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Time And Factors Associated With Rapid Worsening Of Renal Functioning In Chronic Kidney Disease Patients At A Tertiary Care Hospital In Quetta

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Abstract

Background: Chronic kidney disease (CKD) is characterized by a progressive decline in kidney function leading to the development of substantial morbidity and mortality, especially in a resource-poor country like Pakistan. Acknowledging the factors associated with a rapid decline in renal function will be domain of focus in a patient outcomes-improving cycle which will facilitate early spotting of those susceptible groups.

Objective: The goal of this study was to examine the duration and predictors of early deterioration of renal function in people with CKD at a tertiary care facility in Quetta.

Methods: This was a retrospective cohort study at Balochistan Institute of Nephro-Urology, Quetta including 271 patients of chronic kidney disease stage 3 and 4. We extracted data from medical records concerning socio-demographic, clinical, laboratory, and treatment characteristics. Decline in eGFR, increase in serum

creatinine, doubling of creatinine, and CKD stage progression were used as definitions of early worsening of renal function. Associations were analysed using chi-square tests and were considered significant at p 0.05).

Conclusion

In conclusion, progression of CKD with important clinical impact is not uncommon in this population, with unacceptably poor control of comorbid conditions despite demographic and behavioral risk factors. In CKD patients, to prevent disease progression and improve outcomes, it is essential to detect early, manage diabetes and hypertension better, and achieve more structured follow-up.

Introduction

Chronic kidney disease (CKD) is a significant and increasing national health issue across the world (Francis et al., 2024). It is a progressive disorder of the kidney where the kidney functions are gradually and irreversibly reduced in the course of time. The kidneys are crucial in the process of homeostasis in the body by regulating the fluid balance, electrolytes, acid-base conditions and the excretion of the waste products in the body (Imenez Silva & Mohebbi, 2022). In case of worsening of kidney performance, patients are susceptible to a broad spectrum of complications such as anemia, hypertension, cardiovascular disease, electrolyte imbalance, metabolic disturbances, and ultimately end-stage renal disease. Not only does CKD impact survival and physical health, but it also has a significant psychological, social, and economic cost to patients, families, and health care systems (Hussien et al., 2021).

The development course of CKD is mostly silent during the initial stages, and many patients are only diagnosed in the case when the renal impairment has already reached significant levels (Borg et al., 2023). After entering the stages of moderate and severe kidney damage, the threat of further worsening of the condition rises, particularly when co-existing diseases like diabetes mellitus and hypertension are present. These two are the most prevalent causes of CKD and also significant factors in the accelerated deterioration of renal functioning (Mallamaci & Tripepi, 2024). Age (older), smoking, cardiovascular disease, inadequate blood pressure control, inadequate glycemic control, anemia, and delayed clinical follow-up might further hasten the deterioration of renal functioning. Thus, the detection of patients, who are at risk of early deterioration, is required in order to intervene and prevent negative renal outcomes in good time (McGaughey et al., 2021).

Evaluation of deteriorating renal function is usually constructed on objective clinical indicators including diminution in estimated glomerular filtration rate (eGFR), rise in serum creatinine, CKD stage progression, and serum creatinine doubling (Wisniewska & Niemczyk, 2022). These signs are useful in clinical practice as they enable doctors to observe the progression of disease and adapt management. Time is another factor of significance. In CKD, not only is it essential to ascertain whether the renal functioning is getting worse, but also the rate at which it is getting worse (Kalantar-Zadeh et al., 2021). Patients with a sudden deterioration in the course of a short time might need more frequent follow-ups, more vigorous treatment of risk factors, and early consideration of renal replacement therapy in the event of necessity (Kim et al., 2020).

In developing nations like Pakistan, the CKD burden is very alarming because of poor diagnosis, insufficient regular screening, access to specialist management, and poor management of chronic illnesses (Ameh et al., 2020). Renal functioning is already largely impaired in the first presentation of the patients to the specialists in many patients. Tertiary care hospitals thus end up receiving high patients with stage 3 and stage 4 CKD who are already at high risk of progression (Niu et al., 2021). Under these conditions, it is necessary to comprehend when the renal deterioration occurs and under what circumstances the rapid worsening occurs to be able to improve

patient outcomes and inform local clinical practice. But the information in Balochistan, particularly Quetta is scarce in this respect (Mushtaq & Ali, 2020).

