Research Article

World J Curr Med Pharm Res. 2026; 8(2): 44-50

World Journal of Current Medical and Pharmaceutical Research

Content available at www.saap.org.in ISSN: 2582-0222

ASSESSMENT OF PREVALENCE AND RISK FACTORS OF CHRONIC KIDNEY DISEASE IN A TERTIARY CARE TEACHING HOSPITAL

B. SWAPNA[1*], NABEELA NOUSHEEN[2], TANUSHA[2], AMENA FIRDOUSE, P.SOWMYA[1]

*[1]Assistant Professor, Department of Pharmacy Practice, Smt. Sarojini Ramulamma College of Pharmacy, (Palamuru University), Seshadri Nagar, Mahabubnagar District, Telangana State, India.

[2]Pharm. D Intern, Smt. Sarojini Ramulamma College of Pharmacy, (Palamuru University), Seshadri Nagar, Mahabubnagar District, Telangana State, India.

ARTICLE HISTORY

Received on: 14-03-2026
Revised on: 21-04-2026
Accepted on: 05-06-2026

ABSTRACT

Chronic Kidney Disease is a long-term and irreversible condition in which the kidneys progressively lose their ability to filter waste materials and regulate fluid and electrolyte levels in the body. This has become a significant global health issue due to its rising prevalence and its connection with non-communicable diseases such as Type 2 Diabetes and Hypertension. CKD greatly elevates the risk of cardiovascular diseases, end-stage renal failure, and early death, placing a significant strain on healthcare systems, especially in low- and middle-income nations. In tertiary care hospitals, many patients are diagnosed at advanced stages of CKD, as early stages typically show no symptoms and public awareness of the disease remains low. Late diagnosis and limited access to routine screenings further aggravate disease outcomes. Analyzing the prevalence and risk factors of CKD in tertiary care settings helps pinpoint high-risk groups, prevalent contributing factors, and shortcomings in early detection and prevention efforts. These studies can enhance patient awareness, encourage early diagnosis, and assist in adopting better management practices to lower complications and boost quality of life for CKD patients.

Keywords: *Chronic Kidney Disease; CKD prevalence; Risk factors; Diabetes mellitus; Hypertension; Cardiovascular disease; eGFR; End-stage renal disease; Hospital-based observational study.*

***Corresponding Author**
B. Swapna

DOI: https://doi.org/10.37022/wjcmpr.v8i2.395

INTRODUCTION

Chronic kidney disease (CKD) is a major global public health challenge characterized by persistent abnormalities in kidney structure or function that lead to progressive loss of renal function and increased morbidity and mortality [1]. Emerging clinical studies continue to explore innovative management strategies and emphasize the importance of early intervention to improve patient outcomes [2]. Recent public health reviews have highlighted the increasing global burden of CKD and the urgent need for integrated prevention and healthcare strategies [3]. The KDIGO 2024 clinical practice guideline further refined approaches to CKD evaluation, diagnosis, and management using evidence-based recommendations [4]. Epidemiological updates indicate that CKD prevalence continues to rise worldwide due to aging populations and increasing rates of diabetes and hypertension [5].Recent therapeutic advances have transformed CKD treatment, particularly with the introduction of sodium-glucose cotransporter-2 (SGLT2) inhibitors such as dapagliflozin, which significantly reduce kidney disease progression and cardiovascular complications [6]. Hypertension remains both a cause and consequence of CKD, requiring comprehensive and long-term blood pressure management [7]. Genetic research has identified several susceptibility loci associated with kidney disease progression and renal dysfunction [8]. Diabetes mellitus is recognized as one of the leading causes of CKD and contributes significantly to cardiovascular morbidity and mortality [9]. Clinical trials involving empagliflozin demonstrated marked improvements in cardiovascular and renal outcomes among patients with diabetic kidney disease [10].

