STUDY OF KIDNEY FUNCTION MARKERS IN PATIENTS WITH CHRONIC KIDNEY DISEASE (CKD)

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Abstract—**Chronic Kidney Disease (CKD) is a progressive condition characterized by the gradual loss of kidney function over time. It has emerged as a major public health concern worldwide due to its increasing prevalence, associated morbidity, and mortality. Kidney function markers such as serum creatinine, blood urea, uric acid, estimated glomerular filtration rate (eGFR), and electrolytes play a vital role in the diagnosis, monitoring, and management of CKD patients. This prospective observational study was conducted to evaluate kidney function markers in patients diagnosed with CKD and to assess their clinical significance in disease progression. A total of 100 patients with confirmed CKD were included in the study over a period of twelve months. Blood samples were collected and analyzed using standard biochemical methods. The results showed elevated serum creatinine and blood urea levels in the majority of CKD patients. Reduced eGFR was observed in all patients, with severity varying according to disease stage. Electrolyte abnormalities, particularly hyperkalemia and metabolic acidosis, were common among advanced-stage CKD patients. The findings demonstrated a significant correlation between kidney function markers and the severity of renal impairment. The study concludes that routine assessment of kidney function markers remains essential for early detection, staging, and monitoring of CKD. Timely evaluation of these markers can help improve patient outcomes and reduce disease-related complications.**

Index Terms—**Chronic Kidney Disease, Serum Creatinine, Blood Urea, eGFR, Kidney Function Tests, Renal Biomarkers**

I. Introduction

Chronic Kidney Disease (CKD) is a long-term disorder characterized by structural or functional abnormalities of the kidneys persisting for more than three months. The condition is associated with progressive decline in renal function and may eventually lead to end-stage renal disease (ESRD), requiring dialysis or kidney transplantation. The kidneys play a crucial role in maintaining homeostasis by regulating fluid balance, electrolyte concentration, acid-base status, and waste product excretion. When kidney function declines, metabolic waste products accumulate in the bloodstream, resulting in various biochemical abnormalities and clinical manifestations such as uremia, fluid overload, and electrolyte imbalances.

Pathophysiology of CKD: CKD involves progressive damage to nephrons, the functional units of the kidney. This leads to hyperfiltration in remaining nephrons, glomerular hypertension, and further scarring (glomerulosclerosis). Common causes include diabetic nephropathy, hypertensive nephrosclerosis, glomerulonephritis, and polycystic kidney disease. In advanced stages, interstitial fibrosis and tubular atrophy become prominent. Globally, according to recent estimates, over 850 million people are affected by CKD, with higher burdens in low- and middle-income countries. The prevalence of CKD has increased due to rising incidences of diabetes mellitus, hypertension, obesity, and aging populations. In India, CKD

represents a growing healthcare challenge, with prevalence rates estimated between 10-17% in various studies, particularly affecting rural and economically disadvantaged communities where access to healthcare is limited. Laboratory investigations form the cornerstone of CKD diagnosis and monitoring. Serum creatinine and blood urea are the most commonly used indicators of renal function, though they have limitations such as influence by muscle mass and diet. Estimated glomerular filtration rate (eGFR) provides a more reliable assessment of kidney filtration capacity and is used for staging CKD according to KDIGO guidelines (stages 1-5). Additional markers such as serum uric acid, sodium, potassium, calcium, and phosphate contribute valuable information regarding disease severity and complications like secondary hyperparathyroidism and mineral bone disease. Monitoring kidney function markers enables clinicians to assess disease progression, guide therapeutic interventions such as blood pressure control with ACE inhibitors or ARBs, dietary modifications, and evaluate treatment response. Early identification of abnormal biomarkers can facilitate timely management and potentially delay the progression of kidney damage, reducing the need for renal replacement therapy. This study was undertaken to evaluate kidney function markers in CKD patients and determine their significance in the diagnosis and management of chronic kidney disease. Understanding these markers is critical in resource-limited settings like India to optimize patient care.

II. OBJECTIVES

The present study was conducted with the following objectives: 1. To evaluate kidney function markers in patients diagnosed with chronic kidney disease. 2. To assess serum creatinine and blood urea levels in CKD patients. 3. To determine estimated glomerular filtration rate (eGFR) and its relationship with CKD stages. 4. To analyze electrolyte abnormalities associated with chronic kidney disease. 5. To assess the clinical significance of kidney function markers in monitoring disease progression.

III. MATERIAL AND METHODS

Study Design and Duration

This was a prospective observational study conducted in the Department of Paramedical Science, Mewar University, over a period of twelve months from April 2025 to March 2026. **Sample Size**
A total of 100 patients diagnosed with chronic kidney disease were enrolled in the study. **Inclusion**

Criteria

- Patients diagnosed with CKD.
- Patients aged above 18 years.
- Patients willing to participate and provide informed consent. **Exclusion Criteria**
- Patients with acute kidney injury.
- Pregnant women.
- Patientswith severe systemic illnesses affecting kidney function independently. **Data Collection**

Detailed clinical history and demographic information were obtained from all patients. Relevant laboratory investigations were recorded. **Laboratory Methods**
Venous blood samples were collected under aseptic precautions. Serum was separated and analyzed for:

- Serum Creatinine
- Blood Urea
- Uric Acid
- eGFR
- Serum Sodium

- Serum Potassium
- Serum Calcium
- Serum Phosphorus All biochemical analyses were performed using standard automated analyzers.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Mean, standard deviation, percentages, and frequencies were calculated. A p-value less than 0.05 was considered statistically significant.

