Section: Miscellaneous

Original Research Article

CLINICAL PROFILE AND ETIOLOGY OF CHRONIC KIDNEY DISEASE IN A TERTIARY CARE CENTRE IN KARNATAKA

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Abstract

Background: CKD is a progressive condition marked by gradual kidney function loss, usually progressing through five stages, with the final stage requiring dialysis or transplantation. Common CKD clinical features include hypertension, proteinuria, reduced Glomerular Filtration Rate (GFR), anemia, and metabolic imbalances in electrolytes. CKD's etiological factors vary and can be region-specific. Major contributors to CKD development include diabetes mellitus and hypertension, both prevalent in Karnataka. Infections, environmental factors like high fluoride levels in drinking water, hereditary/genetic factors, medication/toxin exposure, and unhealthy lifestyle choices can also contribute to CKD. Understanding these factors is crucial for addressing CKD in the region effectively. **Objectives:** To study the clinical profile of chronic kidney disease patients attending Rajiv Gandhi Super Specialty Hospital, Raichur, to study the etiology of chronic kidney disease and assess comorbidities and to assess the clinico-hematological correlation of the risk factors and complications of patients with chronic kidney disease. **Materials and Methods:** This study is a descriptive analysis conducted over a three-month period at RGSSH, Raichur. Data collection involved sociodemographic information and details related to CKD, including signs, symptoms, and etiological factors. Renal function was assessed through blood urea, serum creatinine, serum electrolytes, abdominal ultrasound with KUB, and cardiovascular parameters. Inclusion criteria encompassed patients with stages I-VI CKD, end-stage renal failure on renal replacement therapy, and a GFR <60 ml/min/1.73 m2, while exclusion criteria excluded patients with other systemic illnesses, pregnancy, certain medical conditions, and renal transplantation. Statistical analysis included mean, standard deviation, chi-square tests, multivariate logistic regression, ANOVA, and Student's t-test, with a significance level set at $P < 0.05$. **Results:** Our study included participants of all ages, with a majority falling into the middle age group, and over one-third were females. Given that our study was conducted in a government hospital catering to the poor, most participants were below the poverty line, with nearly half being illiterate, and the majority hailing from rural areas. Analyzing etiological factors and investigations, heat and dehydration were found to play a role in kidney size and different stages of chronic kidney disease. Tobacco use showed differences in kidney diseases but was not statistically significant. Alcohol was significantly associated with CKD, as was contact with pesticides. **Conclusion:** This study offers proof that CKD is a real public health risk in Raichur. The need to look for new etiological factors is emphasized by the lack of a significant correlation between CKD and established risk factors. To identify etiological causes and put preventive measures in place, extensive research is needed given the considerable impact of CKD in this area.

INTRODUCTION

hronic Kidney Disease (CKD) is a global health concern with a rising prevalence that poses significant challenges to healthcare systems worldwide. In Karnataka, a southern state in India, CKD is a growing public health issue. Understanding the clinical profile and etiological factors contributing to CKD in this region is vital for improving prevention and management strategies. This article explores the clinical profile and underlying aetiologies of CKD in a tertiary care centre in Karnataka, shedding light on the complexities of this condition.[1]

Clinical Profile of CKD

CKD is a progressive and irreversible condition characterized by the gradual loss of kidney function over time. Patients with CKD often progress through five stages, with the final stage necessitating dialysis or kidney transplantation. The clinical profile of **CKD can vary widely, but common manifestations include**

1. **Hypertension:** Elevated blood pressure is a common feature of CKD and often precedes the diagnosis. Hypertension contributes to the progression of kidney damage and is a risk factor for cardiovascular disease.
2. **Proteinuria:** The presence of excess protein in the urine, known as proteinuria, is a hallmark of CKD. It is an early sign of kidney damage and can indicate the severity of the disease.
3. **Reduced Glomerular Filtration Rate (GFR):** A decline in GFR, which measures how well the kidneys filter waste and excess fluid from the blood, is a key diagnostic criterion for CKD.
4. **Anaemia:** CKD can lead to a decrease in the production of erythropoietin, a hormone that stimulates red blood cell production, resulting in anaemia.
5. **Metabolic Disturbances:** CKD can cause disturbances in electrolyte balance, leading to imbalances in sodium, potassium, calcium, and phosphate levels.[2,3]