Renal biopsy remains an important diagnostic procedure for identifying underlying pathological changes and guiding therapeutic decisions in CKD patients [11]. Exercise interventions have shown beneficial effects on physical performance, cardiovascular health, and quality of life in individuals with CKD [12]. Consensus reports on diabetic kidney disease emphasized the importance of glycemic control, blood pressure regulation, and early screening for renal complications [13]. The KDIGO 2012 guidelines established

internationally accepted recommendations for CKD classification, evaluation, and management [14]. Subsequent KDIGO synopses reinforced the importance of individualized care and risk-based management strategies [15].Dietary sodium restriction has been associated with improved blood pressure control and reduced proteinuria in CKD patients [16]. The introduction of cystatin C alongside creatinine-based measurements improved the accuracy of glomerular filtration rate (GFR) estimation [17]. Renin–angiotensin–aldosterone system (RAAS) inhibition became a cornerstone therapy for slowing CKD progression and reducing proteinuria [18]. Anemia is a common complication of CKD caused primarily by impaired erythropoietin production and chronic inflammation [19]. Reduced GFR and increased albuminuria were shown to independently predict mortality and cardiovascular outcomes [20].

The development of the CKD-EPI equation represented a major advancement in estimating kidney function more accurately than previous models [21]. Nutritional interventions, including low-protein diets, have been explored as strategies to delay CKD progression and reduce metabolic burden [22]. Cardiorenal syndrome illustrates the complex interaction between cardiac and renal dysfunction in chronic disease states [23]. Smoking has been identified as an important modifiable risk factor associated with accelerated CKD progression [24]. Uremia contributes to multisystem complications and significantly affects quality of life in advanced kidney disease [25].Chronic kidney disease–mineral and bone disorder (CKD-MBD) is a major complication associated with abnormalities in calcium, phosphate, and bone metabolism [26]. The original definition and classification system for CKD standardized the use of eGFR and kidney damage markers for diagnosis and staging [27]. CKD is strongly associated with increased cardiovascular risk and adverse clinical outcomes [28]. Long-term epidemiological studies established hypertension as a major contributor to end-stage renal disease (ESRD) development and progression [29].

MATERIALS AND METHODOLOGY

Study Design, Type, and Duration

This study adopted a mixed-methods research design, integrating both quantitative and qualitative approaches to comprehensively assess the influence of socioeconomic and educational factors on cancer prevention, diagnosis, treatment acceptance, and patient outcomes. Quantitative data were collected using a structured questionnaire, while qualitative insights were obtained through semi-structured interviews. The study was conducted over a defined study period following ethical approval.

Study Setting and Source of Data

The study was conducted in the Department of Nephrology at SVS Medical College and Hospital, Mahbubnagar. Data were collected from multiple sources, including patient case sheets, medication notes, structured questionnaires, and survey reports obtained directly from cancer patients receiving care at the institution.

Sample Size Determination

A total of 100 chronic kidney diseasepatients were included in the study. The sample size was determined based on feasibility and the availability of eligible participants during the study period.

Sample Selection Criteria

Inclusion Criteria

- Patients aged 18 years and above attending the tertiary care teaching hospital.
- Patients diagnosed with chronic kidney disease (based on eGFR, serum creatinine, or other standard diagnostic criteria).
- Patients willing to provide informed consent for participation.
- Both male and female patients.

Exclusion Criteria

- Patients below 18 years of age.
- Patients with acute kidney injury (AKI) or reversible renal dysfunction.
- Patients who are critically ill and unable to participate.
- Patients unwilling or unable to give informed consent.
- Pregnant women (if pregnancy could influence renal parameters).

Methodology

The data that has been gathered was methodically inputted into the Microsoft Excel spreadsheets. The calculation of descriptive statistics will be performed.

The chi-square test and Analysis of variance (ANOVA) was used to examine the relationship between the variables. Additionally, the prevalence and incidence rate was determined. The mean ± standard deviation (SD) values were computed, and the test of significance was conducted at a significance level of less than 0.05, corresponding to a 95% confidence interval. If deemed required, the proper statistical methods will be used.

Study Procedure

All collected data were input into a computerized database and checked for completeness and accuracy prior to statistical analysis. Descriptive statistics were applied to summarize the demographic, clinical, lifestyle, and laboratory features of the study population. The prevalence of chronic kidney disease was determined by expressing it as a percentage of the total study population. Continuous variables were reported as mean ± standard deviation (SD) or median with interquartile range (IQR), and categorical variables were shown as frequencies and percentages. Links between CKD and possible risk factors were assessed using chi-square tests, independent t-tests, or ANOVA, depending on the situation. A multivariate logistic regression analysis was conducted to determine independent predictors of CKD. The statistical analysis was performed using either IBM SPSS Statistics or R, with a p-value less than 0.05 deemed statistically significant. The findings were presented through tables, graphs, and charts to facilitate a clear understanding of the results.

