

Correlation between serum uric acid levels and microalbuminuria in patients with essential hypertension

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Abstract:

Background: Serum uric acid has been implicated in the pathogenesis of hypertension and renal damage. Microalbuminuria is an early marker of endothelial dysfunction and renal impairment in hypertensive patients.

Objective: To evaluate the correlation between serum uric acid levels and microalbuminuria in patients with essential hypertension.

Methods: A prospective cross-sectional study was conducted over April 2025 to March 2026 including 110 patients with essential hypertension. Serum uric acid levels and urinary microalbumin levels were measured. Patients were categorized based on uric acid levels, and statistical analysis was performed with $p < 0.05$ considered significant.

Results: Patients with elevated serum uric acid levels had a significantly higher prevalence of microalbuminuria. A positive correlation was observed between serum uric acid and urinary albumin levels.

Conclusion: Elevated serum uric acid is significantly associated with microalbuminuria in hypertensive patients, indicating early renal involvement.

Recommendation: Regular assessment of serum uric acid and microalbuminuria is advised in hypertensive individuals for the early identification of renal impairment. Proactive lifestyle alterations, consistent monitoring, and prompt management can avert the advancement to chronic renal disease and enhance outcomes.

Keywords: Serum uric acid, microalbuminuria, hypertensive patients, urinary microalbumin, endothelial dysfunction

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Introduction

Essential hypertension represents a significant worldwide health issue and a primary factor in cardiovascular and renal morbidity and mortality. It frequently

presents asymptotically in its initial phases, rendering prompt identification of target organ damage crucial for averting illness advancement and enduring

consequences(1). Microalbuminuria is one of the initial signs of renal involvement in hypertension, indicating heightened glomerular permeability and underlying endothelial dysfunction. It is well acknowledged as an indicator of renal dysfunction and cardiovascular risk in hypertensive individuals(2).

Serum uric acid, the last result of purine metabolism, has recently garnered attention as a significant risk factor in the development of hypertension and its related consequences. Increased blood uric acid concentrations are associated with heightened oxidative stress, diminished nitric oxide bioavailability, and endothelial dysfunction. Furthermore, hyperuricemia stimulates the renin-angiotensin-aldosterone system and enhances inflammatory pathways, both of which lead to vascular damage and advancing renal disease(3).

Numerous investigations have established a substantial correlation between hyperuricemia and microalbuminuria, indicating that increased uric acid levels may contribute to early renal impairment in hypertensive patients. This association underscores the potential of blood uric acid as a straightforward and economical diagnostic for identifying patients susceptible to renal problems. This study seeks to assess the relationship between

serum uric acid levels and microalbuminuria in patients with essential hypertension, thereby aiding in the early detection and enhanced management of hypertensive renal disease(4).

Methods

Sample size and duration: This prospective cross-sectional study was conducted over April 2025 to March 2026 and included 110 patients diagnosed with essential hypertension.

Inclusion Criteria

- Adults diagnosed with essential hypertension
- Patients willing to participate

Exclusion Criteria

- Secondary hypertension
- Chronic kidney disease
- Diabetes mellitus
- Gout or uric acid disorders
- Pregnancy

Blood samples were collected to measure serum uric acid levels. Spot urine samples were used to assess microalbuminuria.

Statistical analysis was performed using Pearson correlation, chi-square test, and t-test. A p-value < 0.05 was considered significant.

Results

Table 1: Serum Uric Acid Vs Microalbuminuria

Uric Acid Level	Microalbuminuria Present	Absent	p-value
Normal	20%	80%	<0.05
High	65%	35%	

Table 2: Mean Values

Parameter	Mean ± SD
Serum Uric Acid (mg/dL)	6.8 ± 1.2
Microalbumin (mg/day)	45 ± 15

