



Spectrum of Chronic Kidney Disease Without Hemodialysis

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All authors equally contributed to the study and approved the final manuscript

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ABSTRACT

Background: Chronic Kidney Disease is an irreversible process where the deterioration of the kidneys progresses, making it impossible to extract the wastes and fluid from the bloodstream, which further gives rise to various complications. The common factors promoting the advancement of CKD are diabetes mellitus, high blood pressure, and Hepatitis C infections. Effective management of comorbid conditions delays the progress of CKD. This research work focuses on the spectrum of CKD without hemodialysis and how comorbidities influence patients from the region of Abbottabad. **Objective:** To determine the frequency of spectrum of chronic kidney disease in patients without hemodialysis. **Study Design:** Cross-sectional study. **Duration and Place of Study:** This study was conducted from 26th March 2025 to 26th June 2025 at the Department of Nephrology, Ayub Teaching Hospital, Abbottabad. **Methodology:** Ninety patients aged 30 to 60 years, already diagnosed with CKD, were recruited. Information on demographics, comorbid conditions, and CKD stages was gathered. Diagnosis of diabetes involved fasting blood sugar and clinical history, and for hypertension, patients were confirmed if their BP was $\geq 140/90$ mmHg. Hepatitis C diagnosis involved the use of the PCR test. Analysis of the study was conducted using the IBM SPSS version 25 computer software program, and association was determined by the chi-squared test, where the significance level was $p < 0.05$. **Results:** The mean age of participants were 45.81 ± 9.03 years and the average BMI was 27.74 ± 2.71 kg/m². Diabetes mellitus was found in 32.2% patients, hypertension 31.1% and Hepatitis C virus was 15.6%. A significant association was observed between hypertension and female gender ($p = 0.011$). The majority of patients were in Stage 3 of CKD (65.6%). **Conclusion:** Diabetes and hypertension are prevalent comorbidities among CKD patients, with hypertension showing a significant association with female gender.

INTRODUCTION

Chronic Kidney Disease (CKD) can be defined as the progressive loss of kidney function, where the kidneys progressively become unable to filter the wastes and fluid from the blood.¹ This, as a consequence, leads to the buildup of toxic products in the body, which can result in many problems such as high blood pressure, anemia, bone diseases, and cardiovascular diseases.² CKD is staged based on the kidney function, which is called the glomerular filtration rate (GFR), and the last stage of CKD, which is called the End Stage Renal Disease (ESRD), where the kidney function becomes critically low, and the only option left for the patient is dialysis and kidney transplant.³ CKD, if it remains untreated, can cause many problems and diseases. In the early stages, CKD, there are no major symptoms, but as the disease progresses, it often leads to many serious diseases and problems.⁴

Diabetes mellitus is one of the leading causes of CKD, as high sugar levels can damage the blood vessels inside

the kidneys, thus impeding the proper functioning of the kidneys.⁵ In many instances, the uncontrolled levels of diabetes can even cause the development of diabetic nephropathy, which can, in turn, develop into CKD.⁶ Hypertension, or high blood pressure, is one of the major factors that can cause the development and advancement of CKD.⁷ In many instances, high blood levels for an extended period can damage the blood vessels inside the kidneys, thus impeding the kidneys from filtering the wastes produced inside the body.⁸ Though Hepatitis C viruses majorly damage the liver, it can, in many instances, develop kidney-related problems like glomerulonephritis.⁹ Many patients develop various kidney-related problems due to infections by the Hepatitis C virus.¹⁰ These diseases often accelerate the process of CKD, thus increasing the rapid deterioration of the kidneys.

In the management of CKD without hemodialysis, the approach can mainly center on the management of the comorbidities and the prevention of the deterioration of

the kidneys.¹⁰ For diabetes, the control of blood sugar levels through antidiabetics and the observance of proper lifestyle behaviors can help slow the advance of CKD.¹¹ For patients having high blood pressure, the administration of antihypertensive and proper eating behaviors, such as avoiding excessive sodium intake, can help manage the high blood pressure and promote the maintenance of the normal kidney functions.¹² For Hepatitis C patients, the use of antivirals can help manage Hepatitis C and protect against any likelihood of kidney problems.¹³ In addition, proper eating behaviors, staying hydrated, and managing comorbidities such as smoking and overweight are essential for the maintenance of kidney functions.¹⁴