Materials, Investigations, and Interventions

No additional investigations, interventions, or procedures beyond routine clinical care were performed on study participants. Data collection was limited to surveys and interviews.

Anticipated Risks and Risk Minimization

The study posed no anticipated physical or psychological risks to participants. Confidentiality and anonymity were strictly maintained, and participation was entirely voluntary.

Data Analysis Procedure

This study is descriptive, observational, and non-interventional, and was carried out in the Department of Nephrology at SVS Medical College and Hospital. One hundred patients were enrolled over a six-month period. Structured data collection forms were used to gather relevant demographic, clinical, and laboratory information, which was then analyzed with suitable statistical methods to assess the prevalence and associated risk factors of Chronic Kidney Disease.

Statistical Methods

Collected data were entered into Microsoft Excel and analyzed using appropriate statistical techniques. Descriptive statistics, including frequency distributions and mean ± standard deviation, were calculated. Inferential statistical methods such as logistic regression, multiple regression, chi-square tests, ANOVA, correlation analysis, and non-parametric tests (Mann–Whitney U test) were applied as required to examine relationships between variables[25,26].

Statistical Software

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 23 and GraphPad Prism version 9.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Ethics Committee of SVS Medical College and Hospital before study initiation.

Reference Number: IEC/DHR-03/(04-10)/2025

RESULTS AND DISCUSSION

Distribution of Patients Based on Age

The distribution of patients based on age is presented in Table 01 and Figure 01. The majority of the patients belonged to the age group of 46–60 years (42%), followed by 31–45 years (38%). Patients aged above 60 years accounted for 18% of the study population, while only 2% belonged to the 20–30 years age group. The findings indicate that chronic kidney disease was more commonly observed among middle-aged and elderly individuals.

Table 01: Distribution of Patients Based on Age

Age Group	Number of Patients	Percentage (%)
20–30	2	2%
31–45	38	38%
46–60	42	42%
>60	18	18%
Total	**100**	**100%**

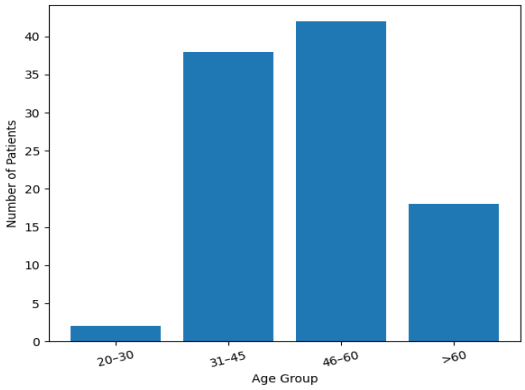

Figure 01: Distribution of Patients Based on Age

Distribution of Patients Based on Gender

The gender-wise distribution of patients is shown in Table 02 and Figure 02. Male patients constituted 55% of the study population, whereas female patients accounted for 45%. The results suggest a slightly higher prevalence of chronic kidney disease among male patients compared to females.

Table 02: Distribution of Patients Based on Gender

Gender	Total Patients	Percentage (%)
Male	55	55.0%
Female	45	45.0%
Total	**100**	**100%**

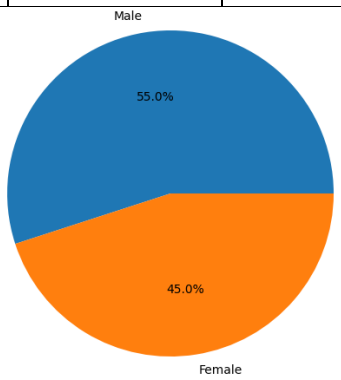

Figure 02: Distribution of Patients Based on Gender

Distribution of Patients Based on CKD Stages

The distribution of patients according to CKD stages is summarised in Table 03 and Figure 03. Most patients were found in advanced stages of chronic kidney disease, with Stage 5 accounting for 52% and Stage 4 accounting for 43% of cases. Only 5% of patients were categorised under Stage 3b, indicating limited early detection of CKD. The findings emphasise the importance of early diagnosis and timely intervention in preventing disease progression.

