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The Etiological Profile of Chronic Kidney Disease Patients Presenting to Nephrology Division, Khyber Teaching Hospital, Peshawar, Pakistan

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ABSTRACT

Background: Chronic Kidney Disease (CKD) poses a significant global health burden, particularly in low-resource settings. Understanding its etiology is vital for prevention and early intervention. **Objective:** To assess the underlying causes of CKD among patients presenting to the Nephrology Division of Khyber Teaching Hospital, Peshawar, Pakistan. **Methods:** This prospective observational study was conducted over four months (November 2024–March 2025) and included 284 CKD patients aged ≥16 years. Data were collected on demographics, comorbidities, CKD etiology, and treatment details. CKD was defined per KDIGO 2012 guidelines. Statistical analysis was performed using SPSS v24. **Results:** The mean age was 50.61 ± 20.98 years; 63.4% were male. The leading causes of CKD were diabetic nephropathy (30.6%) and hypertensive nephrosclerosis (29.6%), followed by glomerulonephritis (15.8%), polycystic kidney disease (12.0%), and obstructive uropathy (7.4%). The cause remained unknown in 4.6% of patients. Among glomerulonephritis subtypes, focal segmental glomerulosclerosis (FSGS) was most frequent (42.2%). All patients were on hemodialysis: 66.2% via AV fistula, 18.0% via tunneled catheter, and 15.8% via non-tunneled catheter. **Conclusion:** Diabetes and hypertension are the predominant causes of CKD in our population. Early screening and management of these risk factors are critical to reducing the burden of ESRD.

INTRODUCTION

Chronic Kidney Disease (CKD) is characterized by evidence of kidney damage or a reduction in glomerular filtration rate (GFR) to below 60 mL/min/1.73 m^2 for a duration of three months or more, regardless of the underlying cause. CKD represents a significant global public health concern, imposing a substantial burden on both patients and healthcare systems. The worldwide prevalence of CKD is estimated to range between 8% and 16%. (1)Globally, CKD ranks as the 12th leading cause of death and the 17th leading cause of disability. However, these figures may underestimate the true impact, as many individuals with CKD succumb to cardiovascular disease (CVD) before progressing to end-stage renal disease (ESRD).

Diabetes mellitus (DM) remains the primary cause of CKD both globally and in India. Approximately 30% of individuals with diabetes develop diabetic nephropathy. With the increasing prevalence of diabetes and an aging population, the incidence of CKD is expected to rise in parallel. According to the Diabetes Atlas (2006), the number of individuals with diabetes in India—currently estimated at 40.9 million—is projected to rise to 69.9 million by 2025 without effective preventive strategies.(2) The growing burden of CKD, its strong association with CVD and ESRD, and the high costs of renal replacement therapy (RRT) highlight the urgent need for awareness and early intervention. Over the past two decades, the prevalence of ESRD and the number of patients requiring RRT have markedly increased. (3)Timely screening and targeted management strategies can help prevent the progression of CKD and reduce the incidence of ESRD.

Objective

The objective of this study is to assess the diverse etiologies of chronic kidney disease (CKD) among patients presenting to our hospital.

MATERIAL AND METHODS

This study was conducted in the Department of Nephrology, Khyber Teaching Hospital, a tertiary referral center. It was a prospective observational descriptive study carried out over a period of four months, from 15th November 2024 to 15th March 2025. Written informed consent was taken from all the participants (or their

primary caretakers wherever applicable). Patients were excluded if they denied consent, were younger than 16 years or were renal transplant recipients.

The study included 284 patients who presented to the Nephrology outpatient departments (OPDs) or emergency services during this period with a diagnosis of chronic kidney disease (CKD).

CKD was defined based on KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease as either of the following present for ≥ three months: (a) Markers of kidney damage (one or more): albuminuria (AER >30 mg/24 hours; ACR >30 mg/g [>3 mg/mmol]), urine sediment abnormalities, electrolyte and other abnormalities due to tubular disorders, abnormalities detected by histology, structural abnormalities detected by imaging, history of kidney transplantation or (b) Decreased GFR <60 ml/ min/1.73 m2 (GFR categories G3a–G5).(4)

Each patient was thoroughly evaluated for demographic variables, comorbid conditions, underlying etiologies of CKD, and treatment-related factors, including the type of renal replacement therapy (RRT) initiated and the type of venous access used for dialysis. Clinical findings were assessed alongside available historical medical records, including renal biopsy results where applicable.

