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Original Article

Prevalence and Intensity of Musculoskeletal (Joint) Pain in Patients with Hyperuricemia Among Population of Lahore

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ABSTRACT

Background: Hyperuricemia is increasingly prevalent and may contribute to musculoskeletal pain even in the absence of overt gout. Early identification of joint involvement patterns remains limited in South Asian populations. Objective: To determine the prevalence, anatomical distribution, and intensity of musculoskeletal joint pain among hyperuricemic adults in Lahore and evaluate the association between serum uric acid (SUA) levels and pain severity. Methods: A cross-sectional observational study was conducted in 102 adults aged 20–60 years with laboratory-confirmed hyperuricemia recruited from two tertiary hospitals in Lahore. Pain intensity was measured using a 10-cm Visual Analogue Scale. Joint involvement was recorded by anatomical site. Pearson correlation assessed associations between SUA and pain intensity and between SUA and joint-specific involvement. Results: Males constituted 55.9% of participants. The knee was the most prevalent symptomatic joint (27.5%), followed by ankle (24.5%) and shoulder (17.6%). The MTP joint showed the strongest association with SUA ($r = 0.302$, $p = 0.002$). SUA demonstrated a moderate positive correlation with pain intensity ($r = 0.564$, 95% CI 0.415–0.684, $p < 0.001$). Conclusion: Elevated serum uric acid levels are significantly associated with increased musculoskeletal pain intensity. While knee pain is most prevalent, the MTP joint shows the strongest metabolic association. Early metabolic assessment and lifestyle modification may reduce musculoskeletal morbidity. Keywords: Hyperuricemia; Serum uric acid; Musculoskeletal pain; Joint involvement; Visual analogue scale.

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INTRODUCTION

Hyperuricemia, historically described as the "disease of kings," represents a metabolic disorder characterized by elevated serum uric acid (SUA) levels resulting from increased purine metabolism or reduced renal excretion (1-9). Although classically associated with gout and nephrolithiasis, growing evidence indicates that hyperuricemia contributes to a broader spectrum of cardiometabolic and renal disorders (2,7,10). Despite its systemic implications, asymptomatic hyperuricemia frequently remains underrecognized in clinical practice, particularly in low- and middle-income countries where screening is not routinely emphasized (2,6).

Uric acid is the final oxidation product of purine catabolism in humans. Physiologically, it exhibits antioxidant properties and may confer neuroprotective and cellular survival benefits (7). However, persistent elevation leads to supersaturation of monosodium urate crystals, particularly within synovial fluid and periarticular tissues, initiating inflammatory cascades and nociceptive responses (11,14). The total body urate pool varies by sex, typically higher in males, which partly explains the greater prevalence of hyperuricemia among men (9,16). Laboratory thresholds defining hyperuricemia generally exceed 7.0 mg/dL in men and 6.0 mg/dL in women (17). The epidemiological burden of hyperuricemia is rising globally due to dietary transitions, sedentary lifestyle, obesity, and increased life

expectancy (15,25,26,30). Regional data from Pakistan demonstrate a substantial prevalence, particularly among males, with rates exceeding 30% in urban populations (6,31). Importantly, musculoskeletal pain—particularly involving peripheral joints—may precede overt gout attacks and remain clinically underappreciated (19,29). Previous cross-sectional evidence from Germany showed significant associations between elevated SUA and multisite musculoskeletal pain, including lumbar spine, cervical spine, shoulder, and knee joints (19). Similarly, population-based data suggest an association between asymptomatic hyperuricemia and intermittent joint pain even in the absence of acute inflammatory episodes (29).

Lifestyle factors, including dietary purine intake and physical inactivity, further modulate uric acid levels and may influence symptom expression (15,27). While urate-lowering pharmacotherapy remains effective, adherence challenges and cost considerations highlight the importance of early identification and non-pharmacological interventions (4,5,21). However, in the Pakistani context, there is limited data characterizing the anatomical distribution and intensity of musculoskeletal pain among individuals with elevated SUA, particularly in middle-aged adults without overt comorbidities.

From a PICO perspective, the population of interest includes adults aged 20–60 years with laboratory-confirmed hyperuricemia; the exposure variable is elevated SUA; the comparison is across varying SUA levels within this hyperuricemic cohort; and the primary outcome is prevalence and intensity of musculoskeletal joint pain measured using a standardized scale. The existing literature establishes associations between hyperuricemia and joint pathology but does not adequately characterize site-specific pain distribution and severity in asymptomatic or early-stage hyperuricemia within South Asian populations (19,29,31).