Table 03: Distribution of Patients Based on CKD Stages

CKD Stage	Number of Patients	Percentage (%)
Stage 3b	05	05.0%
Stage 4	43	43.0%
Stage 5	52	52.0%
Total	**100**	**100%**

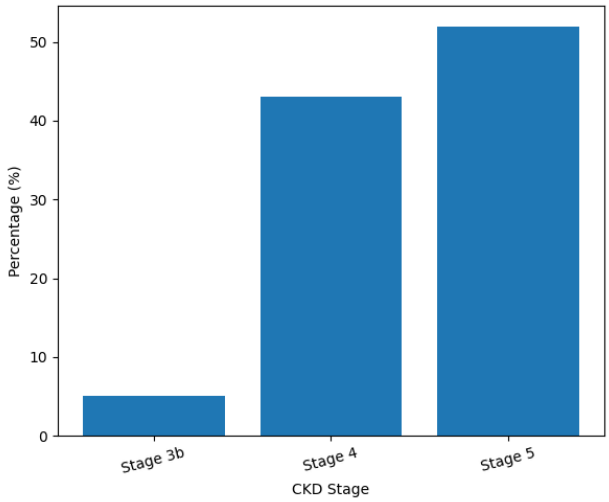

Figure 03: Distribution of Patients Based on CKD Stages

Distribution of Patients Based on History of Smoking

The smoking history of patients is presented in Table 04. Among the study population, 72% were smokers and 28% were non-smokers. The higher prevalence of smoking among CKD patients indicates that smoking may act as an important contributing risk factor in the progression of kidney disease.

Table 04: Distribution of Patients Based on History of Smoking

Smoking Status	Number of Patients	Percentage (%)
Smokers	72	72.0%
Non-Smokers	28	28.0%
Total	**100**	**100%**

Distribution of Patients Based on History of Consumption of Alcohol

The distribution of patients based on alcohol consumption is shown in Table 05. Alcoholic patients constituted 66% of the study population, whereas 34% were non-alcoholic. The findings indicate that alcohol consumption was common among patients with chronic kidney disease and may contribute to worsening renal health.

Table 05: Distribution Based on History of Consumption of Alcohol

Consumption of Alcohol	Number of Patients	Percentage (%)
Alcoholic	66	66.0%
Non-Alcoholic	34	34.0%
Total	**100**	**100%**

Distribution of Patients Based on IP and OP

The distribution of patients based on inpatient and outpatient status is presented in Table 05 and 06. Outpatients accounted for 76% of the study population, while 24% were admitted as inpatients. The findings suggest that the majority of CKD patients were managed on an outpatient basis.

Table 06: Distribution of Patients Based on IP and OP

Patient Type	Total Patients	Percentage (%)
OP	76	76.0%
IP	24	24.0%
Total	**100**	**100%**

Distribution of Medical Risk Factors in Patients with CKD

The medical risk factors associated with CKD are summarised in Table 07 and Figure 04. Diabetes and hypertension were the most common risk factors, each accounting for 30% of cases. Cardiovascular disease and family history of CKD each contributed 20% of cases, while other associated risk factors were also observed. These findings indicate that metabolic and cardiovascular disorders play a significant role in CKD progression.

Table 07: Distribution of Medical Risk Factors in Patients with CKD

Medical Risk Factor	Patients	Percentage (%)
Diabetes	30	30%
Hypertension	30	30%
Cardiovascular Disease	20	20%
Family history of CKD	20	20%
Others	20	20%

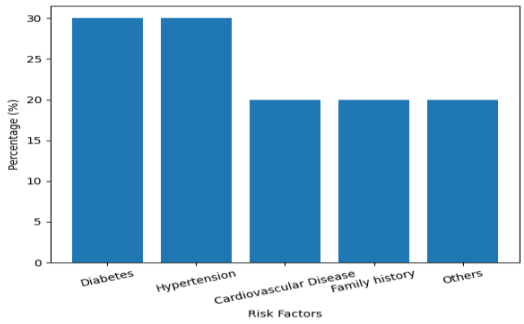

Figure 04: Distribution of Medical Risk Factors in Patients with CKD

Distribution of Drugs and Clinical Risk Factors in Patients with CKD

The distribution of drug-related and clinical risk factors among CKD patients is presented in Table 8 and Figure 05. NSAID use was identified as the most common risk factor (33.3%), followed by nephrotoxic drug use, recurrent urinary tract infections, and previous acute kidney injury, each accounting for 22.2% of cases. These findings highlight the importance of monitoring nephrotoxic exposures in CKD patients.

