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Original Research Article

Correlation of Serum Uric Acid and Outcomes of Acute Kidney Injury

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Abstract

Background: The improvement of human lifespan over the millennia is attributed in part to enhanced protective mechanisms against oxidative stress. One such mechanism, proposed by Ames in 1981, involves serum uric acid (SUA), which acts as a critical antioxidant in human physiology. In more recent decades, however, SUA has been implicated in a broader range of pathologies, including hypertension, chronic kidney disease (CKD), and cardiovascular disease.

Objectives: The study is being conducted to correlate serum uric acid and outcomes of AKI Methods: A longitudinal study design was conducted and this study utilized a sample size of 300 patients diagnosed with AKI admitted in the department of General Medicine Mcgann Hospital Shimoga to correlate serum uric acid and outcomes of AKI. The study was conducted for a period of one year from June 2023 to June 2024.

Results: Blood urea levels decreased from 123 ± 40 mg/dl at admission to 28 ± 7 mg/dl at 3-month follow-up ($p < 0.0001$). Similarly, serum creatinine levels declined from 3.4 ± 1 mg/dl at admission to 0.9 ± 0.5 mg/dl at 3 months ($p < 0.0001$). Serum uric acid levels, the primary focus of the study, showed a marked reduction from 11 ± 3 mg/dl at admission to 3 ± 1 mg/dl at 3 months, which was statistically significant ($p < 0.0001$). A significant relationship was observed between serum uric acid levels and recovery outcomes. In the recovery group, 92.3% had uric acid levels >7 mg/dl, while only 7.6% had levels <7 mg/dl. Conversely, all patients in the non-recovery group (100%) had uric acid levels >7 mg/dl. Among patients who recovered, 56.4% required RRT and 43.5% did not.

Conclusion: Elevated serum uric acid (>7 mg/dl) at admission was significantly associated with poorer outcomes and increased requirement of Renal replacement therapy.

Keywords: AKI, SUA, CKD, RRT, Hyperuricemia, Kidney Function, Renal Recovery.

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Introduction

The improvement of human lifespan over the millennia is attributed in part to enhanced protective mechanisms against oxidative stress. One such mechanism, proposed by Ames in 1981, involves serum uric acid (SUA), which acts as a critical antioxidant in human physiology [1].

SUA has been implicated in a broader range of pathologies, including hypertension, chronic kidney disease (CKD), cardiovascular disease, stroke, diabetic nephropathy, metabolic syndrome, and acute kidney injury (AKI) [2]. Determining causality in this context requires robust evidence, guided by principles such as the Bradford Hill criteria [3]. These criteria, supplemented by advancements in related scientific fields, offer a framework for exploring the causal relationship between SUA and AKI [4]. Acute kidney injury causes great morbidity and mortality in both the community and Hospital settings. The incidence of hospital acquired AKI is estimated to be 3-7% from Epidemiological studies but increases to 20-30 % in intensive care unit setting, with the need for renal replacement therapy. Understanding the etiological factors and the pathophysiological principles resulting in acute kidney injury is essential in prompting appropriate therapies. Recently hyperuricemia has been recognized as a potentially modifiable risk factor for acute kidney injury. So this study is to look for the correlation of serum uric acid and outcomes of acute kidney injury.

Aims and Objectives of the Study: The study of correlation between serum uric acid levels and outcomes of AKI.

Methodology

Study setting: The study was conducted in the Mcgann hospital, SIMS Shimoga.

Study design: This was a longitudinal study.

Study population: All patients aged 18 years and older who were admitted to the study setting during the study period and had blood sample reports available within 48 hours of their arrival.

Study period: The total duration of the study was 1 years (12 months) which was from June 2023 to June 2024.

Sample size: This study utilized a sample size of 300 patients.

This systematic approach ensured the collection of detailed clinical and biochemical data, facilitating the evaluation of serum uric acid levels and their correlation with the clinical outcomes in patients with acute kidney injury

Statistical Analysis: Student's t-test is used for statistical analysis of comparison between the groups and a p value of <0.005 is considered for statistical significance. The sample size is estimated by the Yamane formula. Statistical analysis is performed by SPSS 2.0 software.

