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Original Research Article

Clinical and Demographic Characteristics of Chronic Kidney Disease Patients in a Tertiary Care Setting

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Abstract:

Background: Chronic Kidney Disease (CKD) is a significant societal health issue that is linked to a high morbidity rate, mortality, and healthcare burden especially in developing nations such as India. Most of the time the disease is asymptomatic during the initial stages of the disease, which leads to late diagnosis and late presentation in the tertiary care facilities. The clinical and demographic profile of CKD patients are necessary to provide early intervention and better outcomes. The objective of the present study was to assess demographic, clinical profile, lab results, and staging of the patients with chronic kidney diseases in a tertiary care hospital.

Methods: This cross-sectional analytical study was a hospital-based study and was carried out over a period of 7 months at the Department of General Medicine, Nalanda Medical College and Hospital, Patna, Bihar. The enrollment of 84 patients diagnosis with CKD was done through predetermined inclusion and exclusion criteria. The specific demographic information, the clinical description, the comorbidities, and the laboratory parameters were documented. The stage of CKD was done according to the estimated glomerular filtration rate (eGFR) as calculated by Cockcroft Gault formula. The analysis involved the use of descriptive statistics and chi-square tests.

Results: The average age of the patients was 52.6 / 13.4 years, and the majority were males (61.9). Majority of the patients were rural and underprivileged. The most common comorbidities were hypertension (64.3) and diabetes mellitus (47.6). The common clinical findings were anemia (69.0%) and pedal edema (58.3%). The proportion of patients that showed up in late stages (Stage 4 and 5) of CKD (more than 60 percent) showed that diagnosis and referral was delayed.

Conclusion: CKD patients presenting to tertiary care centers are predominantly middle-aged males with significant comorbidities and advanced disease. Early screening, improved control of diabetes and hypertension, and timely referral are essential to reduce disease progression and associated complications.

Keywords: Chronic Kidney Disease; Clinical Profile; Demographic Characteristics; Tertiary Care Hospital; Hypertension; Diabetes Mellitus; CKD Staging.

Introduction

Chronic Kidney Disease (CKD) is a progressive and irreversible condition characterized by a gradual decline in kidney function, leading to significant morbidity, mortality, and economic burden worldwide [1]. It is characterized by kidney malformation or functional abnormalities that last over three months, with effects on the general wellbeing. The problem of CKD has become a huge issue of national health as its prevalence rate has grown, and most patients develop end-stage renal disease (ESRD), requiring renal replacement therapy either through dialysis or kidney transplantation [2,3].

The rates of CKD in the adult population are estimated to vary between 10 and 15% in the world with an increased rate in the low and middle-income countries. In India and other developing countries, CKD is increasing its weight at a high pace because of demographic changes, urbanization, “lifestyle changes and an augmented prevalence of non-communicable illnesses like diabetes mellitus and high blood pressure [4]. These diseases are identified as the most common etiological determinants of CKD and they are not adequately diagnosed or managed particularly in limited resources.

The CKD clinical presentation is also very varied and is based on the disease stage, etiology, and the presence of complications. The initial phases of CKD are mostly silent leading to late diagnosis and failure to intervene early [5]. Later stages of the disease can result in anemia, electrolyte imbalances, mineral and bone disorders, cardiovascular issues, and deterioration of life quality in the patient. It is thus pivotal that the clinical features of CKD patients have been comprehended and are used to diagnose the conditions in a timely manner, risk stratification and development of effective management strategies [6,7].

The demographic factors that contribute to the occurrence and progression of CKD include age, gender, socioeconomic status and geographic location. The elderly is also at risk because of age related deterioration in renal performance and increased comorbidity [8]. There have also been gender variations on the prevalence and progression of CKD, which are determined by biological, behavioral, and healthcare-access determinants. Also, economic inequality influences health-seeking behavior, availability of specialized care, and treatment outcome, especially in tertiary care facilities where most cases are of advanced nature.

Tertiary care hospitals are referral centers and offer extensive diagnostic and therapeutic interventions to CKD patients including patients with advanced stages of the disease and complications [9]. The analysis of clinical and demographic profile of CKD patients in this type of setting can provide useful information on the tendencies of the disease, its severity at the time of presentation, and comorbid conditions. These data play a fundamental role in the detection of high-risk groups, strategy of resources allocation, and creation of specific preventive and therapeutic interventions. The aim of the current study is an analysis of clinical and demographic features of patients with CKD who visit a tertiary care facility. This study aims to be part of the existing body of knowledge and contribute to better clinical judgment and population health practices in the area of managing CKD by assessing such parameters as age, gender ratio, etiological factors, disease stage, and related clinical aspects.