Data were collected on the socio-demographic profiles, presumed etiology of CKD, major associated co-morbidities, and hematological and biochemical parameters, and treatment-related factors, including the type of renal replacement therapy (RRT) initiated and the type of venous access used for dialysis, filled in the predesigned proforma. In the data analysis, continuous variables were expressed as mean ± standard deviation (SD) and categorical variables were expressed as frequency and percentage. The data entry and all statistical analysis were performed using SPSS version 24.

RESULTS

Demographic characteristics of the patients

A total of 284 patients were included in the study. The demographic characteristic of the study population is presented in Table 1 & 2.

A total of 284 patients were included in the study. The age of the participants ranged from 16 to 86 years, with a mean age of 50.61 years (±20.98 SD).

Table 1 summarizes the age-related descriptive statistics of the study population, including mean, standard deviation, minimum, and maximum values.

Table 1

Descriptive Statistics of Patient Age

	N	Minimum	Maximum	Mean	Std. Deviation
Age	284	16	86	50.61	20.980
Valid N	284				

Out of 284 patients, 180 (63.4%) were male and 104 (36.6%) were female. (Table 2 & Figure 1) Table 2 presents the number and percentage of male and female patients included in the study cohort.

Table 2

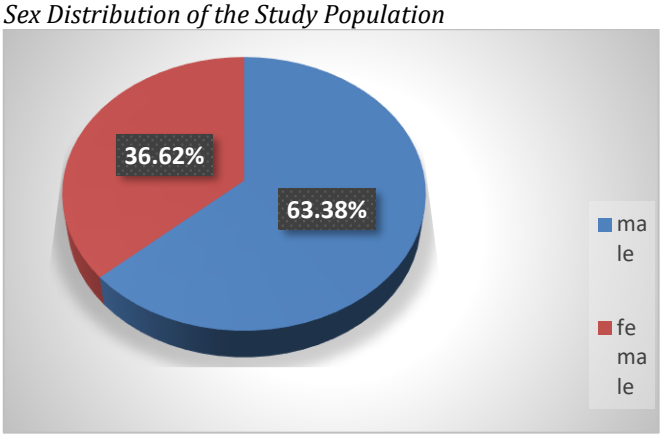
Gender Distribution of the Study Population

		Frequency	Percent
Valid	male	180	63.4
	female	104	36.6
	Total	284	100.0

Figure 1 illustrates the proportion of male and female patients included in the study.

Figure 1

Sex Distribution of the Study Population



The underlying causes of chronic kidney disease identified among the study participants are summarized as follows. (Table 3.) The most common etiology was diabetic nephropathy, observed in 87 patients (30.6%), followed by hypertensive nephrosclerosis in 84 patients (29.6%). Glomerulonephritis was reported in 45 patients (15.8%), while polycystic kidney disease and obstructive uropathy were noted in 34 (12.0%) and 21 patients (7.4%), respectively. The cause of CKD was unknown in 13 patients (4.6%).

Table 3 outlines the underlying causes of chronic kidney disease identified among the study participants.

Table 3

Etiological Distribution of Chronic Kidney Disease

Etiologies	Frequency	Percent
Diabetic Nephropathy	87	30.6
Hypertensive Nephrosclerosis	84	29.6
Glomerulonephritis	45	15.8
Polycystic Kidney Disease	34	12.0
Obstructive Uropathy	21	7.4
Unknown	13	4.6
Total	284	100.0

Among the 45 patients diagnosed with glomerulonephritis, the most frequent subtype was focal segmental glomerulosclerosis (FSGS), observed in 19 patients (42.2%), followed by IgA nephropathy in 10 patients (22.2%). Membranoproliferative glomerulonephritis (MPGN) was found in 5 patients (11.1%), and lupus nephritis in 4 patients (8.9%). ANCA-associated vasculitis, membranous nephropathy, and post-infectious GN were reported in 3 (6.7%), 2 (4.4%), and 2 (4.4%) patients, respectively. (Table 4 & Figure 2)