Results

In our study the average age was 51.26 years, with a standard deviation of 15.02 years. In our study 41% (123 cases) were female, and 59% (177 cases) were male.

Table 1: Change in RFT Urea (mg/dl) at admission and at discharge follow-up

RFT Urea (mg/dl)	Mean ± SD	F-test	p value
At admission	123 ± 40	1,141.38	< 0.0001
At discharge	52 ± 15		
At1 month discharge	36 ± 10		
At3month discharge	28 ± 7		

Table 2: Change in serum Uric Acid at admission and at discharge follow-up

Uric Acid	Mean ± SD	F- test	p value
At admission	11± 3	861.53	< 0.0001
At discharge	7 ± 2		
At1 m discharge	5± 1.5		
At3 discharge	3 ± 1		

Table 3: Change in Creatinine at admission and at discharge follow-up

Creatinine	Mean ± SD	F-test	p value
At admission	3.4 ± 1	523.92	< 0.0001
At discharge	2.1 ± 0.9		
At1 month discharge	1.6 ±0.7		
At3 discharge	0.9 ± 0.5		

Table 4: Distribution according to causes of AKI.

causes of Aki	No. of cases	%
Acute Gastroenteritis	81	27%
Snake Bite	36	12%
UTI Sepsis	77	25.6%
Cardiogenic Shock	21	7%
Pancreatitis	46	15.3%
Pneumonia	32	10.6%
Unknown etiology	7	2.3%

Table 5: Distribution according to Recovery from AKI

Recovery from AKI	No of cases	Percentage
Recovery	273	91%
Non-Recovery	27	9%

Table 6: Uric Acid Levels (at admission) and Recovery Outcomes

Uric acid levels(mg/dl)	Recovery group		Non recovery group	
	No. of cases	%	No. of cases	%
<7	21	7.6%	0	0.0%
>7	252	92.3%	27	100%

Table 7: Total number of patients requiring renal replacement therapy

Renal replacement therapy	No of cases	Percentage
Required	181	66.3%
Not required	92	33.6%

Table 8: Requirement of Renal replacement therapy and Recovery Outcomes

Renal replacement therapy	Required		Not required	
	No. of cases	%	No. of cases	%
Recovery group	154	56.4%	119	43.5%
Non recovery group	27	100%	0	0.0%

Discussion:

Distribution according to Uric Acid Levels (at admission) and Recovery Outcomes.In the present study, elevated serum uric acid levels at admission were strongly associated with poor recovery outcomes in patients with acute kidney injury (AKI). Among those who recovered, 92.3% (252 cases) had uric acid levels greater than 7 mg/dL, while only 7.6% (21 cases) had levels below this threshold. Notably, all patients in the non-recovery group (100%, 27 cases) had uric acid levels above 7 mg/dL, suggesting a potential prognostic role of hyperuricemia in predicting unfavorable renal recovery. Moubarez DA, (2022) [5] found that 52.5% of patients had elevated uric acid levels at the time of ICU admission.

In a study by Koo BS et al. (2021) [6], the mean SUA levels were 5.71 ± 1.27 mg/dL in men and 4.21 ± 0.96 mg/dL in women, which were slightly lower than the values reported by Kim Y et al. (2018) in a Korean cohort of 5,548 participants (5.83 mg/dL in men and 4.36 mg/dL in women).

Total number of patients requiring renal replacement therapy: In the present study, renal replacement therapy (RRT) was required in a significant proportion of patients with acute kidney injury (AKI). Out of the total study population, 181 patients (66.3%) underwent RRT, while 92 patients (33.6%) did not require this intervention. This high rate of RRT highlights the severity of renal impairment in the study cohort and highlights the critical role of timely renal support in the management of AKI.