In a study by Sadek KM, et al. has shown that frequency of diabetes mellitus was 40%, hypertension 29.6% and Hepatitis C virus was 18% in patients with CKD without hemodialysis.¹⁵

Conducting the research in the city of Abbottabad, where many people suffer from ailments such as diabetes, high blood pressure, and other diseases that could lead to problems concerning kidneys, would be important. Many symptoms and diseases are faced by the citizens of the rising city of Abbottabad, which means that the number of people suffering from kidney diseases would increase as well. Conducting research regarding how such diseases influence the kidneys in the region would help the citizens of Abbottabad and benefit their physicians, who would find ways to protect their citizens from kidney diseases and improve their lives. Conducting the study would help us learn more regarding the treatments for CKD patients in the region.

METHODOLOGY

This study was conducted as a cross-sectional study. The study was conducted at the Department of Nephrology, Ayub Teaching Hospital, Abbottabad. The study was performed from 26th March 2025 to 26th June 2025. Ninety patients were selected for the study. The sample size was calculated using the WHO sample size calculator software. This software calculated the sample size keeping the margin of error as 8%, the confidence interval as 95%, and the calculated prevalence of the Hepatitis C virus for patients without hemodialysis as 18%.¹⁵ For sampling, the method applied was the non-probability consecutive sampling technique. The patients selected were between 30 and 60 years old, and both sexes were targeted. Inclusion criteria involved people who had been diagnosed with CKD as per the selection criteria. For the study, the patients were excluded if they had hemodialysis, peritoneal dialysis, acute kidney failure, end-stage renal failure, kidney transplant, pregnancy, urinary obstruction, and use of nephrotoxic medicines.

After obtaining the approval from the ethical committee of the hospital (Approval Code/Ref. No. RC-EA-2025/041) and CPSP, the study took consent from the participants. This consent was obtained after making the participants understand the objectives, advantages, and disadvantages of the study. Basic information such as age, gender, BMI, socioeconomic background, stage of CKD and duration of CKD were recorded.

CKD spectrum was noted which includes diabetes mellitus, Hypertension, and Hepatitis C virus. Diagnosis of

diabetes mellitus was based on the use of antihyperglycemics, confirmed diagnosis, and presence of symptoms such as polyuria, polydipsia, unexplained weight loss, and the like, and if the fasting blood sugar was ≥ 126 mg/dl and the random blood sugar ≥ 200 mg/dl. Hypertension was confirmed if the BP was $\geq 140/90$ mmHg on two separate occasions, and if on antihypertensive therapy. Hepatitis C virus infection was confirmed if there was persistence HCV RNA level (>50 IU/ml) as detected by Real Time-PCR.

For data analysis, the IBM SPSS version 25 software was utilized. For continuous variables like age, duration of CKD, and BMI, the values were calculated as the mean and standard deviation. For the categorical variables like gender, socioeconomic status, stage of CKD, diabetes, Hypertension, and Hepatitis C, the values were calculated as the frequency and percentage. The spectrum CKD was categorized based on various factors such as age, gender, BMI, socioeconomic status, duration of CKD, and stage of CKD. After that, the chi-squared test was performed, and the values of p were calculated, assuming the significance level as 0.05.

RESULTS

The mean age of the patients were 45.81 ± 9.03 years and average BMI was recorded as 27.74 ± 2.71 Kg/m². The mean duration of CKD among participants were 36.58 ± 13.67 months. Regarding gender distribution, majority of patients was males 67 (74.4%) while females comprised 23 (25.6%) of study population. When socioeconomic status was assessed, it were found that 42 (46.7%) patients belongs to poor class, 30 (33.3%) was from middle class and 18 (20.0%) were from rich background. Distribution according to CKD stages showed that 27 (30.0%) patients had Stage 2, 59 (65.6%) was having Stage 3, and 4 (4.4%) patients were in Stage 4 of chronic kidney disease (as shown in Table-I).