CKD has various etiological factors, and these can vary by region. Several factors contribute to the development of CKD

1. **Diabetes Mellitus:** Diabetes is a leading cause of CKD globally and is also prevalent in Karnataka. Prolonged uncontrolled blood sugar levels can damage the small blood vessels in the kidneys, leading to CKD.
2. **Hypertension:** High blood pressure is a common risk factor for CKD. The coexistence of diabetes and hypertension can exacerbate kidney damage.
3. **Infections:** In some cases, infections such as urinary tract infections or chronic pyelonephritis can lead to CKD, especially if left untreated or if recurrent.
4. **Environmental Factors:** In certain regions of Karnataka, environmental factors like high fluoride levels in drinking water have been associated with CKD. These substances can damage the kidneys over time.
5. **Hereditary and Genetic Factors:** Some forms of CKD are hereditary, and genetic factors can play a significant role in the development of the disease.
6. **Medication and Toxin Exposure:** Certain medications, as well as exposure to toxins and heavy metals, can contribute to kidney damage. In agricultural areas, pesticide exposure is of particular concern.
7. **Lifestyle Factors:** Unhealthy lifestyle choices such as smoking, excessive alcohol consumption, and a diet high in salt and processed foods can increase the risk of CKD.[4]

We conducted this study to study the clinical profile of chronic kidney disease patients attending Rajiv Gandhi Super Specialty Hospital, Raichur, to study the etiology of chronic kidney disease and assess comorbidities and to assess the clinico-hematological correlation of the risk factors and complications of patients with chronic kidney disease.

MATERIALS AND METHODS

It is a descriptive study wherein all newly diagnosed cases of chronic kidney disease attending RGSSH, Raichur based on the National Kidney foundation definition were included in this study. Study period was for 3 months. All the patients who visit RGSSH, Raichur during the study period who were eligible according to inclusion criteria were included in the study. Method of collection of data Newly diagnosed cases of chronic kidney disease attending RGSSH, Raichur based on the National Kidney foundation definition were included in this study. Different sociodemographic data were collected for all the study participants. Details related to CKD were collected with respect to signs and symptoms, etiological factors etc. Investigations for assessment of renal failure-

a. Blood urea, Serum creatinine, serum electrolytes.
b. Abdominal ultrasound with KUB
c. Cardiovascular parameters (Blood pressure & Echocardiogram).

Wherever imaging is indicated, Ultrasonography is done.

Inclusion Criteria

Patients with chronic kidney disease with stage I –V disease, Patients with End-stage renal failure on renal replacement therapy in the form of Hemodialysis and peritoneal dialysis and GFR <60 ml/min/1.73 m2 on the basis of estimated GFR using the Modification of Diet in Renal Disease (MDRD) formula (CKD stages 3 to 5)

Exclusion Criteria

Patients with other systemic illness without renal failure, Pregnancy, Aplastic anemia, known haematological malignancy causing secondary renal failure, Patients with the end-stage renal disease treated with renal replacement therapy in the form of

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renal transplantation and History of blood transfusion during the last three months

Data were collected by using pre-tested proforma meeting the objectives of the study. Mean and standard deviation were calculated for descriptive statistics. Chi-square tests for inferential statistics were done. Statistical significance if $P < 0.05$ and 95% confidence limit were used. Fisher's exact test when appropriate were performed to analyze the univariate relations between possible prognostic factors as it is likely that different prognostic factors are mutually related, the independent effects of prognostic factors were additionally analyzed with multivariate logistic regression. Analysis of variance (ANOVA), Student`s `t` test were applied and p-value of less than 0.05 were considered significant.