IV. RESULTS

Demographic Profile

A total of 100 CKD patients were included. The majority were males (60%) and belonged to the age group of 41–70 years.

Age Group	Male	Female	Total
18–40 years	15	10	25
41–55 years	20	12	32
56–70 years	18	10	28
Above 70 years	7	8	15
Total	60	40	100

Kidney Function Markers

Parameter	Mean Value
Serum Creatinine	4.8 mg/dL
Blood Urea	96 mg/dL
Uric Acid	8.2 mg/dL
eGFR	28 mL/min/1.73m²
Potassium	5.4 mEq/L

Table 3: Frequency of Abnormal Findings

Parameter	mber of Patients	Percentage
Elevated Creatinine	92	92%
Elevated Blood Urea	88	88%
Hyperkalemia	42	42%
Hyperphosphatemia	37	37%
Reduced eGFR	100	100%

V. DISCUSSION

The present study evaluated kidney function markers in 100 patients diagnosed with chronic kidney disease. Elevated serum creatinine and blood urea levels were among the most common abnormalities observed. These findings indicate reduced renal clearance and progressive deterioration of kidney function, consistent with the natural history of CKD. The reduction in eGFR observed in all patients confirms its importance as a reliable indicator of CKD severity and staging. Similar findings have been reported in previous studies, demonstrating a strong inverse relationship between serum creatinine levels and glomerular filtration rate. The mean eGFR of 28 mL/min/1.73m² in this cohort places most patients in stage 4 CKD, highlighting advanced disease at presentation. Electrolyte disturbances, particularly hyperkalemia (42%) and hyperphosphatemia (37%), were frequently observed in advanced stages of CKD. These abnormalities result from impaired excretion and contribute significantly to disease complications such as cardiac arrhythmias, bone disease, and vascular calcification. Hyperkalemia, in particular, requires careful management with dietary restrictions, medications like potassium binders, or dialysis in severe cases.

Comparison with Literature: Our results align with studies from various regions showing similar patterns of biomarker derangements in CKD populations. For instance, elevated uric acid levels (mean 8.2 mg/dL) suggest its role as both a marker and potential contributor to disease progression through crystal-induced inflammation and endothelial dysfunction. The study findings highlight the importance of regular monitoring of kidney function markers for early diagnosis, treatment planning, and prevention of CKD progression. In the Indian context, where late presentation is common, such monitoring can significantly impact public health outcomes. Limitations of the study include its single-center design and lack of long-term follow-up. Future studies should incorporate more advanced biomarkers like cystatin C or urinary albumin-to-creatinine ratio for better prognostic value. Additional management strategies include renin-angiotensin system blockade, SGLT2 inhibitors (where available), anemia management with erythropoietin, and multidisciplinary care involving nephrologists, dietitians, and paramedical staff.

VI. CONCLUSION

The present study demonstrates that kidney function markers play a crucial role in the diagnosis, staging, and monitoring of chronic kidney disease. The major findings of the study are: 1. Elevated serum creatinine and blood urea were observed in most CKD patients. 2. Reduced eGFR was present in all patients and correlated with disease severity. 3. Electrolyte abnormalities were common in advanced stages of CKD. 4. Kidney function markers provide valuable information regarding disease progression and treatment monitoring. Based on these findings, routine assessment of kidney function markers should be considered an essential component of CKD management. Early detection and regular monitoring can help improve patient outcomes and reduce complications. **Recommendations**: - Implement community-based screening programs using simple markers like serum creatinine and eGFR. - Educate healthcare workers on early recognition of CKD. - Promote lifestyle modifications including low-protein diet, blood pressure control, and glycemic management. - Strengthen referral systems to higher centers for advanced care. Further research with larger, multi-centric cohorts and longitudinal follow-up is recommended to validate these findings and explore novel biomarkers.

References

[1] Brenner BM, Rector FC. Brenner and Rector's The Kidney. 11th Edition. Elsevier; 2020.

[2] KDIGO Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney

Disease. Kidney Int Suppl. 2013.

[3] Taal MW, Chertow GM, Marsden PA. Brenner and Rector's The Kidney. Elsevier; 2020.

[4] Johnson RJ, Feehally J, Floege J. Comprehensive Clinical Nephrology. 6th Edition. Elsevier; 2019.

[5] Levey AS, Coresh J. Chronic kidney disease. Lancet. 2012;379:165-180.

[6] National Kidney Foundation. KDOQI Clinical Practice Guidelines for Chronic Kidney Disease.

[7] Kumar V, Abbas AK, Aster JC. Robbins and Cotran Pathologic Basis of Disease. 10th Edition. Elsevier; 2021.

[8] Burtis CA, Bruns DE. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics. Elsevier; 2018.

[9] Jameson JL, Fauci AS. Harrison's Principles of Internal Medicine. 21st Edition. McGraw-Hill; 2022.

[10] Thomas MC. Chronic kidney disease and cardiovascular disease. Nephrology. 2017.