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SM Journal of Nephrology and Kidney Diseases

Research Article

Clinical Profile of Chronic Kidney Disease Patients in a Tertiary Care Hospital-An Observational Study

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Article Information

Received date: Sep 12, 2018
Accepted date: Sep 26, 2018
Published date: Sep 28, 2018

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Keywords End stage renal disease (ESRD); Chronic Kidney Disease (CKD); Glomerular filtration rate; Cardiovascular disease

Article DOI 10.36876/smjnkd.1016

Abstract

Introduction: The prevalence of chronic kidney disease (CKD) is estimated to be 12 times the cases of end stage renal disease (ESRD). CKD in earlier stages is generally asymptomatic. Early interventions delay the progression to ESRD and reduce morbidity and mortality.

Aims and objectives: To study the clinical profile of chronic kidney disease in a tertiary care hospital and determines the aetiology of chronic kidney disease and assess comorbidities.

Materials and methods: In a descriptive study, 130 consecutive patients of chronic kidney disease who attended or was admitted in a tertiary care hospital over 1 year. All patients were evaluated in detail and an aetiological diagnosis was made on each patient.

Results: 76.1% of the patients were males and rest were females with sex ratio of 3.2:1. Age of patients varied between 14 and 82 years of age, with mean age of 55.80 ±13.49 years. 28.5 % of all patients had Cardiovascular Diseases (CVD) and cerebrovascular accident was present in 5.4% of the patients. The most common symptom in patients from this study group was pedal oedema (59.2%), followed by anorexia (53.1%), breathlessness (30.7%), nocturia (27.7%), and weakness (25.4%). Only 3.1% patients had hyperphosphatemia.

Conclusion: The assessment of clinical profile of these patients showed the most common aetiology as diabetes mellitus (36.9%). Hypertension being a cause and a complication of CKD was present in 64.6% of patients. Early detection and effective management of these illnesses can delay the onset, progression of CKD and subsequent morbidity and the requirement of renal replacement therapy, if any.

Introduction

Chronic kidney disease (CKD), a continuum of kidney disease ranging from mild kidney damage to end-stage renal disease (ESRD) is a major public health problem worldwide associated with increased morbidity and mortality. The definition of chronic kidney disease as per National Kidney Foundation (NKF) Kidney Disease Outcome Quality Initiative (K/DOQI), [1] is

1. Kidney damage for > 3 months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifest by either Pathologic abnormalities; or markers of kidney damage, including abnormalities in the composition of the blood or urine, or abnormalities in imaging tests.
2. GFR <60 ml/min/1.73m^2 for >3 months, with or without kidney damage.

To facilitate assessment of CKD severity, the National Kidney Foundation

(NKF K/DOQI) developed criteria to stratify CKD patients: [1]

Stage 1: eGFR > 90 mL/min per 1.73 m^2 and persistent albuminuria

Stage 2: eGFR between 60 to 89 mL/min per 1.73 m^2

Stage 3: eGFR between 30 to 59 mL/min per 1.73 m^2

Stage 4: eGFR between 15 to 29 mL/min per 1.73 m^2

Stage 5: eGFR < 15 mL/min per 1.73 m^2 or end-stage renal diseases.

The global incidence of End Stage Renal Disease (ESRD) is increasing at an annual growth rate of 8% [2] while in India almost 100000 new ESRD patients are added every year [3].

Improvements in techniques of dialysis and availability of renal transplantation have improved survival and quality of life for patients of ESRD. The 5 year survival rate for patients on hemodialysis is 30-50 % in nondiabetics and 25% in diabetics, while the 5 year survival rate for living donor transplantation is 81% [4].