RESULTS

In our study, people from all the ages were included. Maximum number of participants were from middle age. More than one third were females. Since the hospital is a government hospital where poor sector of the society OPT for free treatment, most of the study participants were from below poverty line (BPL) and nearly half of the participants were illiterate. More than three fourth of the participants were from rural area [Table 1].

When association between different age groups and size of the kidney and different stages of chronic kidney disease were calculated, the difference between different groups was not found to be significant. The difference between different socioeconomic groups and size of the kidney was statistically significant as P was less than 0.05. However, the difference between different socioeconomic groups was not statistically significant with different stages of the disease. There was no difference between females and males with regard to kidney size and different stages of the disease. Education did not play a role in different stages of kidney disease. There was no difference between different occupations and different stages of the disease but the difference between different rural area and urban area was statistically significant [Table 4].

When different ideological factors and investigations were compared with the kidney size and different stages of chronic kidney disease heat and dehydration was found to be playing a role. Though there was a difference in different kidney diseases and kidney size with respect to tobacco use, this difference was not statistically significant. Alcohol was found to be associated with kidney size which was statistically significant. Contact with pesticides was found to be associated with the size of the kidney and found to be statistically significant. There was no statistical difference between different groups with respect to analgesic use. In our study the difference between different groups of blood pressure was not statistically significant. But the difference between the different stages of CKD was statistically significant with respect to urea levels, creatinine levels, sodium, calcium, phosphorus and hemoglobin levels [Table 5].

Table 1: Sociodemographic details of the study participants

	Categories	Frequency	Percentage
Age groups	0-18 years	11	2.6
	19-30 years	32	7.6
	31-50 years	162	38.3
	51-70 years	191	45.2
	71-90 years	21	5.0
	More than 90 years	1	.2
Gender	Female	160	37.8
	Male	263	62.2
Education	Illiterate	194	45.9
	Primary education	135	31.9
	Highschool education	64	15.1
	Above high school	25	5.9
Occupation	Farmer	197	46.6
	Labour/ Daily wages	138	32.6
	Driver	65	15.4
	Skilled worker	18	4.3
	Unemployed	5	1.2
Economic status	BPL	328	77.5
	APL	90	21.3
Area of residence	Rural	328	77.5
	Urban	90	21.3

Table 2: Frequencies of the study participants with respect to different etiological factors of CKD

	Categories	Frequency	Percentage
Dehydration	Yes	327	77.3
	No	91	21.5
Tobacco habit	Yes	290	68.6
	No	128	30.3
Alcohol habit	Yes	311	73.5

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	No	107	25.3
Exposure to pesticide	Yes	328	77.5
	No	90	21.3
Analgesic use	Yes	273	64.5
	No	145	34.3
Hypertension	Yes	106	25.1
	No	312	73.8
Duration of Hypertension	2 Years	5	1.2
	3 Years	16	3.8
	4 Years	30	7.1
	5 Years	25	5.9
	6 Years	17	4.0
	7 Years	8	1.9
	8 Years	4	.9
	9 Years	2	.5
Diabetes mellites	Yes	70	16.5
	No	348	82.3
Duration of Diabetes Mellitus	2 Years	5	1.2
	3 Years	13	3.1
	4 Years	23	5.4
	5 Years	17	4.0
	6 Years	7	1.7
	7 Years	1	.2
	8 Years	5	1.2
Kidney size on USG	Small	96	22.7
	Normal	318	75.2
	Enlarged	4	.9
CKD staging	CKD-1	4	.9
	CKD-2	25	5.9
	CKD-3A	56	13.2
	CKD-3B	92	21.7
	CKD-4	89	21.0
	CKD-5	98	23.2
	CKD-6D	54	12.8
Presumed aetiology	CGN	192	45.4
	CIN	226	53.4

Table 3: Detailed frequencies of different investigations of the study participants