Balochistan Institute of Nephro-Urology, Quetta (BINUQ), is a large referral facility that receives the patients of nephrology in the province and other nearby areas (Zarkoon et al., 2020). This renders it a significant location to examine the course of CKD under the customary clinical practice. The analysis of the trends of renal deterioration in patients under the care of this center may be of benefit in terms of local data on the burden of progression, the risk factors that are typically encountered, and the time frame during which patients experience clinically significant worsening (Ying et al., 2024). This evidence is valuable to clinicians, hospital administrators, and policymakers who wish to enhance the CKD monitoring and management strategies in the area (Vassalotti & Boucree, 2022).
This study was therefore conducted to assess the time and factors associated with rapid worsening of renal functioning among chronic kidney disease patients at a tertiary care hospital in Quetta. The research was conducted to produce evidence that could aid in identifying the high-risk patients earlier and assist in managing and controlling the CKD advancement through improved monitoring and control of the indicators of renal function.

Methodology

Study Design

The retrospective cohort study was carried out on patients with clinically or objectively diagnosed chronic kidney disease (CKD) stage 3 and stage 4. The researchers examined patient records longitudinally, to determine the incidence and timing of deterioration of renal function, and to determine the demographic and clinical predictors.

Study Setting or Location

The literature was conducted at Nephrology Department of the Balochistan Institute of Nephro-Urology, Quetta (BINUQ), or Kidney Hospital Quetta. BINUQ is situated in the Balochistan capital city and has about 110 beds. It is a large tertiary care unit that offers specialized renal care to patients in not only Balochistan but also the nearby regions such as Afghanistan, Iran and the other provinces in Pakistan. The hospital accepts a big amount of renal patients every single day and is a significant referral facility of nephrology services in the area.

Sample Size

Despite the fact that the minimum required sample size was initially estimated with the help of Daniel formula, all available patient records which had met the requirements of the study period were considered. Following the use of inclusion and exclusion criteria, 271 CKD patients were included in the final analysis.

Inclusion Criteria

The patients were included in the study as long as they met the following criteria:
They were aged 18 years or above.
They were at baseline with clinically known or objectively determined CKD stage 3 or stage 4.
They underwent at least one follow-up assessment of renal function which was documented.
They had full medical records with all the information about the needed demographic, clinical, laboratory, and treatment variables.

Exclusion Criteria

The patients were not allowed to participate in the study when they possessed any of the following:

Past history of acute kidney injury (AKI).

CKD stage 5 baseline.

Renal dialysis at the baseline.

Unfinished or incomplete medical records.

None of the follow-up renal functional data were documented in order to compare it with the baseline data.

Data Collection Form

The structured data collection form was created by examining the associated literature and discussing the data collection form with the supervisory team and clinicians of the study site. Patient medical records were used to extract information using the form. It contained socio-demographic variables like age, sex, residence, smoking status and alcohol use. It also incorporated baseline and follow-up clinical data like CKD stage, CKD duration, comorbidity, hypertension and diabetic control status, adherence to medication as per guidelines, lab parameters.

The extracted laboratory and clinical variables were baseline and follow-up estimated glomerular filtration rate (eGFR), serum creatinine, hemoglobin, sodium, potassium, calcium, fasting blood glucose, glycated hemoglobin (HbA1c), systolic blood pressure and diastolic blood pressure. The baseline and follow-up eGFR values dates were also noted to determine the time interval between measurements.

Outcome Measures

Early deterioration of renal functioning was the main result of the study. This was measured by deterioration of the renal function at the follow-up as determined by the laboratory values and progression markers documented. Measures used to assess worsening included a decrease in eGFR, serum creatinine increase, doubling of serum creatinine, and a change in CKD stage between baseline and follow-up.

The time to worsening of renal function was calculated as the period between baseline and follow-up renal measurements and divided into 3-4 months, 5-6 months, 7-9 months, and over 9 months.

The secondary outcome was the measurement of the factors linked to deteriorating renal function which included socio-demographic, behavioral, treatment-related and clinical features of the patients.