Materials and Methods

Study Design: This study was designed as a hospital-based cross-sectional, analytical study conducted to evaluate the clinical and demographic characteristics of patients diagnosed with chronic kidney disease (CKD). A cross-sectional approach was selected to assess the distribution of CKD-related variables and associated clinical features at a specific point in time among patients attending a tertiary care hospital.

Study Area: The study was carried out in the Department of General Medicine, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, India.

Study Duration: The study was conducted over a period of 7 months from March 2025 to September 2025, allowing adequate time for patient recruitment, data collection, clinical evaluation, and analysis.

Study Population and Sample Size: The study population consisted of patients diagnosed with chronic kidney disease attending the Medicine Department of NMCH during the study period. A sample size of 84 patients was selected based on feasibility, patient availability, and time constraints. Consecutive eligible patients meeting the inclusion criteria were enrolled until the desired sample size was achieved.

Inclusion Criteria

Patients were included in the study based on the following criteria:

- Age 18 years and above
- Diagnosed cases of chronic kidney disease, irrespective of etiology
- Patients willing to participate and provide written informed consent
- Patients attending outpatient or inpatient services of the Medicine Department

Exclusion Criteria

The following patients were excluded from the study:

- Patients below 18 years of age
- Patients unwilling to participate in the study
- Patients with associated malignancy
- Patients with collagen vascular disorders
- Patients on long-term steroid therapy
- Patients with known bleeding disorders
- Pregnant women

Data Collection Procedure: After obtaining informed consent, each participant underwent a detailed evaluation using a pre-designed and pre-tested patient proforma. The proforma was used to record clinicodemographic details, including age, gender, residence, socioeconomic status, and duration of illness. A comprehensive clinical history was obtained, focusing on symptoms related to CKD, past medical history, presence of comorbid conditions such as diabetes mellitus and hypertension, and duration of dialysis if applicable. Medication history and previous hospital admissions were also documented.

Clinical Examination: All enrolled patients underwent a thorough general physical examination and systemic examination, with particular emphasis on cardiovascular, respiratory, and renal systems.

Blood pressure measurements were recorded using standard methods. Signs suggestive of CKD-related complications such as anemia, edema, and uremic manifestations were noted.

Laboratory Investigations: Baseline laboratory investigations were performed for all patients using the most recent available test reports. These included:

- Complete Blood Count (CBC)
- Liver Function Tests (LFT)
- Renal Function Tests (RFT)
- Random Blood Sugar (RBS)
- Serum electrolytes (Serum Sodium and Serum Potassium)
- Arterial Blood Gas (ABG), wherever indicated

These investigations were used to assess renal function status, electrolyte imbalance, anemia, and metabolic complications associated with CKD.

Diagnosis and Staging of CKD: The diagnosis of chronic kidney disease was confirmed based on clinical evaluation, ultrasonography (USG) of the abdomen, and estimation of glomerular filtration rate (eGFR). The eGFR was calculated using the Cockcroft–Gault formula, and CKD staging was done according to standard guidelines. Patients were categorized into different CKD stages (Stage 1 to Stage 5) based on eGFR values.

Statistical Analysis: Data collected were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics such as mean, standard deviation, frequencies, and percentages were used to summarize demographic and clinical variables. The Chi-square test was applied to assess associations between categorical variables. A p-value less than 0.05 was considered statistically significant.

Results

The present study included a total of 84 patients diagnosed with chronic kidney disease (CKD) attending the Department of Medicine, Nalanda Medical College and Hospital (NMCH), Patna, Bihar, during the study period of 12 months. All enrolled patients fulfilled the predefined inclusion criteria and none met the exclusion criteria. Written informed consent was obtained from each participant prior to data collection. The results presented below describe the demographic distribution, clinical characteristics, laboratory findings, and CKD staging of the study population.