OPEN ACCESS
ISSN: 2576-5450

The prevalence of CKD is estimated to be 12 times the cases of ESRD [5]. A community based study done in Delhi has shown that there were approximately 7850 patients per million populations in India with established chronic kidney disease not requiring RRT [6]. The resources and skill for taking care of this large case load, both in terms of personal and health care infrastructure do not exist currently in the country. The problem is worse in Indian scenario due to a significant rise in diabetes, a major illness implicated in aetiology of CKD. According to the first annual report published by the CKD registry of India involving 13,151 patients, diabetes and hypertension were major causes of CKD in India accounting for 28.5% and 16.2% respectively [6]. It is clear that treatment of chronic kidney disease and its advanced stage end stage renal disease is expensive and beyond the reach of average Indian. To tackle the problem of limited access to renal replacement therapy, an important method would be to try and reduce the incidence of end stage renal disease and the need of renal replacement therapy by preventive measures.

CKD in earlier stages is generally asymptomatic. Clinical manifestations of CKD start appearing only from stage 3 onwards. It is, therefore, prudent to detect and initiate interventions early in CKD thereby delaying the progression to ESRD and reducing morbidity and mortality. Patients with CKD are at high risk for Cardiovascular Disease (CVD) and cerebrovascular disease, and they are more likely to die of CVD than to develop end-stage renal failure [7]. There is paucity of Indian studies depicting clinical profile of CKD. Hence the present study was undertaken to study the clinical profile of CKD at a tertiary care hospital.

Material and Methods

1. In a descriptive study, 130 consecutive patients of chronic kidney disease who attended or were admitted in a tertiary care hospital were studied from 01 Jan 2017 to 31 Dec 2017.
2. The study sample was taken from the clientele of the hospital which included armed forces personnel, ex-servicemen and their dependents.
3. CKD was defined as kidney damage >= 3 months with eGFR <60 ml/min/1.73 m^2 and or structural or functional abnormalities in pathology, imaging, urine analysis, blood composition indicating abnormal kidney function.
4. Inclusion criteria included:

   (a) GFR <60 ml/min/1.73 m^2 on the basis of estimated GFR using the Modification of Diet in Renal Disease (MDRD) formula (CKD stages 3 to 5)

   (b) Serum creatinine >2.0 mg/dl

   (c) Age above12 years.

   (d) Those giving informed consent for participation in the study.
5. All the patients who have already undergone renal transplants were excluded.
6. All the patients were distributed as per the GFR that was calculated by MDRD equation.

MDRD equation: 186.3 × (serum creatinine) -1.154 × age -0.203 × (0.742 for women) × (1.212 if black).

7. The case history was recorded on a pro-forma. Data on age, sex, education, occupation, and lifestyle factors, tobacco usage (chewed), smoking and alcohol consumption were collected from all subjects. Detailed medical histories were obtained regarding present complaints. All subjects were also interviewed regarding past history of diabetes, hypertension and other co-morbid conditions
8. All patients underwent the following investigations

   (a) Urine: albumin by dipstick method.

   - Sugar
   - Microscopy
   - 24 hour urinary protein (g/day)

   (b) Serological investigations:

	Method	Normal Value
Blood urea	Nesslerization	15-45 mg/dl
Serum creatinine	Jaffe's	0.8-1.2 mg/dl
Serum electrolytes	Flame photometry	Na^+ 133-145
		K^+ 3.5-5.5 mEq/L
Serum proteins	Biusel method	6-8 mg/dl
Serum albumin	BCG dye method	3-4 mg/dl
Serum calcium	Bacon cell method	8.5-10.5 mg/dl
Serum phosphorus	King Wooton	3-5 mg/dl
Serum alkaline phosphatase	King Armstrong	33-96 U/l
Blood sugar levels	Glucose oxidase	80-110 mg/dl

   Serum calcium was corrected by using formula:

   Measured serum calcium + (4.0-measured serum albumin) x 0.8.

9. An aetiological diagnosis was made on each patient even though it could not be confirmed by histopathology.
10. Statistical analysis

The data thus obtained was analyzed using statistical methods in which quantitative variables were summarized using mean and standard deviation while categorical variables were tabulated using frequencies and percentages. Appropriate statistical tests viz. Analysis of variance (ANOVA), Student`s `t` test were applied and *p* value of less than 0.05 was considered significant.

Results

130 consecutive patients of chronic kidney disease were taken up for the study. The mean age of all patients studied was 55.80±13.49 years. The maximum patients belonged to 60-69 years age group (39.2%). Age wise distribution of cases in study group is shown in Table 1 (Figure 1).