	Categories	Frequency	Percentage
Urea	<20 mg/dL	4	.9
	21-50mg/dL	25	5.9
	51-100 mg/dL	181	42.8
	>100 mg/dL	208	49.2
Creatiniine	Less than 4 mg/dL	126	29.8
	More than 4 mg/dL	292	69.0
Sodium	less than 135 mEq/L	19	4.5
	135-145 mEq/L	399	94.3
Potassium	1.5-5.5 1.5 mEq/L	262	61.9
	More than 5.51.5 mEq/L	156	36.9
Calcium	Less than 8.5	255	60.3
	Normal	163	38.5
Phosphorous	Less than 3.4mg/dL	21	5.0
	Normal range	135	31.9
	More than 4.5 mg/dL	262	61.9
Systolic BP	100to140 mmHg	183	43.3
	More than 140 mmHg	235	55.6
Diastolic BP	60 to 100 mmHg	417	98.6
	More than 100 mmHg	1	.2
Spot PC Ratio	Less than 20	418	100
eGFR	Less than 60	389	92.0
	More than 60	29	6.9
Anaemia	Anaemic	412	97.4
	Normal	6	1.4

Table 4: Association of different sociodemographic parameters with Stages of CKD

Categories	Groups	Stage of CKD							P value
		CKD-1	CKD-2	CKD-3A	CKD-3B	CKD-4	CKD-5	CKD-6D	
Age grouping	0-18 years	0	0	1	3	2	4	1	0.877
	19-30 years	0	3	4	12	4	6	3	
	31-50 years	1	13	18	36	35	38	21	
	51-70 years	3	8	27	36	44	46	27	
	71-90 years	0	1	6	4	4	4	2	
	More than 90 years	0	0	0	1	0	0	0	

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Total Monthly family income	BPL	4	19	44	70	68	77	46	0.788
	APL	0	6	12	22	21	21	8	
Gender	F	1	11	18	35	29	41	20	0.8778
	M	3	14	38	57	59	57	34	
Education	Illiterate	1	9	24	39	44	51	26	0.170
	Primary education	3	9	20	33	22	33	15	
	Highschool education	0	6	5	13	20	12	8	
	Above highschool	0	1	7	7	3	2	5	
Occupation	Farmer	1	7	26	40	47	51	25	0.346
	Labour/ Daily wages	2	11	21	36	21	31	16	
	Driver	1	6	6	11	19	14	8	
	Skilled worker	0	1	3	5	2	2	5	
Residence	Rural	4	19	44	70	68	77	46	0.788
	Urban	0	6	12	22	21	21	8	