Demographic Characteristics of CKD Patients: Table 1 presents a summary of the demographic profile of the study population. Ages of the patients were between 19 and 78 years with an average age of 52.6./13.4 years. The greatest percentage of patients (42.9) was in the 41-60 years of age group, then there was the over 60 years patients (33.3). The young patients that fell between 18-40 years formed 23.8% of the study population. There was a gender-wise distribution where the number of male patients was more than female patients: 52 male patients (61.9%), and 32 female patients (38.1%), which resulted in a male to female ratio of approximately 1.6:1. This means that there is a relatively large prevalence of CKD in males in the study group.

Concerning place of residence, 47 patients (56.0%), and 37 patients (44.0-percent) were either rural and urban respectively, which demonstrates a high proportion of rural patients in this tertiary care facility. Socioeconomic status analysis showed that most patients were in the low socioeconomic group (45.2%), middle socioeconomic group (39.3%), and few (15.5%) patient groups that are in the upper socioeconomic group.

Table 1: Demographic Characteristics of CKD Patients (n = 84)

Variable	Category	Number (%)
Age (years)	18–40	20 (23.8)
	41–60	36 (42.9)
	>60	28 (33.3)
Gender	Male	52 (61.9)
	Female	32 (38.1)
Residence	Rural	47 (56.0)
	Urban	37 (44.0)
Socioeconomic Status	Lower	38 (45.2)
	Middle	33 (39.3)
	Upper	13 15.5)

Clinical Presentation and Comorbid Conditions: Table 2 presents the clinical history and comorbid conditions of the patients with CKD. Hypertension was the most common comorbid condition with 54 (64.3 percent) patients. Either 40 patients (47.6) had diabetes mellitus and 26 patients (31.0) had both diabetes mellitus and hypertension. Out of all the clinical findings, anemia was the most frequent finding, with 58 patients (69.0%), which was indicated by low hemoglobin levels in the complete blood count. Patients had pedal edema (49) (58.3 percent) that showed fluid overload and severe renal

dysfunction. Some 35 patients reported uremic symptoms such as nausea, vomiting, anorexia, fatigue, and altered sensorium (41.7%). History of maintenance dialysis was present in 29 patients (34.5%), indicating that more than one-third of the patients had already reached the severe stages of CKD and needed renal replacement therapy at the time of assessment.

Table 2: Clinical Features and Comorbidities among CKD Patients (n = 84)

Clinical Variable	Number (%)
Hypertension	54 (64.3)
Diabetes Mellitus	40 (47.6)
Diabetes + Hypertension	26 (31.0)
Anemia	58 (69.0)
Pedal Edema	49 (58.3)
Uremic Symptoms	35 (41.7)
History of Dialysis	29 34.5)

Laboratory Findings: Baseline laboratory investigations demonstrated significant abnormalities consistent with chronic kidney disease. Tests of renal functioning showed that all patients had high levels of serum creatinine with an average of 4.6007.14mg/dL. The level of blood urea was also high among the study population. The average eGFR of 26.814.3 mL/min/1.73 m 2 (calculated as the eGFR with the Cockroft Gault formula) revealed moderate to severe renal dysfunction in most of the patients. Abnormalities in electrolytes were common. In 25 patients (29.8%), hyponatremia was observed, and hyperkalemia was observed in 28 patients (33.3%). Arterial blood gas analysis conducted on a selected group of patients reported a high percentage of metabolic acidosis especially in patients with severe CKD. Complete blood count results validated the high load of anemia, and liver functional examinations were mostly in the normal range, which leads to the elimination of a hepatic etiology of biochemical abnormalities.

Distribution of CKD Stages: The staging of chronic kidney disease based on eGFR values is presented in Table 3. Only 4 patients (4.8%) were classified as Stage 1 CKD, while 7 patients (8.3%) were in Stage 2. A larger proportion of patients were identified in Stage 3 (25.0%), reflecting moderate renal impairment. Notably, the majority of patients presented in advanced stages of CKD. Stage 4 CKD was observed in 27 patients (32.1%), and Stage 5 CKD was documented in 25 patients (29.8%). Thus, over 60% of patients were in Stage 4 or Stage 5 at the time of presentation.