In this study, 76.2% of the patients were male with a Male: female ratio being 3.19:1 (Table 2, Figure 2).

Citation: Jha VK and Shashibhushan. Clinical Profile of Chronic Kidney Disease Patients in a Tertiary Care Hospital-An Observational Study. J Nephrol Kidney Dis. 2018; 2(2): 1016.
https://dx.doi.org/10.36876/smjnkd.1016

Table 1: Age-wise distribution of the cases of CKD.

Age (years)	No	Percentage
<20	3	2.30%
20-29	5	3.80%
30-39	9	6.90%
40-49	15	11.50%
50-59	34	26.20%
60-69	51	39.20%
70-79	12	9.20%
80-89	1	0.80%
Total	130	100%

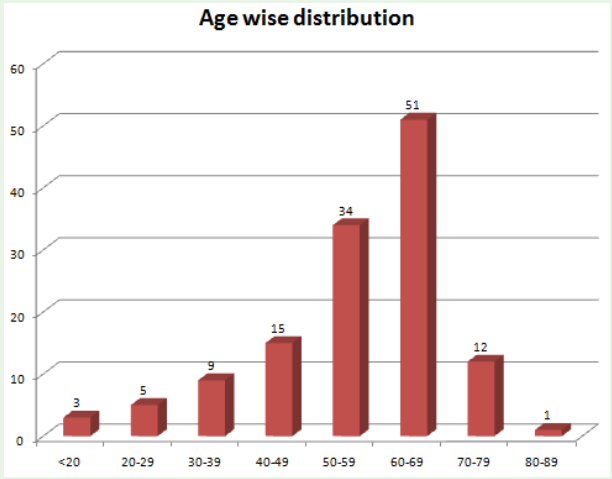

Figure 1: Age wise distribution of CKD cases.

Table 2: Gender distribution of CKD patients.

Gender	N	Percentage
Male	99	76.20%
Female	31	23.80%
Mean age at presentation	55.80±13.49 yrs	

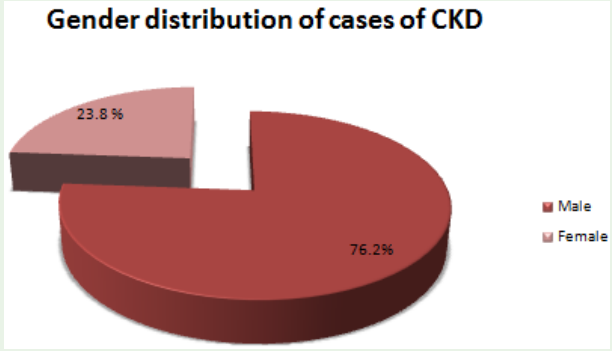

Figure 2: Gender distribution of CKD patients.

All the patients of CKD were distributed as per the MDRD equation in 3 stages. Stage 3 and stage 4 patients together constituted 67.7% of the total cases while stage 5 patients constituted 32.3% (Table 3, Figure 3).

Hypertension and diabetes were the most prevalent comorbidities present in 64.6% and 40.8% of patients respectively while 28.5% patients had associated cardiovascular diseases. The distribution of associated comorbidities in study group is as shown in Table 4 (Figure 4).

Table 3: Distribution of cases as per stage of CKD.

Stage	GFR	N	Percentage
Stage 3	(30-59)ml/min/1.73m^2	40	30.80%
Stage 4	(15-29)ml/min/1.73m^2	48	36.90%
Stage 5	(<15) ml/min/1.73m^2	42	32.30%

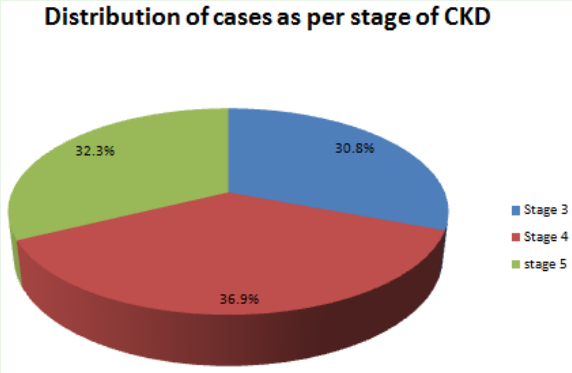

Figure 3: Distribution of cases as per stage of CKD.