Statistical Analysis

Statistical Package of Social Sciences (SPSS) version 26 was used to enter and analyze data. Patient characteristics were summarized using descriptive statistics. Categorical variables were also given in frequency and percentage and the continuous variables in the form of minimum, maximum, mean and standard deviation.

To test the distribution of early worsening of renal function among various categorical variables, cross-tabulation was conducted. The Pearson chi-square test was used to assess associations between categorical independent variables and early worsening of renal function. Fisher exact test was also produced where significant by SPSS when there were 2 x 2 tables, though Pearson chi-square values were also reported when the number of expected cells was sufficient. P-value below 0.05 was deemed to be significant.

Ethical Consideration

The Departmental Ethics and Research Committee of the Department of Pharmacy Practice, University of Balochistan, Quetta and the relevant authorities of BINUQ gave the ethical approval to the conduct of the study. Patient information was kept

confidential during the study. The data extraction form did not contain patient names or personal identifiers and the data was utilized in the context of research.

Socio-demographic characteristics of CKD patients (n = 271)

Table 1 shows socio-demographic features of CKD patients involved in the study (n = 271). Most of the patients were aged over 58 years (42.4%), then aged 3847 years (16.6%), 2837 years (15.1), and the smallest percentage (11.8) was of 1827 years. Gender distribution showed a higher percentage of males (62.0) as opposed to females (38.0). In terms of residence, a little over half of the patients lived in urban regions (51.3%), and 48.7% of the patients lived in rural regions. Overall, the findings indicate that CKD was more prevalent among older individuals, males, and those residing in urban settings.

Table 1. Socio-demographic characteristics of CKD patients (n = 271)

Variable	Category	Frequency (n)	Percentage (%)
Age group (years)	18–27	32	11.8
	28–37	41	15.1
	38–47	45	16.6
	48–57	38	14.0
	58 and above	115	42.4
Sex	Male	168	62.0
	Female	103	38.0
Residence	Urban	139	51.3
	Rural	132	48.7

Table 2. B**aseline clinical characteristics of CKD patients (n = 271)**

Table 2 sums up the clinical features of CKD patients at the baseline (n = 271). Most of the patients were non-smokers (64.6%), with 20.7% being current smokers and 14.8% former smokers. The majority of the patients did not take alcohol (88.6%), and only a small number (11.4%), took alcohol. With regards to disease severity, a huge percentage of patients were in Stage 3 of CKD (71.6%), and the rest were in Stage 4 (28.4%). Hypertension (72.0% of the patients) and diabetes mellitus (84.5%), were highly prevalent. One out of every four patients was reported to have cardiovascular disease and 36.9% hyperlipidemia. Also, almost half of the patients (48.7%) were diagnosed with anemia.

B**aseline clinical characteristics of CKD patients (n = 271)**

Variable	Category	Frequency (n)	Percentage (%)
Smoking status	Never	175	64.6
	Current	56	20.7
	Former	40	14.8
Alcohol use	Yes	31	11.4
	No	240	88.6
Baseline CKD stage	Stage 3	194	71.6
	Stage 4	77	28.4
Hypertension present	Yes	195	72.0
	No	76	28.0
Diabetes mellitus present	Yes	229	84.5
	No	42	15.5
Cardiovascular disease present	Yes	78	28.8
	No	193	71.2
Hyperlipidemia present	Yes	100	36.9

	No	171	63.1
Anemia present	Yes	132	48.7
	No	139	51.3

Renal progression and worsening profile among CKD patients (n = 271)

Table 3 shows how CKD patients (n = 271) have worsening and renal progression profiles. Most of the patients were at Stage 4 CKD (72.0%), then Stage 3 (16.6%) and Stage 5 (11.4%), which showed that a significant proportion of the cohort was at an advanced stage of the disease. Many patients were found to be eligible (65.7 percent) to suffer the requirements of eGFR decline and 57.6 percent were found to have increased serum creatinine, whereas, 34.3 percent were found to have doubled serum creatinine levels. Regarding the degree of deterioration of the renal, the majority of the patients (66.4) had a greater reduction in eGFR by more than 25 percent and 26.9 percent had a reduction in eGFR by 10-19 percent and 6.6 percent, respectively.