Table 3: Distribution of CKD Patients According to CKD Staging (n = 84)

CKD Stage	eGFR (mL/min/1.73 m²)	Number (%)
Stage 1	≥90	4 (4.8)
Stage 2	60–89	7 (8.3)
Stage 3	30–59	21 (25.0)
Stage 4	15–29	27 (32.1)
Stage 5	<15	25 (29.8)

The findings show that kidney chronic disease is mainly common in middle age and old adult age and is more prevalent among males. The majority of the patients have had rural and low socioeconomic origins. The most common comorbidities were hypertension and diabetes mellitus. The high percentage of patients manifested with CKD of advanced stage, anemia, electrolyte imbalance, and uremic manifestations emphasize the late diagnosis and referral to tertiary care services.

Discussion

The current hospital-based research offers significant information regarding the demographic, clinical and biochemical profile of patients with chronic kidney disease who visit a tertiary care facility in eastern India. The middle-aged and old age of the patients were dominant in this research which is in line with the epidemiological patterns of the world whereby the burden of CKD increases with an increase in age owing to the cumulative effects of risk factors including hypertension, diabetes and vascular disease [10]. The same age distribution has been observed in big population-based and multicentric studies and it means CKD has ceased to be an elderly problem but has been spreading to economically productive age bracket thus adding to high years lived with disability [11].

There was an evident male bias in the study population which is consistent with the past reports mentioning that CKD was more prevalent and had a higher rate of progression in males than in females [12]. This disparity may be due to biological factors including hormonal effects, variations in health seeking behavior and increased exposure to

occupational and lifestyle risk factors among men. There are however studies that have given conflicting results concerning gender-based progression of renal disease and a need to conduct region-specific analyses emerged [13]. The greater ratio of the rural and less developed socioeconomic patients highlights how there is a lack of access to early preventive and diagnostic healthcare services, which is typical of developing nations [14].

Hypertension and diabetes mellitus were found to be the most prevalent comorbidities either singly or in a combination, which is why they have firmly established themselves as major causes of CKD globally. This observation aligns with the findings of past research that shows that diabetic kidney disease and hypertensive nephropathy cause a significant percentage of CKD in low- and middle-income countries that experience an epidemiological transition [15]. The fact that the two conditions are co-occurring in almost a third of patients is an added stressor to the synergistic nature of the disorders in enhancing renal damage.

The most common clinical abnormality in the current study has been anemia, with pedal edema and uremic symptoms in the second and third places respectively. High burden of anemia indicates lower production of erythropoietin and chronic inflammation process with falling renal performance, and has often been reported in those with moderate to advanced CKD [16]. The symptoms of fluid overload and uremic symptoms were more common in the later stages of the patients, which means late symptoms and referral. This late diagnosis is also justified by the big percentage of patients who had a history of dialysis in the past indicating that most people seek tertiary care when their complications are severe.

Findings of the laboratory in this research showed significantly increased serum creatinine and decreased eGFR with common electrolyte imbalances including hyperkalemia and hyponatremia. Such abnormalities are typical of late CKD and were associated with high rates of cardiovascular morbidity and mortality [17]. The acidosis of metabolism that is observed in severe stages is also an indication of the failure of the kidneys to excrete the acid and is known to implicate muscle wasting, bone disease and advancing renal dysfunction.

The staging pattern indicated that over 60 percent of the patients presented in Stage 4 or 5 CKD. This distribution reflects the experience" in other developing areas, where late presentation is widespread since it is not screened, there is low disease awareness, and access to nephrology services is low [18]. Last stage presentation does not only narrow the available treatment choices but also increases the cost of healthcare and deteriorates patient outcomes. In general, the results of this research demonstrate the necessity of early detection measures, the efficient management of diabetes and hypertension at the primary care stage, and the enhancement of the referral systems to decrease the impact of the advanced CKD in the resource-deficient areas.

Conclusion

The current paper emphasizes that chronic kidney disease is mostly prevalent in middle-aged and elderly people, more predominant in males, rural populations, and people belonging to the lower social strata. Hypertension and diabetes mellitus became the primary comorbidities, which contributes to the main role of the etiology and progression of CKD. Most of the patients reported at an advanced stage of the disease with anemia, electrolyte imbalances, and uremic syndrome, which implies a late diagnosis and referral of patients to tertiary care. These results underscore the importance of early screening, enhanced community awareness and adequate management of the modifiable risk factors like hypertension and diabetes in order to lessen the effects of the disease and minimize the morbidity and mortality of chronic kidney disease.

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