Table 4: Pre existing co-morbidities with CKD patients.

Co-morbidities	N	Percentage
Hypertension	84	64.60%
Diabetes	53	40.80%
Cardiovascular diseases	37	28.50%
CVA	7	5.40%
Obstructive uropathy	12	9.20%

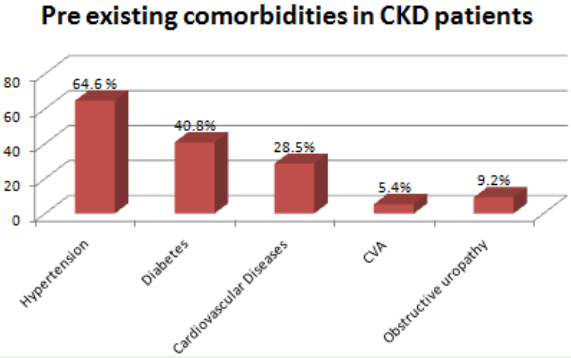

Figure 4: Pre-existing co-morbidities with CKD patients.

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Amongst the study group, the most common aetiology was diabetic nephropathy (n=48, 36.9%) followed by chronic interstitial nephritis. Aetiology wise distribution of cases of chronic kidney disease is shown in Table 5 (Figure 5).

In this study most of the patients presented with pedal oedema (59.2%) followed by anorexia (53.1%), dyspnoea (30.7%). Table 6, Figure 6 shows the symptoms of chronic kidney disease in study population.

The presence of different modifiable risk factors in this study population is depicted in Table 7.

83.1% of patients had hemoglobin less than 12g/dl. Different biochemical parameters in chronic kidney disease are depicted in Table 8.

Amongst 130 patients in study group, 28 patients (21.5%) were on dialysis out of which only 1 patient was on Continuous Ambulatory Peritoneal Dialysis (CAPD). Table 9 shows distribution of renal replacement therapy in the study group Table 10.

(# Kruskal-Wallis One Way Analysis of Variance on Ranks applied).

Table 5: Aetiology of Chronic kidney disease.

Aetiology	N	Percentage
Diabetic Nephropathy	48	36.90%
Chronic Interstitial Nephritis	30	23.10%
Chronic Glomerulonephritis	25	19.20%
Obstructive Uropathy	13	10.00%
Hypertensive nephropathy	6	4.60%
ADPKD	2	1.50%
Renal Artery Stenosis	2	1.50%
Contrast Nephropathy	1	0.80%
Ectopic Kidney	1	0.80%
Drug induced nephropathy	1	0.80%
SLE	1	0.80%

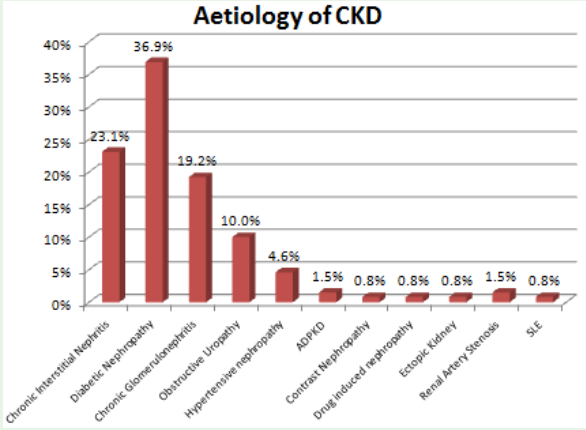

Figure 5: Aetiology of Chronic kidney disease.

Table 6: Symptoms of chronic kidney disease.