Table I

Patient Demographics and Clinical Characteristics

Demographics	Mean \pm SD
Age (years)	45.81 \pm 9.03
BMI (Kg/m ²)	27.74 \pm 2.71
Duration of CKD (months)	36.58 \pm 13.67
Gender	
Male n (%)	67 (74.4%)
Female n (%)	23 (25.6%)
Socioeconomic Status	
Poor n (%)	42 (46.7%)
Middle n (%)	30 (33.3%)
Rich n (%)	18 (20.0%)
CKD Stage	
Stage 2 n (%)	27 (30.0%)
Stage 3 n (%)	59 (65.6%)
Stage 4 n (%)	4 (4.4%)

Analysis of comorbidities revealed that diabetes mellitus were present in 29 (32.20%) patients while 61 (67.80%) patients was not having diabetes. Hypertension were observed in 28 (31.10%) of the patients whereas 62 (68.90%) did not had hypertension. Hepatitis C virus infection was found in 14 (15.60%) patients and 76 (84.40%) patients was negative for HCV (as shown in Table-II).

Table II
Frequency of Comorbidities Among Patients with Chronic Kidney Disease

Comorbidities	Frequency	%age
Diabetes Mellitus		
Yes	29	32.20%
No	61	67.80%
Total	90	100%
Hypertension		
Yes	28	31.10%
No	62	68.90%
Total	90	100%
Hepatitis C Virus		
Yes	14	15.60%
No	76	84.40%
Total	90	100%

For diabetes mellitus no significant association was found with age groups (≤ 40 years vs > 40 years) where p-value were 0.752. Similarly, gender showed no significant association with diabetes as p-value was 0.832.

Table III
Association of Comorbidities with Demographic Factors

Demographic Factors	Diabetes Mellitus		p-value	Hypertension		p-value	Hepatitis C Virus		p-value	
	Yes n(%)	No n(%)		Yes n(%)	No n(%)		Yes n(%)	No n(%)		
Age (years)	≤ 40	10 (34.5%)	0.752	7 (24.1%)	22 (75.9%)	0.324	4 (13.8%)	25 (86.2%)	0.772*	
	> 40	19 (31.1%)		42 (68.9%)	21 (34.4%)		40 (65.6%)	10 (16.4%)		51 (83.6%)
Gender	Male	22 (32.8%)	0.832	16 (23.9%)	51 (76.1%)	0.011	9 (13.4%)	58 (86.6%)	0.505*	
	Female	7 (30.4%)		16 (69.6%)	12 (52.2%)		11 (47.8%)	5 (21.7%)		18 (78.3%)
Socioeconomic Status	Poor	15 (35.7%)	0.873*	16 (38.1%)	26 (61.9%)	0.458	5 (11.9%)	37 (88.1%)	0.599*	
	Middle	9 (30.0%)		21 (70.0%)	7 (23.3%)		23 (76.7%)	5 (16.7%)		25 (83.3%)
	Rich	5 (27.8%)		13 (72.2%)	5 (27.8%)		13 (72.2%)	4 (22.2%)		14 (77.8%)
CKD Stage	2	7 (25.9%)	0.238*	7 (25.9%)	20 (74.1%)	0.841	4 (14.8%)	23 (85.2%)	0.742*	
	3	22 (37.3%)		37 (62.7%)	20 (33.9%)		39 (66.1%)	10 (16.9%)		49 (83.1%)
	4	0 (0.0%)		4 (100.0%)	1 (25.0%)		3 (75.0%)	0 (0.0%)		4 (100.0%)
Duration (months)	≤ 30	13 (41.9%)	0.153	12 (38.7%)	19 (61.3%)	0.259	4 (12.9%)	27 (87.1%)	0.764*	
	> 30	16 (27.1%)		43 (72.9%)	16 (27.1%)		43 (72.9%)	10 (16.9%)		49 (83.1%)

*Fischer Exact Test

DISCUSSION

The mean age of the patients was 45.81 ± 9.03 years, which indicates that CKD prevails among the young, which might be due to delayed diagnosis and lack of awareness in developing nations. Male dominance 67 (74.4%) can be attributed to their excessive exposure to risk factors, as well as the inability of females to access healthcare due to cultural and social reasons. Most of the patients 42 (46.7%) belonged to the poor socioeconomic background, which indicates that CKD can be associated with poverty due to poor nutritional standards and the inability to access healthcare and buy medicines. Most of the patients 59 (65.6%) were in Stage 3.