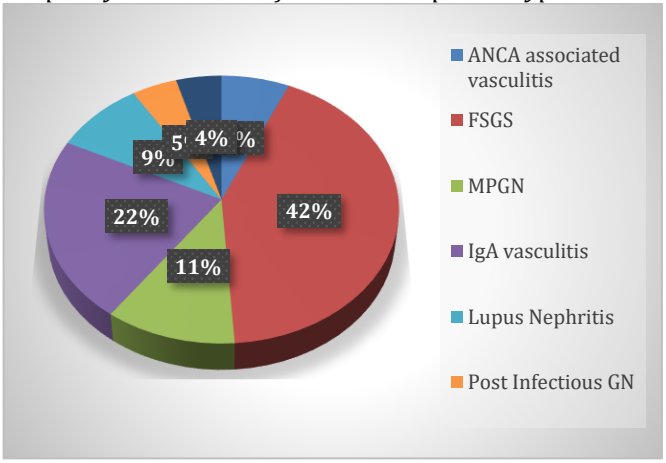
Table 4 presents the various histological types of glomerulonephritis identified among the study participants.

Table 4
Distribution of Patients by Type of Glomerulonephritis

Type of Glomerulonephritis	frequency	percentage
FSGS (Focal Segmental Glomerulosclerosis)	19	42.2
MPGN (Membranoproliferative GN)	5	11.1
IgA Nephropathy	10	22.2
Lupus Nephritis	4	8.9
Post-infectious GN	2	4.4
Membranous Nephropathy	2	4.4
ANCA-associated Vasculitis	3	6.7
Total	45	100.0

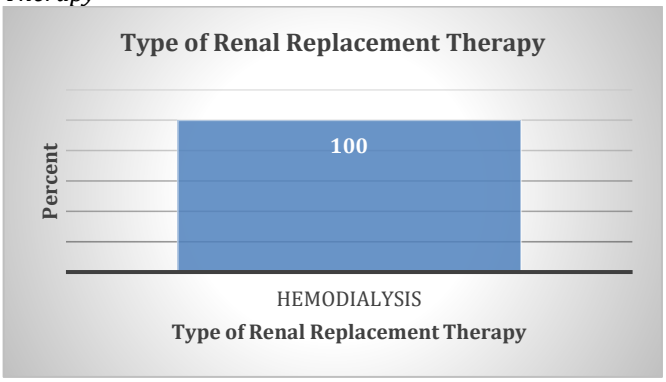
Figure 2 illustrates the relative frequency of different types of glomerulonephritis observed among the study population.

Figure 2
Frequency Distribution of Glomerulonephritis Types



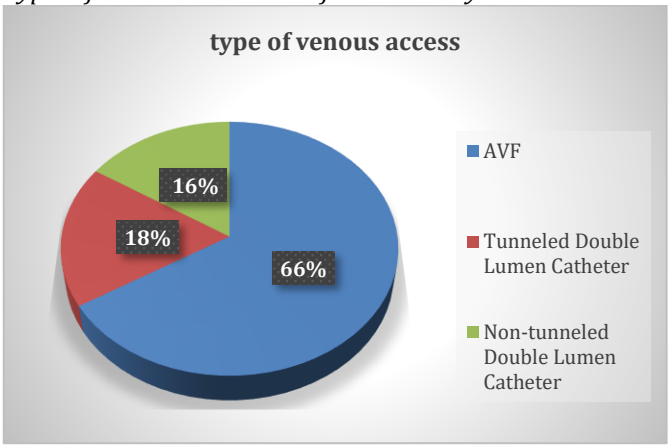
All patients in the study were receiving hemodialysis; none were undergoing peritoneal dialysis. Figure 3 illustrates the type of renal replacement therapy in the study cohort. Regarding vascular access, 66.2% of patients were dialyzing via arteriovenous (AV) fistula, 18.0% via tunneled double-lumen catheter, and 15.8% via non-tunneled double-lumen catheter, as shown in the pie chart in Figure 4.

Figure 3
Distribution of Patients by Type of Renal Replacement Therapy



All patients in the study were undergoing Hemodialysis (n=284, 100%).
Figure 4 depicts the distribution of different types of vascular access among patients undergoing hemodialysis, including AV fistula, temporary catheter, and tunneled double lumen catheter.