Symptom	N	Percentage
Pedal oedema	77	59.20%
Anorexia	69	53.10%
Dyspnoea	40	30.70%
Nocturia	36	27.70%
Weakness	33	25.40%
Weight loss	20	15.40%
Increased frequency	19	14.60%
Urgency	15	11.50%
Hematuria	7	5.40%
Altered sensorium	7	5.40%
Joint pains	5	3.40%
Abdominal pain	2	1.50%

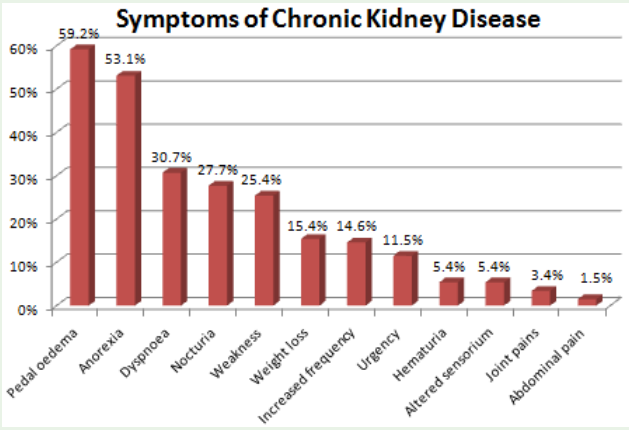

Figure 6: Symptoms of chronic kidney disease.

Table 7: Modifiable risk factors in chronic kidney disease.

	N	Percentage
Smoking	20	15.40%
Alcohol	22	16.90%
Tobacco	11	8.50%

The average level of hemoglobin showed a falling trend with stages of CKD. The standard deviation showed a rising trend from stage 3 to stage 4, indicating more variation in the level of hemoglobin in stage 4 patients. Comparison among the stages of average level of hemoglobin was found to be statistically significant (p=0.0001). The average level of potassium showed a rising trend with the CKD stages and the standard deviation value has gone up (1.09), which indicates more variation in the level of potassium in stage 5 patients. The average level of albumin corrected calcium amongst all CKD stages was found to be equivalent to the normal corrected calcium. There was no statistical significant difference in phosphorus level among stages of CKD (p=0.320). The serum albumin levels showed a falling trend with progressive CKD stages. The comparison of average

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Table 8: Biochemical parameters in chronic kidney disease.

Parameters	N (n=130)	Percentage
Hemoglobin (<12g/dl)	108	83.10%
Urea (>45mg/dl)	117	90%
Potassium (>5.0 mEq/l)	30	23.10%
Corrected Calcium (<8.5 mEq/l)	23	17.70%
Phosphorus (>5.5mEq/l)	4	3.10%
Serum Albumin (<3.5mg/dl)	64	49.20%

Table 9: Distribution of renal replacement therapy in study group.

Renal replacement therapy	No.
Hemodialysis	27
Peritoneal dialysis	1

Table 10: Comparison of biochemical parameters among different CKD stages.

Parameter	Stage 3	Stage 4	Stage 5	`p` value
Hemoglobin (g/dl)	11.1±1.52	10.14± 1.58	8.97±1.09	0.0001
Potassium (mEq/l)	4.17±0.53	4.61±0.59	4.53±1.09	0.009
Corrected Calcium (mg/dl)	8.88±0.87	9.20 ±0.58	8.85±0.59	0.029
Phosphorus (mg/dl)	4.42±0.57	4.20±0.44	4.38±0.61	0.32
Serum albumin (g/dl)	3.86±0.94	3.4±0.40	3.48±0.40	0.005

level of serum albumin among the stages was statistically significant (p=0.005).

Discussion

All the patients enrolled in this study were distributed as per the GFR calculated with the MDRD equation. 76.1% of the patients were males and rest were females with sex ratio of 3.2:1. Age of patients varied between 14 and 82 years of age, with mean age of 55.80 ±13.49 years.

There is a broad variation in age in this study group highlighting the preponderance of chronic kidney disease across a very large age group. The US renal data system 1999 showed that CKD is more prevalent in elderly population, with older age there is structural and functional changes in the kidney leading to reduced renal reserve making the patient more susceptible to minor insults like intervening infections, immunologic processes, exposure to drugs and toxins and fluid and electrolyte imbalances [8].