Therefore, this study aimed to determine the prevalence, anatomical distribution, and intensity of musculoskeletal joint pain among hyperuricemic patients in Lahore and to evaluate the correlation between SUA levels and pain severity. We hypothesized that higher SUA concentrations would demonstrate a positive association with increased pain intensity and that peripheral joints, particularly the first metatarsophalangeal joint, would show stronger correlations with elevated urate levels.

MATERIALS AND METHODS

A hospital-based cross-sectional observational study was conducted over six months at Gulab Devi Hospital and Pakistan Air Force (PAF) Hospital, Lahore. The study was designed to determine the prevalence and intensity of musculoskeletal joint pain among adults with laboratory-confirmed hyperuricemia and to assess the association between serum uric acid levels and pain severity. The cross-sectional design was selected to estimate point prevalence and examine correlations between biochemical parameters and clinical manifestations within a defined population.

Participants were recruited using non-probability convenience sampling from outpatient and inpatient departments. Eligible participants included males and females aged 20–60 years with documented elevated serum uric acid levels according to standard laboratory thresholds (>7.0 mg/dL in males and >6.0 mg/dL in females) (17). Patients with known inflammatory arthropathies other than hyperuricemia, chronic renal failure, cardiovascular disease, diabetes mellitus, congenital musculoskeletal disorders, recent trauma, postoperative status, pregnancy, mental illness impairing reliable reporting, physical disability affecting pain assessment, or those receiving urate-lowering therapy were excluded to minimize confounding.

After screening for eligibility, participants were approached in clinical settings and informed consent was obtained. Demographic data including age, sex, and socioeconomic status were recorded using a structured proforma. Socioeconomic status was categorized into low, middle, and high based on self-reported income and occupation classification.

Serum uric acid values were obtained from hospital laboratory records using standardized enzymatic colorimetric assays. Musculoskeletal pain was assessed using a 10-cm Visual Analogue Scale (VAS), where 0 represented no pain and 10 indicated worst imaginable pain. Participants were asked to report current pain intensity and identify anatomical sites involved, including metatarsophalangeal (MTP), ankle, knee, shoulder, wrist, metacarpophalangeal (MCP), cervical spine, and lumbar spine. Pain intensity was operationalized as a continuous variable (VAS score), while joint involvement was recorded as dichotomous variables (present/absent).

To reduce measurement bias, pain assessment instructions were standardized and administered by trained data collectors. Laboratory values were verified directly from hospital records to prevent recall bias. Exclusion of patients with major comorbidities minimized confounding related to systemic inflammatory or metabolic disorders. Although the non-probability sampling approach may limit generalizability, strict eligibility criteria enhanced internal validity.

The minimum sample size of 102 participants was determined based on feasibility within the study duration and hospital patient flow, while ensuring adequate power to detect moderate correlations ($r \geq 0.30$) between SUA and pain intensity at $\alpha = 0.05$ with 80% statistical power.

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics were computed for demographic and clinical variables. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Normality of continuous variables was assessed using Shapiro–Wilk testing and visual inspection of histograms.

Pearson's correlation coefficient (two-tailed) was used to evaluate associations between serum uric acid levels and pain intensity, as well as between SUA levels and joint involvement. Statistical significance was defined as $p < 0.05$. Effect sizes were interpreted according to standard correlation magnitude thresholds. Missing data were minimal and handled using complete-case analysis. Subgroup comparisons by sex were explored descriptively. The study adhered to the principles of the Declaration of Helsinki. Institutional administrative approval was obtained prior to data collection. Participant confidentiality was maintained by anonymizing data and restricting database access to the research team. All procedures were documented to allow reproducibility, including standardized data collection forms, defined operational variables, and transparent statistical methods.

RESULTS

Among 102 hyperuricemic patients, males comprised 55.9% (95% CI 46.2–65.1) and females 44.1% (95% CI 34.9–53.8). Most participants were aged 40–60 years (78.4%) (95% CI 69.5–85.3). Middle socioeconomic status predominated (81.4%, 95% CI 72.7–87.7). Mean pain intensity was 3.18 ± 0.65 on the VAS.