Table 08: Distribution of Drugs and Clinical Risk Factors in Patients with CKD

Drug / Clinical Risk Factor	Patients	Percentage (%)
NSAID Use	33	33.3%
Nephrotoxic Drug Use	22	22.2%
Recurrent UTI	22	22.2%
Previous AKI	22	22.2%

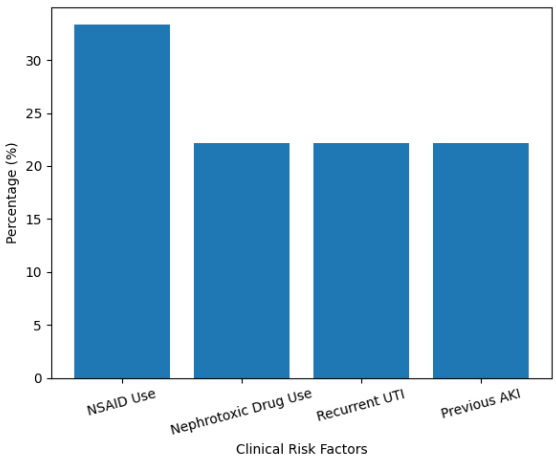

Figure 05: Distribution of Drugs and Clinical Risk Factors in Patients with CKD

Treatment Options and Outcomes in Patients with Chronic Kidney Disease

The treatment options and outcomes among patients with chronic kidney disease are summarized in Table 09. Patients receiving appropriate management demonstrated better clinical outcomes, including improved blood pressure control, glycaemic management, medication adherence, dialysis compliance, and regular nephrology follow-up. In contrast, patients with delayed or inadequate management showed poor adherence and unfavourable disease progression. The findings highlight the importance of early and consistent treatment in improving CKD outcomes.

Table 09: Treatment Options and Outcomes in Patients with CKD

Treatment Factor	Patients Receiving Appropriate Management (n = 50)	Patients with Inadequate/Delayed Management (n = 50)
Antihypertensive Therapy	46 (92%) received regular BP control therapy	24 (48%) received irregular treatment
Diabetes Management	42 (84%) maintained glycaemic control	20 (40%) had poor diabetic control
Dialysis Support	38 (76%) received scheduled dialysis	18 (36%) had delayed/inadequate dialysis
Dietary & Lifestyle Modification	45 (90%) followed renal diet and fluid restriction	21 (42%) showed poor compliance
Medication Adherence	47 (94%) adhered to prescribed drugs	25 (50%) had irregular adherence
Regular Nephrology Follow-up	44 (88%) attended routine follow-up	19 (38%) missed follow-up visits
Stable Disease / Improved Outcome	41 (82%) showed stable renal function	23 (46%) showed stable outcomes

The association between treatment adherence and CKD outcomes was statistically evaluated using chi-square analysis, as shown in Table 10. Significant associations were observed between regular treatment adherence and improved patient outcomes ($p < 0.05$). Medication adherence and regular follow-up demonstrated highly significant associations with stable renal function and better disease management outcomes.

Table 10: Chi-square Analysis of Treatment Adherence and CKD Outcomes

Outcome Variable	Adequate Management	Inadequate Management	Chi-square	df	p-value	Statistical Significance
Stable Renal Function	41 stable vs. 9 progressed	23 stable vs. 27 progressed	12.84	1	<0.001	Significant
Medication Adherence	47 adherents	25 adherent	19.76	1	<0.001	Highly significant
Dialysis Compliance	38 compliant	18 compliant	11.42	1	<0.01	Significant
Regular Follow-up	44 regular visits	19 irregular visits	16.35	1	<0.001	Highly significant

Barriers to CKD Management and Healthcare Access

The barriers affecting CKD management and healthcare access are presented in Table 11 and Figure 11. Financial burden, poor access to dialysis centres, interrupted medication availability, lack of awareness regarding CKD progression, and poor dietary compliance were more common among poorly managed patients. Patients with better disease management demonstrated improved adherence to lifestyle modifications and regular follow-up. These findings emphasize the need for affordable healthcare services, patient education, and improved nephrology support to enhance CKD outcomes.