Diabetes mellitus 29 (32.20%) and Hypertension 28 (31.10%) were the most prevalent comorbid conditions leading to kidney damage due to glomerular hyperfiltration and vascular alterations. Hypertension showed significant association with female 12 (52.2%) as

shown by p-value 0.011. This could be attributed to the hormonal influence and high prevalence of Obesity. Hepatitis C virus 14 (15.60%) infection, as it leads to the deposition of immune complexes into the kidney and the development of glomerulonephritis and CKD. The mean age of patients in present study were 45.81 ± 9.03 years which is considerably younger compared to findings of MacRae C *et al.*¹⁶ who reported mean age of 74.9 ± 10.9 years in Scottish CKD patients and Gutiérrez-Sánchez D *et al.*¹⁷ who found mean age of 70.6 ± 9.2 years in Spanish stage-5 CKD patients. This difference can be attributed to earlier onset of kidney disease in developing countries due to poor healthcare infrastructure and delayed diagnosis. Similar to current findings, Balan DG *et al.*¹⁸ also documented younger mean age of 55.86 ± 12.00 years in Romanian dialysis patients. Male predominance 67 (74.4%) observed in current study aligns with findings of Gurukkal CM *et al.*¹⁹ who

reported 70.8% males and Bilal MS *et al.*²⁰ who documented 63.9% male patients. This pattern supports that males are more affected by CKD possibly due to occupational exposures and lifestyle factors. However, Nasuuna EM *et al.*²¹ reported only 59.4% males in HIV-associated CKD suggesting certain disease etiologies may have different gender distributions.

Diabetes mellitus prevalence of 32.20% (29 patients) was lower than reported by Bilal MS *et al.*²⁰ who found 78.3% diabetic nephropathy and Gurukkal CM *et al.*¹⁹ who documented 52.8% diabetes among stage 4-5 CKD patients. This discrepancy may be explained by fact that current study included earlier CKD stages where diabetic complications has not yet manifested fully. Alsageer MA *et al.*²² reported 59.1% diabetes in hospitalized CKD patients which is higher than present findings. In contrast, MacRae C *et al.*¹⁶ found only 26.3% diabetes in primary care CKD patients which is closer to present results.

Hypertension prevalence of 31.10% (28 patients) was substantially lower compared to international data. Balan DG *et al.*¹⁸ reported 91.9% hypertension in dialysis patients, MacRae C *et al.*¹⁶ documented 71.2% in primary care CKD patients, and Alsageer MA *et al.*²² found 70.8% among hospitalized patients. This difference may be due to under-diagnosis of hypertension as many patients in developing countries does not have regular blood pressure monitoring. Trbojevic-Stankovic J *et al.*²³ noted that 70-90% of CKD patients has hypertension globally, highlighting that present finding likely represents under-detection. The significant association between hypertension and female gender (p-value 0.011) with females showing 52.2% prevalence is consistent with hormonal factors, though Bilal MS *et al.*²⁰ noted that females experienced more hypotensive episodes during dialysis.

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Hepatitis C virus prevalence of 15.60% (14 patients) reflects endemic nature of HCV in developing regions. Balan DG *et al.*¹⁸ reported 10.8% chronic viral hepatitis which is comparable to present findings. The predominance of Stage 3 CKD 59 (65.6%) indicates late presentation which contrasts with well-resourced settings. Holstiege J *et al.*²⁴ demonstrated that multimorbidity increases with advancing CKD stage, suggesting current patients may develop more comorbidities as disease progresses.

There are certain limitations that the current study possesses. Since the study is an individual center study, the result might not be applicable to the larger community. As far as the sample size is concerned, the total number of 90 patients was small, which could be one of the reasons that the study did not possess adequate statistical power for testing the association of comorbidities and various factors. Since the study was conducted on the patient records, there could be an inherent problem of underreporting of certain comorbidities, especially the one that needs continuous monitoring, like Hypertension.

CONCLUSION

Diabetes mellitus and Hypertension were found to be comorbidities commonly observed in CKD patients, and Hypertension had been significantly associated with the female gender. Hepatitis C virus infections were observed to be present in considerable number of patients, which gives an insight into the prevalence of Viral Hepatitis.

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