Table 3. Renal progression and worsening profile among CKD patients (n = 271)

Variable	Category	Frequency (n)	Percentage (%)
Current CKD stage	Stage 3	45	16.6
	Stage 4	195	72.0
	Stage 5	31	11.4
Meets eGFR decline	Yes	178	65.7
	No	93	34.3
Meets serum creatinine increase	Yes	156	57.6
	No	115	42.4
Meets serum creatinine doubling	Yes	93	34.3
	No	178	65.7
eGFR decline category	<10% decline	18	6.6
	10–19% decline	73	26.9
	>25% decline	180	66.4

Time-related pattern of worsening of renal function (n = 271)

Table 4 presents the time-related pattern of worsening of renal function among CKD patients (n = 271). The largest proportion of patients experienced worsening after more than 9 months (46.5%), followed by those within 7–9 months (25.5%) and 5–6 months (21.0%), while only a small percentage showed worsening within 3–4 months (7.0%). These findings indicate that although early deterioration occurs in some patients, the majority tend to experience worsening of renal function over a longer duration, particularly beyond 9 months.

Table 4. Time-related pattern of worsening of renal function (n = 271)

Variable	Category	Frequency (n)	Percentage (%)
Time to worsening of renal function	3–4 months	19	7.0
	5–6 months	57	21.0
	7–9 months	69	25.5
	More than 9 months	126	46.5

5. Trends in selected clinical parameters during follow-up (n = 271)

Table 5 shows the dynamics of selected clinical parameters in CKD patients (n = 271) followed up. Hemoglobin levels decreased significantly in most of the patients (88.2%), with 11.8% improving. Sodium levels decreased in 59.0 per cent of patients, but 41.0 per cent showed improvement. Conversely, most patients (79.0%) had better levels of potassium, and only 21.0% had worse levels. In 69.7% and 30.3% of patients, there was a decrease and improvement in calcium levels, respectively. Improvement in fasting blood glucose was recorded in a significant percentage of patients (72.3%); 27.7% patients were getting worse. Likewise, systolic blood pressure improved in 79.7% patients and only 20.3% of patients experienced a decrease. In general, the results show inconsistent trends in all clinical parameters, whereby there was a significant improvement in potassium levels, blood glucose, and systolic blood pressure, but a decline in hemoglobin levels, sodium levels, and calcium levels of CKD patients during the follow-up period.

Table 5. Trends in selected clinical parameters during follow-up (n = 271)

Variable	Category	Frequency (n)	Percentage (%)
Hemoglobin trend	Improved	32	11.8
	Declined	239	88.2
Sodium trend	Improved	111	41.0
	Declined	160	59.0
Potassium trend	Improved	214	79.0
	Declined	57	21.0
Calcium trend	Improved	82	30.3
	Declined	189	69.7
Fasting blood glucose trend	Improved	196	72.3
	Declined	75	27.7
Systolic BP trend	Improved	216	79.7
	Declined	55	20.3

Control status of hypertension and diabetes mellitus (n = 271)

Table 6 presents the control status of hypertension and diabetes mellitus among CKD patients (n = 271). A majority of patients with hypertension were found to be uncontrolled (67.9%), while 32.1% were categorized as not applicable. Regarding diabetes mellitus, nearly half of the patients had uncontrolled diabetes (49.4%), whereas only a small proportion achieved controlled status (4.8%), and 45.8% were classified as not applicable. Overall, these findings highlight poor control of both hypertension and diabetes among CKD patients, particularly the very low rate of controlled diabetes.

Table 6. Control status of hypertension and diabetes mellitus (n = 271)

Variable	Category	Frequency (n)	Percentage (%)
Hypertension control status	Uncontrolled	184	67.9
	Not applicable	87	32.1
Diabetes control status	Controlled	13	4.8
	Uncontrolled	134	49.4
	Not applicable	124	45.8

Descriptive statistics of continuous clinical and biochemical variables among CKD patients (n = 271)