Out of the 18 studies analysed by the NKF K/DOQI, [1] 17 reported that the male sex was more at risk for CKD and 14 showed that the male sex was associated with a faster rate of progression to end stage renal disease. Agarwal SK, Dash SC et al [9] in their study found 60-70% of the patients were male. One of the main reasons for these differences in the age and gender of subjects is that in India more males visit hospitals than females. It can also be attributed to the fact that in the present study, the population mainly comprised of serving personnel or exservice men. CKD is found less commonly in females due to the effect of estrogen in slowing the progression of disease. In this study an increasingly high number of patients were found to be diabetic (40.76%) and hypertensive (64.6%). This trend is similar to that reported by Dash and Agarwal in the study conducted at the All India Institute of Medical Sciences [9] in which chronic kidney disease caused by hypertension was found in 22% of the cases, though hypertension as such was present in 70.3% of all cases of CKD. Hypertension is both a cause and a complication of chronic kidney disease.

In this study, it was found that 28.5 % of all patients had Cardiovascular Diseases (CVD). Many studies including Framingham Heart study, HOPE, HDFP, MRFIT, HOT showed that increased cardiovascular risk started early in CKD [3] About 1/3rd of patients with mild renal insufficiency were found to have history of CVD which is comparable to the incidence in this study [10]. This multifold increased cardiovascular risk may be related to the primary disease causing chronic kidney disease or it may be related to the presence of one or more risk factors like anemia, dyslipidemia, increased oxidant stress, inflammation, hyperhomocysteinemia, neurohumeral overactivity or activated renin angiotensin system. The antihypertensive and lipid lowering treatment to prevent heart attack trial (ALLHAT) reported that patients with moderate or severe reductions in GFR were more likely to have had a prior myocardial infarction or stroke (28.7%, 76.9%), have ischemic changes on Electrocardiography (ECG) (24.6%, 34.1%) and have left ventricular hypertrophy on ECG (6.0%, 11.2%) [5].

The prevalence of stroke in India is estimated as 203 per 100000 populations above 20 years. V Siva Kumar, P Ramakrishna et al in their study stroke in chronic kidney disease found in 1369 CKD patients, the incidence of stroke was 1.97% [11] while in this study cerebrovascular accident was present in 5.4% of the patients.

Diabetic nephropathy as an etiology of CKD was found in 36.9% of patients in the study group followed by chronic interstitial nephritis seen in 23.1%. Data from study shows a higher incidence of diabetes. This can be justified by rapid rise in detection of diabetic patients in India which has led to WHO declaring India, the diabetic capital of the world. In a study by SC Dash et al, conducted in 33 hospitals comprising 4145 CKD patients , the aetiological pattern seen was diabetes (29.7%) followed by chronic glomerulonephritis (19.3%), hypertension (14%), chronic interstitial nephritis (12.6%), and obstructive uropathy (9.3%) [9]. In a population based study published earlier from the South India, 2028 patients with CKD were assigned a tentative diagnosis and were analyzed (only 23.4% of patients had a biopsy examination). The result showed that chronic interstitial nephritis (27.9%) was the commonest aetiology followed by diabetic nephropathy (26.8%). On re-analysis after excluding diabetic nephropathy and other conditions, where renal biopsy is usually not done such as polycystic kidney disease and obstructive uropathy, interstitial nephritis (46%) remained the predominant cause, while glomerulonephritis (30%) remained second [12].

The most common symptom in patients from this study group was pedal oedema (59.2%), followed by anorexia (53.1%), breathlessness (30.7%), nocturia (27.7%), and weakness (25.4%). In a subgroup in the NHANES III study, patients with decreased GFR the impairment of physical function was not significantly related to the level of kidney function; but physical impairment was 8 times worse than in general population. Anorexia was evidenced by more than half (53.1%) of our patients.

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Anorexia in chronic kidney disease is evidenced by decreased dietary protein intake, a hallmark of CKD. Limitation of protein intake reduces the accumulation of toxic substances derived from the metabolism of protein. Decreased dietary protein intake may be viewed as adaptive in patients with CKD. Thus, the overall outcome of this adaptive procedure may be the increased prevalence of protein energy malnutrition in patients with CKD.

