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Association of Serum Uric Acid and C-Reactive Protein Level In Chronic Kidney Disease Patients

Urvashi Midha[1], Eram Hussain Pasha[2], Juhi Aggarwal[3], Sanjukta Naik*[4], Jyoti Batra[5]

[5] Professor, Department of Biochemistry, Santosh Medical College & Hospital, Santosh Santosh Deemed to be University, Ghaziabad, Uttar Pradesh, India.

ABSTRACT:

Both elevated C-reactive protein (CRP) and hyperuricemia are recognised as distinct indicators of inflammation. Endothelial dysfunction is frequently linked to elevated uric acid levels. Little research has been done on its function in chronic kidney disease (CKD). The goal of the current study was to evaluate the levels of serum uric acid and C-reactive protein in CKD patients. The study's results indicate that people with CKD typically had higher levels of CRP and serum uric acid. As proven independent risk factors for cardiovascular disease (CVD), CRP and uric acid should be further investigated for their relationship in CKD patients.

Key words: CKD, CRP, Uric Acid

INTRODUCTION:

Chronic kidney disease (CKD) is a slow and progressive loss of kidney function over a period of several years. Eventually, the patient has permanent kidney failure. CKD is a term for a variety of illnesses that affect the structure and operation of the kidney. The aetiology, pathophysiology, severity, and rate of advancement are factors that contribute to the variance in illness expression. [1-5]

A GFR of less than 60 ml per minute per 1.73 m2 for three months or more is generally regarded as a marker of kidney impairment, as are anomalies in the composition of blood or urine, anomalies in imaging studies, and other symptoms. The terms "kidney damage" and "markers of kidney damage" refer to structural or functional abnormalities of the kidney, whether or not they are accompanied by a decrease in Glomerular Filtration Rate (GFR), are influenced by pathologic abnormalities, or both. [6]

Most impoverished nations suffer from chronic renal disease [7] chronic kidney disease will become more prevalent as a result of the rapid rise in risk factors like diabetes, hypertension, and obesity, which will also have significant socioeconomic and public health repercussions in both resource-poor and industrialised nations. Many nations currently see an incidence of up to 200 cases per million per year [8]. 40–60% of cases of CKD today in India are caused by diabetes and hypertension. According to the most recent data from the Indian Council of Medical Research, the prevalence of diabetes in the adult population of India has increased to

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7.1%, and it is as high as 28% in metropolitan areas. [9] Regular renal failure and cardiovascular disease are prominent causes of chronic kidney disease (CKD), which is common and linked to an elevated mortality rate. [10, 11]

The liver produces the glycoprotein known as CRP. Its production is sped up when there is severe inflammation and tissue destruction within the body. An inflammatory process is present when the CRP is positive. Human serum with a healthy CRP content ranges between 5 and 10 mg/L. Increased levels are found in late pregnant woman, mild inflammation, and viral infection (10-40 mg/L), active inflammation, bacterial infection (40-200mg/L) and severe bacterial infections and burns (>200.0 mg/L).[12] Thus CRP has great importance in following condition: Cardiovascular disease, Fibrosis and inflammation, coronary artery disease risk, Rheumatoid Arthritis.

According to a number of studies, CRP may have strong proinflammatory effects by binding to ligands exposed on cells or alternative autologous structures as a result of infection, inflammation, ischemia, or other pathologies. This would then activate complement, which could exacerbate tissue damage and cause more serious illness. [13]

Over the past few years, the importance of CRP and inflammation has grown, particularly in people with end-stage renal disease. It is now clear from a simple marker that CRP actively contributes to local pro-inflammatory and thrombotic events as well as pro-atherosclerotic phenomena.

The metabolic breakdown of purine nucleotides results in uric acid, which is a typical component of urine. [13] High blood uric acid levels can also be a sign of a number of illnesses, such as diabetes, gout (which involves recurrent attacks of acute arthritis), hyperparathyroidism, acute renal failure, and plays a significant role in urinary stones.

According to several research, uric acid may have connections to cardiovascular disease, renal disease, and hypertension. Despite the fact that this evidence is growing, it does support the general treatment of asymptomatic hyperuricemia to lower cardiovascular risk. However, it would appear that there is enough proof from clinical trials to say if reducing uric acid levels would be clinically advantageous in the prevention or treatment of cardiovascular and renal illnesses.[14]

Both elevated CRP and hyperuricemia have been established as independent pro-inflammatory factors. According to a number of studies, elevated uric acid levels are linked to endothelial dysfunction. The relationship between CRP and uric acid hasn't exactly been researched as such. The purpose of the current study was to evaluate the relationship between patients with chronic renal disease and their serum uric acid and CRP levels.

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DISCUSSION:

Chronic kidney disease (CKD) is described as the presence of kidney damage markers for more than three months, whether or not there is a decline in GFR, or as the presence of a GFR less than or equal to 60 ml/min/1.73 m2 for three months, whether or not there are additional signs of kidney damage. [15] Numerous studies have suggested that more research be done in this area because of the part that uric acid (UA) and CRP play in the development and progression of CKD.