The descriptive statistics of continuous clinical and biochemical variables of CKD patients are in Table 7 (n = 271). The mean age of patients was 51.92 ± 18.72 years. There was a significant impairment of the renal functioning, and the mean serum creatinine level increased by 77.22, and the mean eGFR decreased by 32.77. The mean length of follow-up was 255.75 ± 95.11 days. The progression of disease is observed in the rise in mean CKD stage compared with baseline (3.28) and follow up (3.95). Mean eGFR, likewise, dropped to 24.63 mL/min/1.73m 2 and serum creatinine rose to 4.19mg/dl. The hemoglobin levels fell to a mean of 8.99 g/dL as opposed to 11.02 thus showing aggravated anemia. Electrolyte changes were found to be slightly decreasing in sodium and calcium levels with potassium levels rising up to 5.00 mmol/L and glycemic parameters up to 174.87 with a HbA1c of 9.09%. The level of blood pressure rose significantly, and systolic and diastolic blood pressure increased to 169.31 and 149.61 mmHg, respectively. The average lifespan of CKD in patients was 62.30 months ± 32.80 months. In general, the results show that the clinical and biochemical status of CKD patients deteriorates significantly with time.

Table 7. Descriptive statistics of continuous clinical and biochemical variables among CKD patients (n = 271)

Variable	Minimum	Maximum	Mean	Std. Deviation
Age (years)	20	84	51.92	18.72
Serum creatinine increase (%)	-41.10	340.70	77.22	74.64
eGFR decline in percent	5.70	55.00	32.77	15.22
Time interval between baseline and latest measurements (days)	92	419	255.75	95.11
Baseline CKD stage	3	4	3.28	0.45
Current CKD stage	3	5	3.95	0.53
Baseline eGFR (mL/min/1.73m²)	20.0	54.9	36.76	9.59
Latest eGFR (mL/min/1.73m²)	9.4	46.4	24.63	8.35
Baseline serum creatinine (mg/dL)	1.4	3.5	2.52	0.60
Latest serum creatinine (mg/dL)	2.0	6.5	4.19	1.32
Baseline hemoglobin (g/dL)	9.0	13.0	11.02	1.17
Latest hemoglobin (g/dL)	7.0	11.0	8.99	1.19
Baseline sodium (mmol/L)	133	145	139.08	3.40
Latest sodium (mmol/L)	130	146	138.04	4.51
Baseline potassium (mmol/L)	3.6	5.0	4.29	0.41
Latest potassium (mmol/L)	3.8	6.2	5.00	0.71
Baseline calcium (mg/dL)	7.8	9.8	8.78	0.59
Latest calcium (mg/dL)	7.2	9.2	8.25	0.55
Baseline fasting blood glucose (mg/dL)	90	190	138.55	30.15
Latest fasting blood glucose (mg/dL)	101	259	174.87	46.16
Baseline HbA1c (%)	6.1	9.8	7.96	1.12
Latest HbA1c (%)	6.5	11.5	9.09	1.48
Baseline systolic blood pressure (mmHg)	130	169	149.61	11.86
Latest systolic blood pressure (mmHg)	140	199	169.31	16.93
Baseline diastolic blood pressure (mmHg)	75	99	87.66	6.93
Latest diastolic blood pressure (mmHg)	80	114	95.83	10.03

Duration of CKD (months)	2	119	62.30	32.80

Association of socio-demographic factors with early worsening of renal function among CKD patients (n = 271)

Table 8 shows the association of socio-demographic factors with early worsening of renal function among CKD patients (n = 271). Early worsening was most common among the patients aged 58 years and older (70.4%), younger generations aged 48-57 years old (68.4) and 28-37 years (68.3) old. However, this association was not statistically significant ($\chi^2 = 3.356$, $p = 0.500$). Similarly, a slightly higher proportion of males (67.9%) experienced early worsening compared to females (65.0%), but the difference was not significant ($\chi^2 = 0.227$, $p = 0.634$). In terms of residence, urban patients showed a higher proportion of early worsening (70.5%) compared to rural patients (62.9%), though this difference was also not statistically significant ($\chi^2 = 1.775$, $p = 0.183$).