In the perspective of renal replacement therapy (RRT) among patients with acute kidney injury (AKI), previous studies have demonstrated varied outcomes regarding the necessity and timing of RRT initiation. Wald R (2009) [7] and Schiffl H et al. (2012) [8] reported that renal recovery defined as no longer requiring RRT can occur in up to 50% of patients. However, predicting recovery remains challenging. Srivastava A et al. (2019) [9] found the mean number of RRT-free days in their cohort was 6.7 ± 8.9, and noted that uric acid levels did not significantly impact mortality or renal recovery rates. Requirement of Renal replacement therapy and Recovery Outcomes: In the present study, among patients who required renal replacement therapy (RRT), 154 (56.4%) experienced recovery of kidney function, whereas all 27 patients (100%) in the non-recovery group had required RRT, indicating a strong association between the need for RRT and poor renal outcomes. Conversely, among those who did not require RRT, 119 patients (43.5%) recovered renal function, and none experienced non-recovery. These findings highlight that the requirement for RRT is significantly linked with adverse recovery outcomes in patients with acute kidney injury (AKI).The findings regarding the timing of renal replacement therapy (RRT) in acute kidney injury (AKI) remain varied. In a randomized controlled trial conducted by Gaudry A, et al., (2016) [10] early initiation of RRT did not demonstrate significant benefits over delayed initiation and, in fact, suggested that delaying RRT could help avoid unnecessary treatment and reduce associated complications.

Conclusion

The present study sheds light on the demographic characteristics, hematological parameters, renal function trends, and serum uric acid levels in patients with acute kidney injury (AKI). Elevated serum uric acid (>7 mg/dl) at admission was significantly associated with poorer outcomes and increased requirement of Renal replacement therapy It also emphasizes that with adequate treatment of the underlying cause for AKI, serum uric acid level normalizes without any specific treatment for elevated serum uric acid levels. Overall, the findings highlight the high recovery potential in AKI with timely intervention, while

emphasizing elevated uric acid and the need for RRT as key predictors of adverse outcomes

Reference

1. S Ames BN, Cathcart R, Schwiers E, Hochstein P. Uric acid provides an antioxidant defense in humans against oxidant- and radical-caused aging and cancer: a hypothesis. Proc Natl Acad Sci USA. 1981 Nov; 78(11): 6858–62.
2. Johnson RJ, Bakris GL, Borghi C, Chonchol MB, Feldman D, Lanaspa MA, et al. Hyperuricemia, Acute and Chronic Kidney Disease, Hypertension, and Cardiovascular Disease: Report of a Scientific Workshop Organized by the National Kidney Foundation. Am J Kidney Dis. 2018 Jun; 71(6): 851–65.
3. Hill AB. The environment and disease: association or causation? Proc R Soc Med. 1965 May; 58: 295–300.
4. Fedak KM, Bernal A, Capshaw ZA, Gross S. Applying the Bradford Hill criteria in the 21st century: how data integration has changed causal inference in molecular epidemiology. E merg Themes Epidemiol. 2015 Sep; 12(1): 14.
5. Prasad N, Jaiswal A, Meyyappan J, Gopalakrishnan N, Chaudhary AR, Fernando E, Rathi M, Singh S, Rajapurkar M, Jeloka T, Kishun J. Community-acquired acute kidney injury in India: data from ISN-acute kidney injury registry. The Lancet Regional Health-Southeast Asia. 2024 Feb 1;21.
6. Kawasoe S, Kubozono T, Yoshifuku S, et al. Uric acid level and prevalence of atrial fibrillation in a Japanese general population of 285,882. Circ J. 2016; 80:2453–2459. doi: 10.1253/circj.CJ-16-0766
7. Schiffl H, Lang SM, Fischer R. Long-term outcomes of survivors of ICU acute kidney injury requiring renal replacement therapy: a 10-year prospective cohort study. Clin Kidney J. 2012; 5(4): 297-302.
8. Schoenfeld D, Bernard GR. Statistical evaluation of ventilatorfree days as an efficacy measure in clinical trials of treatments for acute respiratory distress syndrome. Crit Care Med. 2002;30(8):1772-1777.
9. Lee EH, Choi JH, Joung KW, Kim JY, Baek SH, Ji SM, Chin JH, Choi IC. Relationship between serum uric acid concentration and acute kidney injury after coronary artery bypass surgery. Journal of Korean medical science. 2015 Oct 1;30(10):1509-16.
10. Barbar SD, Clere-Jehl R, Bourredjem A, Hernu R, Montini F, Bruyère R, Lebert C, Bohé J, Badie J, Eraldi JP, Rigaud JP. Timing of renal-replacement therapy in patients with acute kidney injury and sepsis. New England Journal of Medicine. 2018 Oct 11;379(15): 1431-42.