Mok Y et al., (2012), Higher blood serum uric acid levels increased the chance of developing chronic kidney disease, suggesting that at least some of the documented relationship between serum uric acid.[16] Cosmo S. De et. al., 2015 found that in those with type 2 diabetes, mild hyperuricemia is highly linked to the risk of CKD.[17] On the other hand, Giordano C et. As noted by et al. (2015), hyperuricemia may be used as a disease marker for the potential to acquire renal disease in the future as well as to indicate risk for a patient with renal disease to experience worsening renal function.[18]

Tsai, Ching-Wei, et al. In a Chinese population, a higher UA level was strongly linked to a faster deterioration in renal function and a higher chance of developing kidney failure, according to a 2017 study by Li et al. [19]

E Russo et. In patients with CKD, hyperuricemia is highly common, according to al, 2021. This study highlights the need for clarification about the definition of hyperuricemia in the presence of CKD and the value of urate lowering therapy for the protection of the cardiovascular system and the kidneys in people with CKD.[20]

“A recent study by Hassan W in 2022 found that uric acid-lowering therapy was not associated with positive kidney outcomes in patients with kidney function within the reference range and may even be associated with potential harm in patients with less noticeably elevated serum uric acid levels”. [21]

The association between inflammation and renal function was explained by a number of theories. According to one explanation, the decline in nitric oxide synthase activity led to the conclusion that inflammation is a contributing factor to renal failure.[22] A study conducted in the USA explained that lower CRP filtration in end-stage renal illness accounts for greater CRP concentrations with CKD. [22]

Ervin r. fox et. al, 2010 findings suggested that CRP as a marker of inflammation may serve a good potential target for treatment and prevention.[23] Additionally, another study by Stuveling contends that the risk factors for both CKD and CRP i.e. hypertension, obesity, and diabetes—are similar. [24]

Ruggiero C et. al., 2006 stated that an extensive population-based sample of older people and a subsample of participants with normal UA both revealed a positive and significant

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correlation between UA and a number of inflammatory markers.[25] Caravaca F et. al., 2005 also concluded that uric acid levels relate independently with the CRP in patients with CKD. [26]

Baravkar P et. al., 2013 concluded that when predicting an elevated risk of cardiovascular death in CKD, CRP estimate is useful. Increased cardiovascular risk and death have been linked to either inflammation or hyperuricemia. [27] Similar to this, Kenaan T. et al. To sum up, high UA levels were linked to higher TG/HDL and hepatic steatosis levels, regardless of metabolic syndrome and obesity, as well as higher hs-CRP levels, independent of metabolic syndrome.[28]

Further, in 2021, Jeena J. stated that there is a patients with CKD may be at risk for disease progression due to the direct correlation between serum uric acid and C-Reactive protein. [29]

SUMMARY AND CONCLUSION:

Kidney disease of the sort known as CKD is highly prevalent in today's lifestyle. It is a condition where kidney function gradually declines over a few months or years. An annular protein called C-reactive protein (CRP) can be utilised to screen for inflammation because it is a sign for inflammation. The leading cause of hospitalisation and mortality in chronic renal disease is cardiovascular disease, and CRP levels are markedly elevated in a number of diseases (CKD).

The primary byproduct of the catabolism of purine nucleosides is uric acid, which is eliminated by the kidneys.

CRP and Uric Acid are found to be correlated with the risk of CKD. However, role of CRP and Uric Acid has not been explored much in context of CKD.

The goal of the current study was to evaluate the relationship between CRP and uric acid in chronic renal disease. It was suggested that patients with CKD have considerably higher levels of CRP and UA. In addition to having impaired renal function, CKD patients run the risk of developing additional co-morbid conditions. In CKD patients, the development of CVD is a major cause of death. Therefore, more research into the relationship between CRP and UA in CKD patients is necessary.

The study recommends regular screening of uric acid and CRP levels in patients diagnosed for CKD. Early detection of the above risk factors can be helpful in providing optimum treatment and hence improving the quality of life. The study further proposes follow up studies on the proposed parameters and also evaluation of other risk factors in CKD patients.

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REFERENCES:

