International Journal of Research in Health and Allied Sciences

Journal home page: www.ijrhas.com

Official Publication of "Society for Scientific Research and Studies" [Regd.]

ISSN: 2455-7803

Original Research

Significance of hyperuricemia on the early diagnosis of disease severity in sepsis

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ABSTRACT:

Background: Uric acid occurs predominantly as a urate anion under physiologic pH. In the kidney, urate is filtered readily by the glomerulus and subsequently reabsorbed by the proximal tubular cells of the kidney. The present study was conducted to assess significance of hyperuricemia on the early diagnosis of disease severity in sepsis. **Materials & Methods:** 86 cases of sepsis of both genders were subjected to assessment of complete blood count, lactic acid, phosphorus, albumin, and arterial blood gas was performed. Hyperuricemia is defined as a serum urate level of >7 mg/dL (420 uM) in men and >6 mg/dL (300 uM) in women. **Results:** Out of 86 patients, males were 56 and females were 30. The mean uric acid level >7 mg/dl was seen in 54 and <7 mg/dl in 32. There were 78 patients with >7 and 8 with <7 uric acid level. Clinical features were altered sensorium in 48 and 38, RR>22 seen in 50 and 36, Systolic<100 was seen in 46 and 40 and ARDS in 10 and 76 with >7 and with <7 uric acid level respectively. The difference was significant (P< 0.05). **Conclusion:** Serum uric acids is potentially used as a marker of severity of illness as well as predictor of mortality and morbidity in patients with clinically suspected sepsis.

Key words: Sepsis, Hyperuricemia, Uric acid

Received: 17 June, 2021 Accepted: 24 July, 2021

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This article may be cited as: Modi D, Singh P, Bhatia R. Significance of hyperuricemia on the early diagnosis of disease severity in sepsis. Int J Res Health Allied Sci 2021; 7(4): 165-167.

INTRODUCTION

Uric acid is end product of purine metabolism in humans. Purines are nitrogen containing compounds, endogenous or exogenous. Uric acid passes through the liver, enters the blood stream, most of it excreted in urine. Some uric acid is degraded in the body after reaction with oxidants or peroxynitrite.[1]

Uric acid occurs predominantly as a urate anion under physiologic pH. In the kidney, urate is filtered readily by the glomerulus and subsequently reabsorbed by the proximal tubular cells of the kidney; normal fractional excretion of uric acid is approximately 10%. Normal levels of blood uric acid are typically 3.4–7.2 mg/dL for men and 2.4–6.1 mg/dL for women. Since the last century elevated uric acid levels have been noted to be associated with atherosclerosis, hypertension, hyperinsulinemia and chronic kidney disease. Sepsis is a serious medical condition characterized by a whole-body inflammatory state (systemic inflammatory response syndrome) and the presence of a known or suspected infection that has severe consequences. Hence majority of intensive care unit patients undergo ischemic-reperfusion injury and inflammation to varying degrees during their hospitalization.[2]

Oxidative stress is found out by the presence of elevated serum uric acid which is a poor prognostic sign in case of patients with sepsis as multi organ dysfunction occurs as a result of high oxygen free radicals. Increased levels of serum uric acid causes acute activation of many transcription factors in patients with severe infection and is a poor prognostic sign in case of severe infection. Chronic condition is also associated with elevated serum uric acid.[3] The present study was conducted to assess significance of

hyperuricemia on the early diagnosis of disease severity in sepsis.

MATERIALS & METHODS

The present study comprised of 86 cases of sepsis of both genders. They were made part of the study with their written consent. Sepsis was defined based on the Society of Critical Care Medicine, Surviving Sepsis Campaign 2012 definition.

Demographic data was recorded. Assessment of complete blood count, lactic acid, phosphorus, albumin, and arterial blood gas was performed. Hyperuricemia is defined as a serum urate level of >7 mg/dL (420 uM) in men and >6 mg/dL (300 uM) in women. Acute kidney injury was defined an absolute >0.3 mg/dl increase in creatinine above the baseline in both males and females. SOFA score ie. assigning one point for low blood pressure (SBP≤100 mmHg), high respiratory rate (≥22 breaths per min), or altered mentation (Glasgow coma scale<15). 2 or 3 points indicate high risk of poor outcome in patients with clinically suspected sepsis. Results were analysed statistically.

RESULTS

Table I Distribution of patients

Total- 86		
Gender	**Males**	**Females**
Number	56	30

Table I shows that out of 86 patients, males were 56 and females were 30.