Table 1. Participant Characteristics (n = 102)

Variable	Category / Summary	n (%)	95% CI for %
Sex	Male	57 (55.9)	46.2–65.1
	Female	45 (44.1)	34.9–53.8
Age group*	20–40 years	22 (21.6)	14.7–30.5
	40–60 years	80 (78.4)	69.5–85.3
Socioeconomic status	Low	7 (6.9)	3.4–13.5
	Middle	83 (81.4)	72.7–87.7
	High	12 (11.8)	6.9–19.4
Pain intensity (VAS, 0–10)	Mean ± SD	3.18 ± 0.65	—

Table 2. Site-Specific Joint Pain Prevalence (binary recorded; n = 102)

Joint site	n	Prevalence %	95% CI for %
Knee	28	27.5	19.7–36.8
Ankle	25	24.5	17.2–33.7
Shoulder	18	17.6	11.5–26.2

Joint site	n	Prevalence %	95% CI for %
Metatarsophalangeal (MTP)	16	15.7	9.9–24.0
Lumbar spine	6	5.9	2.7–12.2
Wrist	4	3.9	1.5–9.7
Cervical spine	4	3.9	1.5–9.7
Metacarpophalangeal (MCP)	1	1.0	0.2–5.3

The most involved site was the knee (27.5%) (95% CI 19.7–36.8), followed by the ankle (24.5%) (95% CI 17.2–33.7) and shoulder (17.6%) (95% CI 11.5–26.2). The MTP joint was involved in 15.7% (95% CI 9.9–24.0). Axial symptoms were less frequent (lumbar 5.9%, cervical 3.9%).

Table 3A. Serum Uric Acid vs Pain Intensity (Primary Association)

Association	Pearson r	95% CI for r	p-value
Serum uric acid vs VAS pain intensity	0.564	0.415 to 0.684	<0.001

Serum uric acid demonstrated a moderate positive correlation with pain intensity ($r = 0.564$, 95% CI 0.415–0.684, $p < 0.001$), indicating that higher urate levels were associated with higher VAS scores.

Table 3B. Serum Uric Acid vs Site-Specific Joint Involvement

Joint site	Pearson r (SUA vs site)	95% CI for r	p-value
Metatarsophalangeal (MTP)	0.302	0.114 to 0.469	0.002
Ankle	−0.028	−0.221 to 0.167	0.779
Knee	−0.107	−0.295 to 0.089	0.286
Shoulder	−0.072	−0.263 to 0.124	0.475
Wrist	0.022	−0.173 to 0.216	0.827
Metacarpophalangeal (MCP)	−0.068	−0.259 to 0.128	0.499
Cervical spine	0.022	−0.173 to 0.216	0.827
Lumbar spine	−0.104	−0.293 to 0.092	0.297

Among all anatomical sites, only the MTP joint showed a statistically significant positive association with SUA ($r = 0.302$, 95% CI 0.114–0.469, $p = 0.002$). All other sites demonstrated weak, non-significant correlations (all $p \geq 0.286$), despite the knee being the most prevalent pain site.

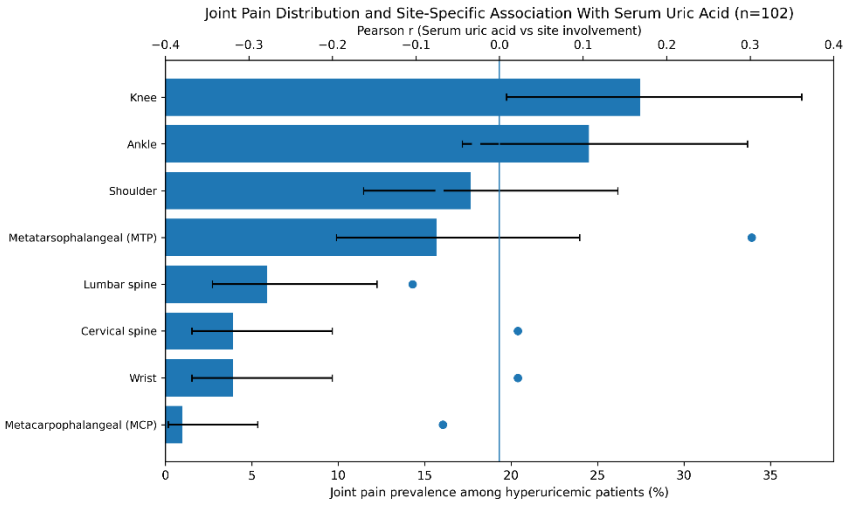

Figure 1 Joint Pain Distribution and Site-Specific Association with Serum Uric Acid