1. National Kidney Foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis 2002;39(2 suppl 1):S1–266.
2. Levey AS, Coresh J, Balk E, et al. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Ann Intern Med 2003;139:137–47.
3. Levey AS, Stevens LA, Coresh J. Conceptual model of CKD: applications and implications. Am J Kidney Dis 2009;53(suppl 3): S4-16.
4. Rettig RA, Norris K, Nissenson AR. Chronic kidney disease in the United States: a public policy imperative. Clin J Am Soc Nephrol. 2008;3:1902–10.
5. Levey AS, Atkins R, Coresh J, et al. Chronic kidney disease as a global public health problem: approaches and initiatives- a position statement from Kidney Disease Improving Global Outcomes. Kidney Int. 2007; 72:247–59.
6. Nugent RA, Fathima SF, Feigl AB, Chyung D. The burden of chronic kidney disease on developing nations: a 21st century challenge in global health. Nephron Clin Pract. 2011;118:c269–77.
7. World Health Organization -Burden of disease, accessed on September 2006.
8. Kepler J. International comparisons. United States Renal Data System. 2010 Annual Data Report: Atlas of chronic kidney disease and end-stage renal disease in the United States, vol 2 Atlas of ESRD. 2010.
9. Levey AS, Tangri N, Stevens LA. Classification of chronic kidney disease: a step forward. Ann Intern Med. 2011;154:65–7.
10. Levey AS, Andreoli SP, DuBose T, Provenzano R, Collins AJ. CKD: common, harmful, and treatable – World Kidney Day 2007. Am J Kidney Dis. 2007;49:175–9.
11. Pepys MB, Baltz ML. Acute phase proteins with special reference to C-reactive protein and related proteins (pentaxins) and serum amyloid A protein. Adv Immunol. 1983;(34):141-212.
12. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. J Clin Invest 2003;(111):1805-12.
13. Thomas L. TH-Books, Frankfurt/Main, 7. Auflage. Labor und Diagnose. 2008;1396.
14. Daniel I. Feig, Duk-Hee Kang, Richard J. Johnson, Uric Acid and Cardiovascular Risk, 2008; 359(17): 1811–21.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper **© 2012 IJFANS. All Rights Reserved,** **UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022**

15. Schnaper HW. Remnant nephron physiology and the progression of chronic kidney disease. Pediatr Nephrol. 2014;(2):193-202.

16. Mok Y, Lee SJ, Kim MS, Cui W, Moon YM, Jee SH. Serum uric acid and chronic kidney disease: the Severance cohort study. Nephrol Dialys Trans. 2011;27(5):1831-5.

17. De Cosmo S, Viazzi F, Pacilli A, Giorda C, Ceriello A, Gentile S, et al. Serum Uric Acid and Risk of CKD in Type 2 Diabetes. Clin J Am Soc Nephrol. 2015;10:1921–9.

18. Giordano C, Karasik O, King-Morris K, Asmar A. Uric acid as a marker of kidney disease: review of the current literature. Dis Mar. 2015;1-6.

19. Tsai CW, Lin SY, Kuo CC, Huang CC. Serum uric acid and progression of kidney disease: a longitudinal analysis and mini-review. PloS one. 2017 Jan 20;12(1):e0170393.

20. Russo, E., Viazzi, F., Pontremoli, R. et al. Association of uric acid with kidney function and albuminuria: the Uric Acid Right for heArt Health (URRAH) Project. J Nephrol 35, 211–221 (2022). https://doi.org/10.1007/s40620-021-00985-4

21. Hassan W, Shrestha P, Sumida K, et al. Association of Uric Acid–Lowering Therapy With Incident Chronic Kidney Disease. JAMA Netw Open. 2022;5(6):e2215878. doi:10.1001/jamanetworkopen.2022.15878

22. Trachtman H, Futterweit S, Arzberger C, et al: Nitric oxide and superoxide in rat mesangial cells: modulation by C-reactive protein. Pediatr Nephrol 2006, 21(5):619-26.

23. Fox ER, Benjamin EJ, Sarpong DF, Nagarajarao H, Taylor JK, Steffes MW, et al. The relation of C-reactive protein to chronic kidney disease in African Americans: the Jackson Heart Study. BMC Nephrol. 2010;11(1):1.

24. Stuveling EM, Hillege HL, Bakker SJ, Gans RO, De Jong PE, De Zeeuw D: Creactive protein is associated with renal function abnormalities in a non-diabetic population. Kidney Int 2003, 63(2):654-61.

25. Ruggiero C, Cherubini A, Ble A, Bos AJ, Maggio M, Dixit VD, et al. Uric acid and inflammatory markers. Eur Heart J. 2006;27(10):1174-81.

26. Caravaca F, Martin MV, Barroso S, Cancho B, Arrobas M, Luna E, et al. Serum uric acid and C-reactive protein levels in patients with chronic kidney disease. Nefrologia: publicacion oficial de la Sociedad Espanola Nefrologia. 2005;25(6):645-54.

27. Pravin NB, Jayashree SB, Shilpa BA, Suhas SB, Jayashree SB, Anand PT. Study of serum uric acid and c-reactive protein levels in patients with chronic renal disease. Int J Biol Med Res. 2013;4(1):2758-61.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11, S Iss 2, 2022

28. Tanya Keenan, Michael J. Blaha, Khurram Nasir, Michael G. Silverman, Rajesh Tota-Maharaj, Jose A.M. Carvalho, Raquel D ,Conceição, Roger S. Blumenthal,and Raul D. Santos(2012) Am J Cardiol. 2012 December 15; 110(12): 1787–1792. doi:10.1016/j.amjcard.

29. Jeena, J., Manhas, S., Prasad, R. et al. Direct Relationship Between Uric Acid and C-Reactive Protein and Its Implication in the Chronic Kidney Disease. Ind J Clin Biochem 37, 365–369 (2022). https://doi.org/10.1007/s12291-020-00942-1