**Table 5: Association of different etiologic factors and investigations with Stages of CKD **

Categories	**Groups**	**Stage of CKD**							**P value**
		CKD-1	CKD-2	CKD-3A	CKD-3B	CKD-4	CKD-5	CKD-5D	
Heat and dehydration	Yes	4	19	43	70	68	77	46	0.877
	No	0	6	13	22	21	21	8	
Tobacco	Yes	3	19	38	64	60	68	38	0.991
	No	1	6	18	28	29	30	16	
Alcohol	Yes	4	19	41	66	66	73	42	0.908
	Yes	0	6	15	26	23	25	12	
Pesticides	Yes	4	19	44	70	68	77	46	0.788
	No	0	6	12	22	21	21	8	
Analgesic use	Yes	2	16	38	60	50	64	43	0.188
	No	2	9	18	32	39	34	11	
Hypertension	Yes	1	6	16	23	20	27	13	0.985
	No	3	19	40	69	69	71	41	
Duration of Hypertension	2 Years	0	0	1	0	1	3	0	0.674
	3 Years	0	1	3	3	1	6	2	
	4 Years	0	3	3	5	4	9	6	
	5 Years	1	2	2	7	8	3	2	
	6 Years	0	0	6	3	2	4	2	
	7 Years	0	0	1	1	4	1	1	
	8 Years	0	0	1	3	0	0	0	
	9 Years	0	0	0	1	0	1	0	
Diabetes Mellitus	Yes	1	2	12	19	16	13	7	0.549
	No	3	23	44	73	73	85	47	
Duration of DM	2 Years	0	0	1	2	0	2	0	0.229
	3 Years	0	2	2	4	3	2	0	
	4 Years	0	0	6	4	5	7	1	
	5 Years	0	0	1	6	5	2	3	
	6 Years	1	0	0	3	1	0	2	
	7 Years	0	0	1	0	0	0	0	
	8 Years	0	0	1	1	2	0	1	
CLD	Yes	0	4	5	16	24	16	10	0.165
	No	4	21	51	76	65	82	44	
IHD	Yes	1	5	9	14	15	19	10	0.986
	No	3	20	47	78	74	79	44	
Urea	<20 mg/dL	4	0	0	0	0	0	0	<0.001
	21-50mg/dL	0	16	9	0	0	0	0	
	51-100 mg/dL	0	9	47	85	28	0	12	
	>100 mg/dL	0	0	0	7	61	98	42	
Creatinine	Less than 4 mg/dL	4	25	56	41	0	0	0	<0.001
	More than 4 mg/dL	0	0	0	51	89	98	54	
S. Sodium	less than 135 mEq/L	0	5	5	5	0	0	4	<0.001
	135-145 mEq/L	4	20	51	87	89	98	50	
S. Potassium	1.5-5.5 1.5 mEq/L	4	19	38	58	51	58	34	0.366
	More than 5.51.5 mEq/L	0	6	18	34	38	40	20	
Systolic BP	100to140 mmHG	4	19	46	30	42	29	13	<0.001
	More than 140 mmHG	0	6	10	62	47	69	41	
Diastolic BP	60 to 100 mmHg	4	25	56	92	88	98	54	0.716
	More than 100 mmHg	0	0	0	0	1	0	0	
Spot PCR	Less than 20	4	25	56	92	89	98	54	
Hemoglobin	Anaemic	1	22	56	92	89	98	54	<0.001
	Normal	3	3	0	0	0	0	0	
Calcium	Less than 8.5	0	0	0	58	45	98	54	<0.001
	Normal	4	25	56	34	44	0	0	

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Phosphorous	Less than 3.4mg/dL	2	7	12	0	0	0	0	<0.001
	Normal range	2	14	28	26	45	12	8	
	More than 4.5 mg/dL	0	4	16	66	44	86	46	

DISCUSSION

The public and medical community have been deeply concerned over the past 20 years about the high prevalence of CKD in the Kalyan Karnataka region. In order to ascertain the prevalence of CKD and related risk factors among the people of Raichur district, we did this study. This abnormally high incidence of CKD in a particular population subgroup is highly important and indicates that CKD is on the rise in this area.

According to estimates of serum creatinine, the prevalence of CKD in the south zone of New Delhi5 was found to be 0.79 percent, whereas the prevalence of reduced Modification of Diet in Renal Disease-GFR was 4.2% in the north Indian population[6]. Another study conducted in rural south India indicated that CKD prevalence was 6.3% and that reduced Modification of Diet in Renal Disease-GFR prevalence was 4.35%.[7]

According to population-based research, reduced GFR was more common than normal in Europe 8,9 and the United States,[10,11] (4.5% to 7.7%)in other studies. The prevalence of CKD in Raichur is at least three to four times higher than any of the research cited earlier reported. There have been reports of a number of CKD epidemics around the world, some of which have recognized etiologies and others whose causes are yet unknown. According to reports, CKD is a serious public health issue that has a substantial death rate in Nicaragua, El Salvador, and Sri Lanka. These countries are known as CKD hotspots. Between 13% and 18% of people in these 3 locations had CKD,[12,13]

It's interesting to note that Raichur has the same prevalence of CKD as any other hotspot identified from a different geographic focus. In our study population, the prevalence of diabetes was found to be 16.75% among the participants studied, which is in contrast to earlier Indian studies in rural communities, where the prevalence was reported to be between 6% and 7%. This might be due to the samples collected are of CKD and Diabetes is an important common cause. In comparison to data from the Indian CKD registry, where diabetic nephropathy was the leading cause of CKD in 31% of patients, our study found only 6% prevalence of diabetic kidney disease.

