.2.43
11. Das S, Chaudhury AB, Dewangan H, Bhattacharya K, Kesh SB, Dutta S et al. Assessment of metabolic syndrome in young adults and its association with hyperuricemia and regional fat. Academia.edu. 2025. Doi:https://doi.org/10.62110/sciencein.cbl.2024.v11.653
12. Akhtar H, Mohsin M, Itrat M, Tafseer B, Rashid M. New insights into the epidemiology and risk factors associated with gout (Niqras). EC Orthop. 2025; 16 (3):01-09.
13. Yustisia I, Kurniawan LB, Esa T, Thamrin SA. The relationship between age, obesity indices, and cardiometabolic risk factors in women: findings from a point-of-care health screening in South Sulawesi, Indonesia. Clin Epidemiol Glob Health. 2025;33:102048. Doi: https://doi.org/10.1016/j.cegh.2025.102048
14. Chen S, Shi M, Chen X, Le Q, He J. Lactiplantibacillus plantarum YDJ-03 and Limosilactobacillus fermentum YDJ-6 alleviate metabolic syndrome in mice. Int J Vitam Nutr Res. 2025;95(2):31275. Doi: 10.31083 /IJVNR31275.
15. Liu C, Wang W, Miao R, Chen H, Wang N, Cheng W, et al. Structure optimization of natural product piperine to obtain novel and potent analogs with anti-inflammation, pain, and urate-lowering effect. Eur J Med Chem. 2025;292:117649. Doi: 10.1016/j.ejmech.2025.117649
16. Somi M, Frounchi N, Zakavi SS, Ostadrahimi A, Gilani N, Faramarzi E, et al. The association between serum uric acid levels and the cardiometabolic phenotype among healthcare workers of Tabriz University of Medical Sciences. J Cardiovasc Thorac Res. 2025; 17(1):40-8. Doi: 10.34172/jcvtr.32902.
17. Qi Y, He X, Wu X, Zhou T, Liang N, Jiao J, et al. Identification of deferasirox as a human xanthine oxidase inhibitor. Life Med. 2025;4(2):lnaf014. Doi: 10.1093/lifemedi/lnaf014
18. Shahid R, Hussain M, Ghori MU, Bilal A, Awan FR. Association of hyperuricemia with metabolic syndrome and its components in an adult population of Faisalabad, Pakistan. Nutr Metab Cardiovasc Dis. 2024;34(6):1554-8. Doi: 10.1016/j.numecd.2024.03.017