Table 3: Correlation

Variable	Correlation (r)	p-value
Uric Acid vs Albumin	+0.62	<0.05

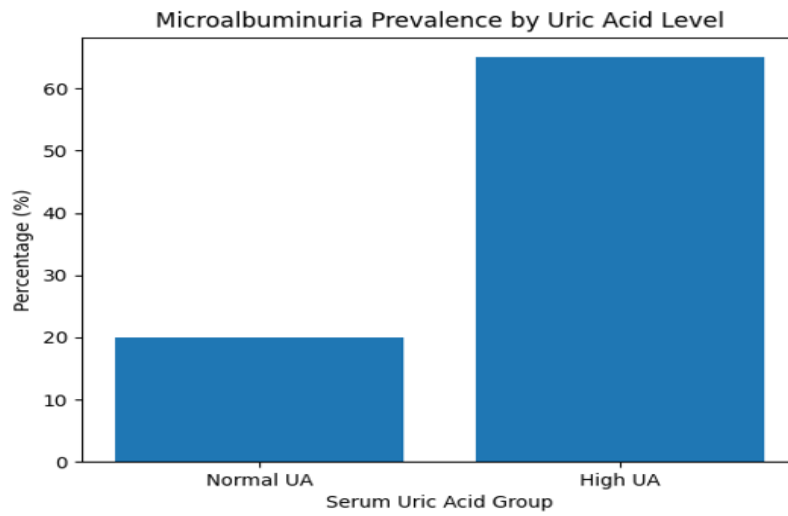


Figure 1: Microalbuminuria prevalence by uric acid level

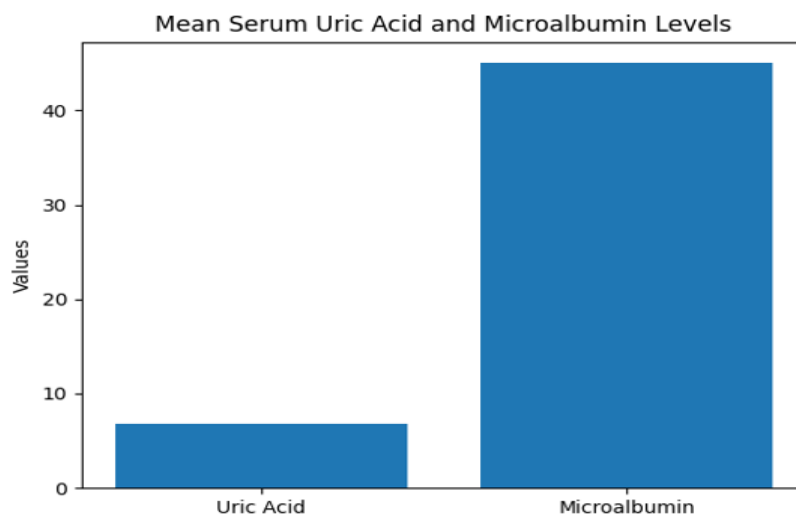


Figure 2: Mean serum uric acid and microalbumin levels

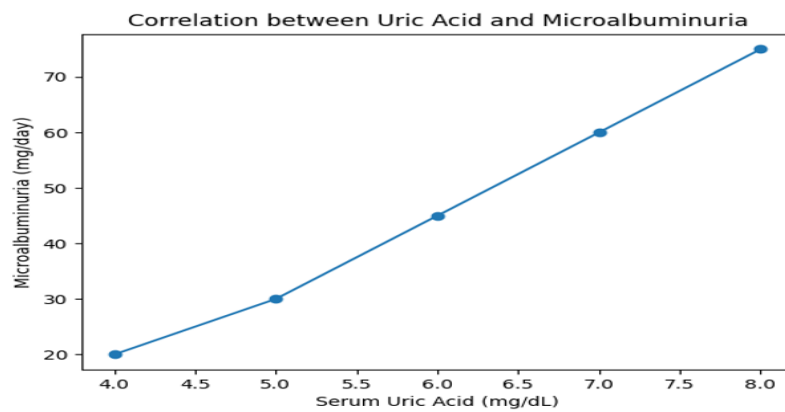


Figure 3: Correlation between uric acid and microalbuminuria

Discussion

This study reveals a notable positive connection between serum uric acid levels and microalbuminuria in individuals with essential hypertension, highlighting the impact of hyperuricemia on early renal dysfunction. Increased uric acid levels correlated with a greater incidence of microalbuminuria, indicating that uric acid may act as an early indicator of subclinical renal impairment in hypertensive patients(5).

The pathophysiological mechanisms that contribute to this connection are multifaceted. Hyperuricemia exacerbates endothelial dysfunction by elevating oxidative stress and diminishing nitric oxide bioavailability, leading to compromised vasodilation and heightened vascular resistance(6). Furthermore, uric acid induces inflammation and stimulates the renin-angiotensin-aldosterone pathway, hence aggravating hypertension and hastening renal damage. These alterations may elevate glomerular pressure and permeability, ultimately causing albumin to leak into the urine(7).

Microalbuminuria in patients with increased uric acid levels indicates early glomerular injury and is a recognised predictor of renal and cardiovascular morbidity. These findings align with prior research that has recognised serum uric acid as an independent risk factor for the onset and advancement of hypertensive nephropathy(8).

The prompt recognition and treatment of hyperuricemia in hypertensive individuals may be essential in averting the advancement to overt proteinuria and chronic kidney illness. Regular assessment of serum uric acid and microalbuminuria may facilitate risk classification and inform prompt therapeutic measures to enhance long-term results(9).

Conclusion

Serum uric acid levels exhibit a substantial positive connection with microalbuminuria in individuals with essential hypertension, underscoring its function as an early marker of renal involvement. Increased uric acid levels contribute to endothelial dysfunction and renal microvascular injury, perhaps resulting in heightened urine albumin excretion. Early identification of hyperuricemia can facilitate the detection of subclinical renal injury prior to the manifestation of overt kidney disease. Regular assessment of serum uric acid and microalbuminuria in hypertensive individuals can enable early detection, risk evaluation, and prompt intervention, thereby enhancing the management and outcomes of hypertension-related problems.

Recommendation

This study's findings suggest that routine screening for blood uric acid and microalbuminuria should be integrated into the clinical assessment of individuals with essential hypertension to facilitate early diagnosis of renal involvement. Individuals with increased uric acid concentrations must be meticulously observed for the onset of microalbuminuria and additional indicators of target organ impairment. Initial lifestyle modifications, such as dietary alterations, weight regulation, and the reduction of purine-rich food consumption, should be advocated to treat hyperuricemia. Pharmacological therapies may be considered for some patients to lower uric acid levels and avert the advancement of renal impairment. Consistent monitoring and risk assessment facilitate prompt intervention, thereby diminishing the likelihood of chronic kidney disease and enhancing overall cardiovascular results.

Acknowledgment

List of abbreviations

SD Standard deviation

Mg Mili gram

Source of funding

Conflict of interest

Author biography

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