Table 11: Barriers to CKD Management and Healthcare Access

Barrier Type	Better Managed Patients (50 Patients)	Poorly Managed Patients (50 Patients)
Cost of Treatment	8 patients reported financial difficulty	32 patients struggled with dialysis and medication costs
Access to Dialysis Centres	Most patients had accessible dialysis facilities	20 patients travelled long distances for dialysis
Medication Availability	46 patients had regular access to medicines	24 patients reported interrupted drug availability
Awareness	44 patients had	29 patients lacked

About CKD	adequate disease awareness	knowledge regarding CKD progression
Dietary Compliance	43 patients followed renal dietary advice	26 patients were unable to maintain dietary restrictions
Follow-up and Monitoring	45 patients attended regular follow-up	28 patients missed scheduled monitoring visits
Lifestyle Modification	40 patients stopped smoking/alcohol use	30 patients continued unhealthy lifestyle habits

CONCLUSION

This study highlights the increasing burden of Chronic Kidney Disease (CKD) among patients attending tertiary care hospitals, with most patients presenting at advanced stages of the disease, indicating delayed diagnosis and inadequate early screening. Major risk factors identified included diabetes mellitus, hypertension, smoking, alcohol consumption, nephrotoxic drug exposure, recurrent urinary tract infections, and previous acute kidney injury. The study also demonstrated that regular treatment adherence, timely dialysis, lifestyle modification, and continuous nephrology follow-up were associated with improved clinical outcomes and slower disease progression. However, financial burden, poor awareness, and limited access to specialized renal care remained major barriers to effective disease management. Therefore, early identification of high-risk individuals, routine screening programs, patient education, and strengthening preventive and specialized healthcare services are essential to reduce CKD-related morbidity and mortality and improve the overall quality of life of patients.

LIMITATIONS AND RECOMMENDATIONS

Limitations of this study are subject to several limitations. The study included only 100 patients from one tertiary care centre, potentially limiting how well the results apply to a wider population. The study lasted only six months, which was relatively brief, and as a result, it was not possible to evaluate long-term outcomes or disease progression. Because the study was observational and did not involve intervention, it was not possible to conclusively determine causal links between risk factors and chronic kidney disease. Certain patient details such as smoking habits, alcohol use, and medication history were obtained through self-reporting, potentially leading to recall bias. Moreover, socioeconomic, dietary, and genetic factors that affect CKD progression were not examined in depth. Screening programs should be introduced early, especially for individuals at high risk including those with Type 2 Diabetes, Hypertension, cardiovascular disease, or a family history of kidney disease. Public understanding of CKD risk factors, healthy lifestyle habits, quitting smoking, and avoiding nephrotoxic drugs needs to be improved. Consistent follow-up, sticking to prescribed medications, nutritional guidance, and prompt referral to nephrology care are crucial for slowing the advancement of the disease. Larger, multi-centre studies with extended follow-up periods are advised to gain a clearer understanding of CKD patterns, treatment outcomes, and preventive approaches.

FUNDING

Nil

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

ACKNOWLEDGMENT

We also thank the patients who consented to participate in this research.

AUTHOR CONTRIBUTIONS

B.Swapnaconceived and designed the study, supervised the research work, and drafted the manuscript. Nabeela Nousheen, Tanusha, Amena firdouse and P. Soumya contributed to data collection, analysis, and manuscript preparation. All authors reviewed and approved the final version of the manuscript.

ETHICAL STATEMENT

Ethical clearance was obtained from the Institutional Ethics Committee of SVS Medical College and Hospital, Mahbubnagar, before the initiation of the study (Reference number: IEC/DHR-03/(04-10)/2025

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