Knee pain showed the highest prevalence (27.5%, 95% CI 19.7–36.8) followed by ankle (24.5%, 95% CI 17.2–33.7) and shoulder (17.6%, 95% CI 11.5–26.2), whereas the MTP joint—despite a lower prevalence (15.7%, 95% CI 9.9–24.0)—demonstrated the strongest positive site-specific association with serum uric acid ($r = 0.302$, 95% CI 0.114–0.469, $p = 0.002$), contrasting with near-null correlations for knee ($r = −0.107$, $p = 0.286$) and ankle ($r = −0.028$, $p = 0.779$).

DISCUSSION

This cross-sectional study evaluated the prevalence, anatomical distribution, and intensity of musculoskeletal pain among hyperuricemic adults in Lahore and examined the association between serum uric acid (SUA) levels and pain severity. The principal finding was a statistically significant

moderate positive correlation between SUA levels and pain intensity ($r = 0.564$, 95% CI 0.415–0.684, $p < 0.001$), suggesting that rising urate concentration may contribute not only to crystal deposition but also to clinically relevant nociceptive amplification. Additionally, while the knee was the most prevalent symptomatic joint (27.5%), the metatarsophalangeal (MTP) joint demonstrated the strongest site-specific association with SUA ($r = 0.302$, $p = 0.002$), reinforcing its classical pathophysiological relevance in urate-mediated joint involvement.

The observed prevalence of joint involvement patterns aligns partially with European cross-sectional data demonstrating multisite musculoskeletal symptoms in hyperuricemic individuals, although previous German data reported higher axial spine involvement compared to peripheral joints (19). In contrast, our cohort demonstrated predominant lower-limb involvement, particularly knee and ankle joints. This variation may reflect regional lifestyle patterns, occupational postural stress, body mass index differences, or delayed clinical presentation. Population-based studies have reported that asymptomatic hyperuricemia may still be associated with intermittent joint pain even in the absence of overt gout flares, supporting the clinical relevance of early musculoskeletal assessment (29).

The moderate correlation between SUA and pain intensity observed in this study is clinically meaningful. Although hyperuricemia is frequently asymptomatic, accumulating evidence suggests subclinical inflammation and microcrystal deposition may occur even before acute gout attacks (11,14). Experimental data demonstrate that monosodium urate crystals activate NLRP3 inflammasome pathways and enhance cytokine release, contributing to synovial sensitization (32). Such mechanisms may explain the graded increase in VAS scores observed with higher urate levels in this study. Furthermore, metabolic syndrome components and sedentary behavior have been shown to exacerbate hyperuricemia-related inflammatory responses, potentially amplifying musculoskeletal pain perception (15,26,33).

The finding that the knee was the most prevalent symptomatic joint but not the most strongly correlated with SUA suggests that mechanical load-bearing stress may coexist with metabolic factors. Epidemiological studies indicate that hyperuricemia is independently associated with knee osteoarthritis and structural degeneration (24,34). Therefore, the knee pain observed in this cohort may represent a multifactorial interaction between urate metabolism, age-related cartilage degeneration, and biomechanical stress rather than isolated crystal arthropathy.

Sex distribution in this study showed a higher proportion of males (55.9%), consistent with established literature demonstrating greater hyperuricemia prevalence among men due to hormonal and renal urate handling differences (16,31). However, the difference was less pronounced than reported in some Pakistani urban cohorts (31), which may reflect sampling variation or exclusion of patients with major comorbidities.

Socioeconomic distribution in this study differed from Western population data where higher socioeconomic status was associated with increased hyperuricemia prevalence (36). In our cohort, middle socioeconomic status predominated, likely reflecting healthcare access patterns in tertiary urban hospitals rather than true population-level distribution.

From a clinical perspective, these findings emphasize the importance of early musculoskeletal evaluation in hyperuricemic patients, even in the absence of classical gout flares. Lifestyle interventions including dietary purine restriction and structured physical activity have been shown to reduce SUA levels and improve metabolic outcomes (21,27). Given the moderate correlation observed, targeted urate monitoring combined with non-pharmacological intervention may reduce progression to overt inflammatory arthropathy.