Table II Distribution of patients based on uric acid level

Uric acid level	Number	P value
<7	54	0.021
>7	32	

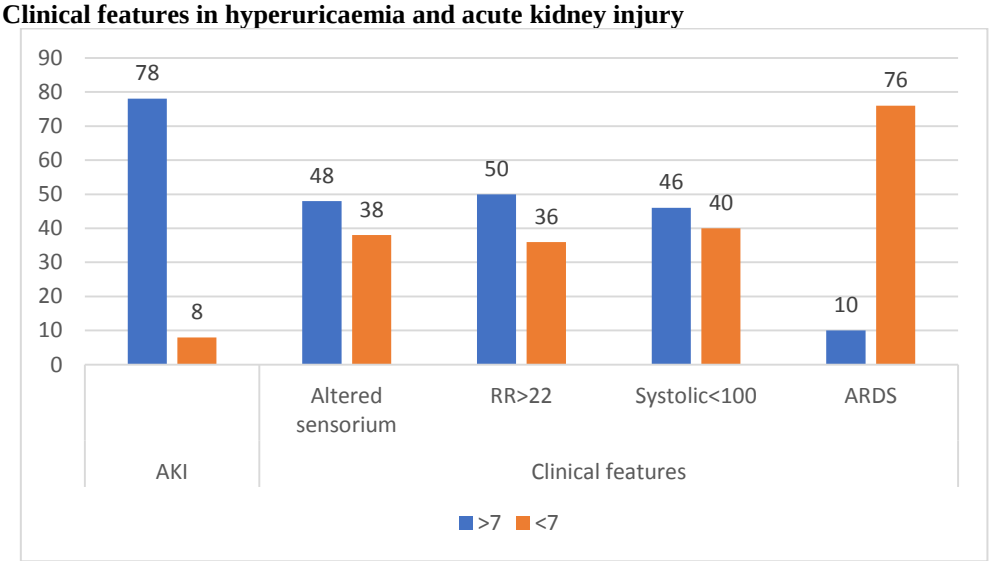
Table II shows that mean uric acid level >7 mg/dl was seen in 54 and <7 mg/dl in 32. The difference was significant (P< 0.05).

Table III Clinical features in hyperuricaemia and acute kidney injury

Parameters	Variables	>7	<7	P value
AKI		78	8	0.01
Clinical features	Altered sensorium	48	38	0.05
	RR>22	50	36	
	Systolic<100	46	40	
	ARDS	10	76	

Table III, graph I shows that there were 78 patients with >7 and 8 with <7 uric acid level. Clinical features were altered sensorium in 48 and 38, RR>22 seen in 50 and 36, Systolic<100 was seen in 46 and 40 and ARDS in 10 and 76 with >7 and with <7 uric acid level respectively. The difference was significant (P< 0.05).

Graph I Clinical features in hyperuricaemia and acute kidney injury



DISCUSSION

Sepsis term was derived from the Greek word sepo meaning decay or putrefaction. Severe sepsis is acute organ dysfunction due to infection. Septic shock was derived from the French word choquer meaning 'to collide with'. Sepsis and septic shock are major

healthcare problems all over the world. The incidence of sepsis and related syndromes is increasing around the globe. Every year millions of people are affected by sepsis world over and most of them succumb to it.[4] Both community acquired and hospital acquired infections can cause sepsis. Pneumonia is the most common cause of sepsis which constitutes about half of all cases followed by intra- abdominal and genitourinary infections as the next common causes. Blood cultures are positive in only one third of patients while the remaining are culture negative in all sites.[5] Most commonly isolated gram- positive bacteria are Staphylococcus aureus and Streptococcus pneumoniae. Escherichia coli, Klebsiella species, and Pseudomonas aeruginosa are most common gram-negative bacteria isolated. In recent years, gram-positive infections are being reported more often than gram-negative infections.[6] The risk factors for sepsis are related to both the predisposition to develop an infection and, the likelihood of developing acute organ dysfunction once the infection develops.[7] The present study was conducted to assess significance of hyperuricemia on the early diagnosis of disease severity in sepsis.

In present study, out of 86 patients, males were 56 and females were 30. Nithish et al[8] in their study a total no of 60 patients were enrolled based on the inclusion criteria, clinically suspected sepsis patients aged more than 18 years. Patients were divided in two groups based on the uric acid levels. The first group had clinically suspected sepsis patients with uric acid levels more than 7 and the second group had clinically suspected sepsis patients with uric acid level less than 7. Results: More than half of the patients, 55%, with high uric acid were found to be males. The overall mortality rate in patients with high uric acid levels was found to be 90%. The probability of having hyperuricemia with acute kidney injury was around 92.9%

We found that mean uric acid level >7 mg/dl was seen in 54 and <7 mg/dl in 32. Akbar et al[9] evaluate correlation between hyperuricemia and the morbidity rate. Secondary end points were Acute Kidney Injury (AKI), mortality, Acute Respiratory Distress Syndrome (ARDS), and duration of stay. They enrolled 144 patients. 54 (37.5%) had the primary end point of hyperuricemia. The overall morbidity rate was 85.2%. The probability of having hyperuricemia along with AKI was 68.5% and without AKI was 31.5%. Meanwhile the probability of having a uric acid value < 0.0001. They report that elevated uric acid levels on arrival to the MICU in patients with sepsis are associated with poor prognosis. These patients are at an increased risk for AKI and ARDS.

Many studies reported that levels the serum levels of uric acid could reflect the severity and prognosis of infection.[10.11] Rats with hyperuricemia have a significant increase in macrophage infiltration in their kidneys independent of crystal deposition the development of acute kidney injury during sepsis increases the patient's morbidity mortality as it has a significant effect on multiple organ function and is associated with increased duration of stay in the hospital.[12]

CONCLUSION

Authors found that serum uric acids is potentially used as a marker of severity of illness as well as predictor of mortality and morbidity in patients with clinically suspected sepsis.

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