Out of the total 130 patients that were studied, 21.5% patients were on dialysis out of which 28 patients were on hemodialysis. Only 1 patient was on Continuous Ambulatory Peritoneal Dialysis (CAPD). The choice of mode of dialysis was discussed with all patients prior to initiating dialysis. The reason why CAPD as a mode of dialysis was less preferred is most of the patients may be unavailability of assistance for the procedure to be done at home.

While decreased hemoglobin often accompanies chronic kidney disease, there is no quantitative definition of anaemia in chronic kidney disease, since acceptable (normal) Hb levels have not been defined for patients with chronic kidney disease [1]. Lower hemoglobin may result from the loss of erythropoietin synthesis in the kidneys and or the presence of inhibitors of erythropoiesis [13]. The severity of anaemia in chronic kidney disease is related to the duration and extent of kidney failure. Onset and severity of anaemia are related to the levels of GFR; below a GFR of 60 ml/min/1.73m^2, there is a high prevalence of anaemia. It was observed that more number of patients was anaemic as the GFR stage progresses.

In 12 of 22 studies reviewed in NKF K/DOQI, there was an association of haemoglobin and level of GFR at GFR levels < 90ml/min/1.73m^2. The Canadian Multicenter study in a large cohort of patients showed that anaemia was present in 87% of the population below 25 ml/min/1.73m^2. McGonigle RJ et al studied 863 patients for anaemia and found upto 90 % of patients to have haemoglobin less than 10 g/dl [13].

Hyperkalemia was seen in 23.1% of CKD patients in this study. In stage 3 patients, the average level of potassium was 4.18 with a standard deviation of 0.53 which kept on increasing with the CKD stage. The standard deviation of potassium in the stage 5 CKD patients is 1.09 which shows wide variation of level of potassium in this stage. Hyperkalemia may develop earlier in the course of CKD in patients with hyporeninemic aldosteronism, a complication seen usually with diabetic nephropathy or tubulointerstitial disease. Hyperkalemia may occur in association with dietary indiscretion (e.g. excessive consumption of chocolates, dry fruits, bananas), increased catabolism (as with severe intercurrent illness), or metabolic acidosis. It may also be seen with the use of potassium sparing diuretics, Angiotensin-Converting Enzyme (ACE) inhibitors.

Hypocalcemia is a known entity in patients with chronic kidney disease and current study showed the incidence at 17.7% of albumin corrected total calcium. This can be explained on the basis of use of calcium supplements and activated vitamin D from the early stages of CKD.

This study showed only 3.1% patients to have hyperphosphatemia. This can be explained by limited dietary phosphate intake and use of phosphate binders in patients amongst the study group.

The serum albumin levels were decreased in 49 % of patients and this is consistent with known studies like Koppel et al-Modification of diet in renal disease (MDRD study group). Using data from the US Renal Data System maintained by the Health Care Financing Administration, a recent study documented the high frequency of hypoalbuminemia in patients entering dialysis. In the studies reviewed by NKF K/DOQI, [1] serum albumin is lower at levels of GFR below 60 ml/min/1.73m^2, indicating a decline in circulating protein levels of serum protein concentrations, protein losses of inflammation.

Conclusion

The study involved 130 patients of chronic kidney disease attending a tertiary care hospital. The assessment of clinical profile of these patients showed the most common aetiology as diabetes mellitus (36.9%). Hypertension being a cause and a complication of CKD was present in 64.6% of patients. Early detection and effective management of these illnesses can delay the onset, progression of CKD and subsequent morbidity and the requirement of renal replacement therapy, if any. Another manageable condition obstructive uropathy found in 10% of these patients, if treated at an early stage prevents progression to irreversible kidney damage.

Cardiovascular diseases as a morbidity was identified in 28.5 % patients. Being the leading cause of mortality in CKD it would be imperative to monitor patients for this morbidity.

Other complications like anemia, hypoalbuminemia, hyperkalemia were present in significant numbers emphasising the need for the detection and correction of these complications.

Limitations

Prospective observational study and limited sample size.

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