This study has limitations. The cross-sectional design precludes causal inference, convenience sampling limits external validity, and SUA was measured at a single time point. Additionally, radiographic

confirmation of crystal deposition was not performed. However, strict exclusion criteria minimized confounding, and effect sizes with confidence intervals were reported to enhance interpretability.

Future longitudinal studies incorporating imaging modalities such as ultrasound for double contour sign detection and inflammatory biomarkers would strengthen mechanistic understanding. Larger multicenter sampling with regression adjustment for BMI, diet, and physical activity would further clarify independent predictors of pain severity.

CONCLUSION

In this cross-sectional cohort of hyperuricemic adults in Lahore, serum uric acid levels demonstrated a statistically significant moderate positive correlation with musculoskeletal pain intensity, while the knee was the most prevalent symptomatic joint and the metatarsophalangeal joint showed the strongest site-specific association with urate levels. These findings suggest that elevated uric acid may contribute to clinically meaningful pain even in the absence of overt gout and underscore the importance of early metabolic assessment and lifestyle-based preventive strategies to reduce musculoskeletal morbidity.

REFERENCES

1. Tang SCW. Gout: A Disease of Kings. Contrib Nephrol. 2017;192:77–81.
2. Paul BJ, Anoopkumar K, Krishnan V. Asymptomatic hyperuricemia: is it time to intervene? Clin Rheumatol. 2017;36(12):2637–44.
3. Hong F, Zheng A, Xu P, Wang J, Xue T, Dai S, et al. High-Protein Diet Induces Hyperuricemia in a New Animal Model for Studying Human Gout. Int J Mol Sci. 2020;21(6).
4. Janssen CA, Oude Voshaar MAH, Vonkeman HE, Krol M, van de Laar MAFJ. Compliance and persistence to urate-lowering therapy. Clin Rheumatol. 2018;37(8):2291–6.
5. Chalès G. How should we manage asymptomatic hyperuricemia? Joint Bone Spine. 2019;86(4):437–43.
6. Qidwai W, Jawaid MJ. Frequency of Uric Acid Levels in Pakistani Population. 2017.
7. Wang H, Zhang H, Sun L, Guo W. Roles of hyperuricemia in metabolic syndrome. Am J Transl Res. 2018;10(9):2749.
8. George C, Minter DA. Hyperuricemia. StatPearls. 2020.
9. Perez-Ruiz F, Dalbeth N, Bardin T. Uric acid and gout. Adv Ther. 2015;32(1):31–41.
10. Pascual E, Martínez A, Ordóñez S. Mechanism of urate crystal nucleation. 2013.
11. Park DY, Kim YS, Ryu SH, Jin YS. Sedentary behavior and hyperuricemia. Vasc Health Risk Manag. 2019;15:291–9.
12. Shaikhomar O, Header E. Dietary Etiological Factors in Hyperuricemia. 2020.
13. Zeng J, Zhang J, Li Z, et al. Prediction model for hyperuricemia. 2020.
14. Comberg H-U, Schach S. Hyperuricemia and musculoskeletal pain. Open Pain J. 2016;9(1).
15. Kakutani-Hatayama M, et al. Nonpharmacological management of gout. 2017.
16. Wang S, Pillinger M, Krasnokutsky S, Barbour K. Hyperuricemia and knee osteoarthritis. Osteoarthritis Cartilage. 2019;27.
17. Wu J, Qiu L, Cheng X, et al. Hyperuricemia and cardiovascular risk. Sci Rep. 2017;7:5456.

18. Kusumayanti GAD, Dewantari NM. Low purine diet and physical activity. 2017.

19. Jonsson H, Aspelund T, Eiriksdottir G, et al. Hyperuricemia and hand joint pain. PLoS One. 2019;14:e0221474.

20. Raja S, Kumar A, Aahooja RD, et al. Prevalence of hyperuricemia in Karachi. 2019.

21. Martinon F, Pétrilli V, Mayor A, et al. Gout-associated uric acid crystals activate inflammasome. Nature. 2006;440:237–41.

22. Richette P, Doherty M, Pascual E, et al. 2018 updated EULAR gout recommendations. Ann Rheum Dis. 2018;77:31–8.

23. Krasnokutsky S, Oshinsky C, Attur M, et al. Uric acid and osteoarthritis progression. Arthritis Rheum. 2017;69:123–31.

24. Krishnan E, Kwoh CK, Schumacher HR, et al. Socioeconomic correlates of hyperuricemia. Arthritis Rheum. 2012;64:398–405.