Figure 4
Types of Venous Access Used for Hemodialysis



DISCUSSION

The global incidence and prevalence of chronic kidney disease (CKD) are significantly underreported, especially in developing nations. In India, the absence of a national renal registry makes it difficult to determine the true burden of the disease. Current estimates suggest that the incidence and prevalence of CKD in India are around 0.16% and 0.78%, respectively.(5) In the United States, the prevalence of CKD showed an upward trend between the two time periods, rising from 10.0% during 1988–1994 to 13.3% in 1999–2004 for CKD stages 1 to 4.(6) In our study, the average age at presentation of CKD was 50.61 ± 20.98 years, with a male-to-female ratio of approximately 1.73:1 (63.4% males and 36.6% females). These findings are comparable with those reported by Sakhuja et al. in a hospital-based study, where the mean age at presentation was 40 years, and 70% of the patients were male.(7) This result was different from a population-based study conducted by Agarwal et al, where the mean age of patients with CKD was 59 years with 48% being males.(8) The main aim of our study was to identify the various causes of CKD among patients presenting to Khyber Teaching Hospital, Peshawar, Pakistan. In our study, the leading cause of CKD was DM, seen in 36.6% cases. The results of our study were almost similar to study conducted by Agarwal et al(9) in which diabetes and HTN were the leading causes of CKD, seen in 41% and 22.8% of the cases, respectively. In our study, chronic GN was found in 15.8% of the cases whereas Barsoum reported an incidence of 10%–20% in Africa (10) Afshar et al(11) in their study found that the most common etiology of CKD was DM, seen in 26.8% of patients, followed by HTN seen in 13.5%, obstructive uropathy in 12%, cystic and congenital disorders in 10.3%, GN in 6.5%, urinary tract infections in 4%, vasculitis in 2%, tubulointerstitial nephritis and pregnancy related in 0.8% each, and unknown causes in 29.5% of the patients. Awad et al(12) in their study found that the most common etiology of CKD was DM, seen in 33%, followed by HTN seen in 22.6%, obstructive uropathy in 17.3%, undetermined causes in 14%, pyelonephritis in 4.7%, GN in 4.3%, and polycystic kidney disease in 3.9% of the patients. Alam et al(13) in their study found that the most common etiology of CKD was DM in 40%, followed by HTN in 35%, chronic GN in 12%, obstructive uropathy in 3%, ADPKD in 2%, chronic

pyelonephritis in 2%, chronic tubulointerstitial nephritis in 1%, rapidly progressive glome- rulonephritis in 2%, ischemic renal disease in 2%, and unexplained cause in 1% of their patients. All the above studies found DM to be the most common cause of CKD followed by HTN.

The underlying causes of chronic kidney disease identified among our study participants are summarized as follows. The most common etiology was diabetic nephropathy, observed in 87 patients (30.6%), followed by hypertensive nephrosclerosis in 84 patients (29.6%). Glomerulonephritis was reported in 45 patients (15.8%), while polycystic kidney disease and obstructive uropathy were noted in 34 (12.0%) and 21 patients (7.4%), respectively. The cause of CKD was unknown in 13 patients (4.6%).

The histological types of glomerulonephritis identified among the study participants. Among the 45 patients diagnosed with glomerulonephritis, the most frequent subtype was focal segmental glomerulosclerosis (FSGS), observed in 19 patients (42.2%), followed by IgA nephropathy in 10 patients (22.2%). Membranoproliferative glomerulonephritis (MPGN) was found in 5 patients (11.1%), and lupus nephritis in 4 patients (8.9%). ANCA-associated vasculitis, membranous nephropathy, and post-infectious GN were reported in 3 (6.7%), 2 (4.4%), and 2 (4.4%) patients, respectively.

All patients in the study were receiving hemodialysis; none were undergoing peritoneal dialysis. Regarding vascular access, 188 patients (66.2%) were dialyzing via arteriovenous (AV) fistula, 51 patients (18.0%) via tunneled double-lumen catheter, and 45 patients (15.8%) via non-tunneled double-lumen catheter.

CONCLUSION

This study highlights the significant burden of chronic kidney disease (CKD) in patients presenting to a tertiary care nephrology center in Pakistan. The most prevalent causes of CKD were Diabetic nephropathy and Hypertensive nephrosclerosis, together accounting for over 60% of cases. Glomerulonephritis also emerged as an important contributor, with focal segmental glomerulosclerosis being the most common histological subtype. All patients in our cohort were dependent on hemodialysis, with the majority utilizing arteriovenous fistulas for vascular access.

These findings reinforce the urgent need for early detection, public awareness, and aggressive management of diabetes and hypertension to curb the progression to end-stage renal disease. Additionally, strengthening primary healthcare systems and integrating regular screening programs for high-risk populations may facilitate timely diagnosis and reduce the long-term burden on dialysis services. Further multi-center studies and the establishment of a national CKD registry are recommended to better understand regional variations and guide policy development for renal healthcare in Pakistan.

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