Table 8. Association of socio-demographic factors with early worsening of renal function among CKD patients (n = 271)

Variable	Category	Early worsening Yes n (%)	Early worsening No n (%)	Total n (%)	Test statistic	p-value
Age in categories	18–27	21 (65.6)	11 (34.4)	32 (11.8)	$\chi^2 = 3.356$	0.500
	28–37	28 (68.3)	13 (31.7)	41 (15.1)		
	38–47	25 (55.6)	20 (44.4)	45 (16.6)		
	48–57	26 (68.4)	12 (31.6)	38 (14.0)		
	58 and above	81 (70.4)	34 (29.6)	115 (42.4)		
Gender	Male	114 (67.9)	54 (32.1)	168 (62.0)	$\chi^2 = 0.227$	0.634
	Female	67 (65.0)	36 (35.0)	103 (38.0)		
Residence	Urban	98 (70.5)	41 (29.5)	139 (51.3)	$\chi^2 = 1.775$	0.183
	Rural	83 (62.9)	49 (37.1)	132 (48.7)		

Association of behavioral, treatment, and time-related factors with early worsening of renal function among CKD patients (n = 271)

The results of correlation between behavioral, treatment, and time factors and early deterioration of renal function among CKD patients (n = 271) are provided in Table 8. Early worsening was observed in the majority of patients across all smoking categories, with the highest proportion among never smokers (68.6%), followed by former smokers (65.0%) and current smokers (62.5%); however, this association was not statistically significant ($\chi^2 = 0.773$, $p = 0.679$). Likewise, the proportion of early worsening was a little higher among patients who did not drink alcohol (67.5% vs. 61.3%) although it was not significant ($\chi^2 = 0.477$, $p = 0.490$). Regarding medication adherence, early worsening was highest among those who did not follow guidelines (71.4%), followed by those who fully followed (68.2%) and partially followed (63.4%), though no significant association was found ($\chi^2 = 1.154$, $p = 0.562$). In terms

of time-related patterns, patients with worsening after more than 9 months had the highest proportion of early worsening (70.6%), while the lowest was seen in the 7–9 months group (60.9%); however, this relationship was also not statistically significant ($\chi^2 = 2.044$, $p = 0.563$). In general, there was no significant correlation between behavioral, treatment and time variables and worsening of renal function in early stages in this study.

Table 9. Association of behavioral, treatment, and time-related factors with early worsening of renal function among CKD patients (n = 271)

Variable	Category	Early worsening Yes n (%)	Early worsening No n (%)	Total n (%)	Test statistic	p-value
Smoking status	Never	120 (68.6)	55 (31.4)	175 (64.6)	$\chi^2 = 0.773$	0.679
	Current	35 (62.5)	21 (37.5)	56 (20.7)		
	Former	26 (65.0)	14 (35.0)	40 (14.8)		
Alcohol use	Yes	19 (61.3)	12 (38.7)	31 (11.4)	$\chi^2 = 0.477$	0.490
	No	162 (67.5)	78 (32.5)	240 (88.6)		
Medication adherence as per guidelines	Fully followed	75 (68.2)	35 (31.8)	110 (40.6)	$\chi^2 = 1.154$	0.562
	Partially followed	71 (63.4)	41 (36.6)	112 (41.3)		
	Not followed	35 (71.4)	14 (28.6)	49 (18.1)		
Group of early worsening (days)	3–4 months	13 (68.4)	6 (31.6)	19 (7.0)	$\chi^2 = 2.044$	0.563
	5–6 months	37 (64.9)	20 (35.1)	57 (21.0)		
	7–9 months	42 (60.9)	27 (39.1)	69 (25.5)		
	More than 9 months	89 (70.6)	37 (29.4)	126 (46.5)		

Discussion

The present study examined the time and factors associated with rapid worsening of renal functioning among chronic kidney disease patients managed at a tertiary care hospital in Quetta (Ahmed et al., 2022). The results indicated that the deterioration of renal functions occurred early in this group of patients with 181 of 271 patients (66.8) experiencing the worsening (Pelaia et al., 2021). This shows that almost two-thirds of the patients enrolled in CKD deteriorated clinically in the course of the follow-up, which also revealed the significant burden of renal progression in this environment (Chesnaye et al., 2024). Age was another leading feature in the study population with 42.4% being above 58 years of age and a high comorbidity burden especially diabetes mellitus (84.5) and hypertension (72.0) (Sarker et al., 2024).