Some of these patients may have had nondiabetic kidney disease, and stricter diagnostic standards for diabetic nephropathy may have further lowered the prevalence of diabetic kidney disease. Only 9% of our patients exhibited significant proteinuria (PCR >1), showing that tubulo-interstitial illness rather than diabetic nephropathy was the primary cause of CKD in the majority of individuals with diabetes.

25.4% of the subjects had hypertension, and 82.3% of them reported having had it in the past, showing that many of them were aware of their hypertensive condition. In our study, long-standing hypertension affected 27.6% of all hypertensive patients, but it affected just 13.6% of individuals with chronic renal disease. These findings show that the two typical etiological elements were conspicuously lacking in a significant portion of CKD patients.

Dipstick-positive proteinuria has been utilized as a diagnostic indicator for chronic renal disease in numerous Indian research. In these investigations, the prevalence of proteinuria ranged from 0.5% to 4.4%.[5,6,14]

In studies of Meso-American nephropathy and Sri Lankan CKD, the prevalence of CKD varied conspicuously with age and occupation, such as agricultural works, sugarcane cutting, and mining, which are considered as heat stress occupations,[12]

Similarly, we found the influence of occupation on the prevalence of CKD in Raichur. CKD prevalence also varied with altitude and climatic conditions,[14]

Raichur had a comparatively high frequency of CKD. In our study, 294 (73%) patients with CKD had PCR 1 but neither diabetes nor chronic high blood pressure. To the best of our knowledge, no other regions of India have documented cases of this form of CKD with an unknown etiology, which is startlingly prevalent in the Raichur region. Cross-sectional studies from Nicaragua and Sri Lanka found that patients with CKD had a prevalence of more than 50% CKD,[15,16]

The analysis of our data revealed no evidence of a connection between CKD in Raichur and gender disparity, education, farming, exposure to pesticides, or behavioral patterns such tobacco use or alcohol consumption. Our results strongly suggest that men and women are equally exposed to unidentified factors that increase their risk of developing CKD. The pathophysiology of CKD is highly supported by the moderate disease progression, limited urine protein, and lack of persistent hypertension or diabetes.

The study has a few restrictions. It was based on a single serum creatinine measurement for every person and an estimation of GFR rather than a direct measurement. Nevertheless, the high prevalence of low eGFR in a single spot determination is remarkable given that this is a sizable population-based study in a particular geographical location. Early CKD stages I and II kidney biopsy tests would have likely assisted in determining the causes of CKD.

CONCLUSION

In conclusion, this study offers proof that CKD is a real public health risk in Raichur. The need to look for new etiological factors is emphasized by the lack of a significant correlation between CKD and

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established risk factors. To identify etiological causes and put preventive measures in place, extensive research is needed given the considerable impact of CKD in this area.

Chronic Kidney Disease is a multifaceted condition with a diverse clinical profile and numerous underlying etiologies. In a tertiary care centre in Karnataka, the clinical presentation of CKD is likely to encompass a range of symptoms, including hypertension, proteinuria, reduced GFR, anaemia, and metabolic disturbances. The etiology of CKD in Karnataka is complex, influenced by factors such as diabetes, hypertension, infections, environmental factors, genetics, medications, toxins, and lifestyle choices.

To combat the rising burden of CKD, comprehensive strategies must be implemented, including early detection, management of underlying conditions, lifestyle modifications, and public health interventions to address environmental and genetic factors. Furthermore, ongoing research is essential to better understand the specific regional determinants of CKD and tailor prevention and treatment approaches accordingly.

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