The significant change in the severity of CKD between time was also an important finding of the study (Hapca et al., 2021). On baseline, the majority of patients were in CKD stage 3 (71.6%), whereas the majority were at stage 4 (72.0) at follow-up with 11.4% at stage 5 (Tangri et al., 2023). This trend indicates that the renal status is

seriously deteriorating throughout the observation period (Xu et al., 2024). Likewise, 65.7 percent of patients satisfied the criterion of eGFR decrease, 57.6 percent satisfied the criterion of serum creatinine-rise, and 34.3 percent exhibited doubling of serum creatinine. These indicators together, reliably lead to the conclusion that renal function decline was common and of clinical importance in this population (Ebert et al., 2021).

This interpretation is further reinforced by the descriptive statistics (Sanchez, 2023). Mean baseline eGFR worsened to 24.63 to 36.76 mL/min/1.73m 2, and mean serum creatinine increased to 4.19-2.52 mg/dL, at follow-up. The average change in eGFR was 32.77 and the mean change in serum creatinine was 77.22. These results indicate significant impairment of kidney function with time. Moreover, the level of hemoglobin decreased, with an average of 11.02 g/dL at baseline to 8.99 g/dL at follow-up, indicating aggravated anemia and renal deterioration (Pan et al., 2022). At follow-up, blood pressure and glycemic measures were also higher, with the average systolic blood pressure reading 169.31 mmHg and average HbA1c reading 9.09% that possibly shows ineffective management of significant CKD-related risks factors in the study group (Zhang et al., 2024).

In terms of time, the average time between baseline and the last measurements was 255.75 days, which shows that degradation took place in a rather short follow-up (Nylander et al., 2023). Almost a half of the patients had the worsening group that was over 9 months (46.5%), and smaller proportions were 7659 months (25.5), 56 months (21.0), and 34 months (7.0) (Emanuel, 2024). These results indicate that the deterioration of the kidneys was not concentrated within a very short time frame, but occurred gradually over a number of months. Simultaneously, the fact that a certain number of patients deteriorated as early as 3-4 months points to the existence of a group of patients who might be at a significantly high risk within the short-term and, therefore, need a more thorough observation (McGaughey et al., 2021).

These findings are put into perspective by the comorbidity profile of the patients (Platona et al., 2024). Diabetes mellitus, and hypertension were very common, and all are well-known triggers of CKD development. Nearly half of the patients were anemic and over a third of them had hyperlipidemia and over a quarter had cardiovascular disease (Lanser et al., 2021). This aggregation of metabolic and cardiovascular risk factors was likely to play a role in the high incidence of renal deterioration that was seen in the sample (Scurt et al., 2024). Even though the possible statistically significant associations between the chosen socio-demographic variables and behavioral variables were not statistically significant in the current inferential tables, the descriptive pattern however indicates that the study population was medically complex and at high overall risk of progression (Namazkhan et al., 2020).

In the bivariate analysis, age category, sex, and residence did not have a significant relationship with the early worsening of renal function (Luo et al., 2023). Likewise, smoking status, alcohol consumption, medication compliance level, and the combined period of worsening were not statistically significant with the outcome (Song et al., 2022). Such non-significant results can also suggest that accelerated deterioration in this cohort was more driven by the presence of underlying disease burden and general clinical complexity than by the unique demographic factors (Negru et al., 2025). The other conceivable reason is that the result was shared by almost all subgroups making the difference between the exposed and unexposed less prominent. There are also possibilities that more sample size or multivariate analysis may be more effective to reveal more hidden associations not evident in the simple chi-square test (Shen et al., 2022). The lack of statistical significance should thus not be considered evidence that these variables are of no clinical significance, but only that a distinct independent relationship was not established in the current unadjusted analysis (Howes et al., 2021).

Conclusion:
This study shows that a large proportion of CKD patients had rapid and clinically important renal function decline, with distinct transition of stage 3 CKD to end–stage CKD over a short follow–up time course. The decline in eGFR, increase in serum creatinine, and progression of anemia and metabolic parameters together reflect persistent disease progression. We believe that poor control of major comorbidities, particularly diabetes and hypertension, is responsible for inducing faster renal decline. Although socio demographic and behavioural factors were not statistically significant, the consistently high rates of worsening across all groups implies that poor overall clinical burden or poor management of disease represent primary factors. Such findings highlight the importance of identifying high-risk patients early, optimizing comorbid condition management, and incorporating systematic follow-up plans aimed at delaying CKD progression and improving patient outcomes in resource-strapped settings.

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