Original Research Article

Clinical and epidemiological profile of chronic kidney disease patients in a tertiary care referral centre in South India

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ABSTRACT

Background: The clinical course of CKD (chronic kidney disease) is typically a progressive loss of nephron function ultimately leading to end stage renal disease (ESRD) requiring some form of renal replacement therapy. As this puts a significant burden on global resources, planning for prevention of CKD by early identification of kidney damage by identifying and screening high-risk individuals is the most practical solution. Aim: To study the clinico-epidemiological profile of newly diagnosed cases of CKD.
Methods: This study was conducted between January 2008 and June 2008 at a Government tertiary referral institution in South India. All newly diagnosed cases of CKD based on the National Kidney foundation definition were included in this study.
Results: Of the total 333 patients included in the study, 217 (65%) were males and 116 (35%) were females. Majority (275, 82.59%) of the patients were between 21-60 years of age. Chronic glomerulonephritis was by far the most common etiological diagnosis (51%) followed by diabetic nephropathy (22%) and hypertensive nephrosclerosis (7%). About 24% had diabetes mellitus while 84% of the patients had hypertension. Dyspnea (75.68%), symptoms suggestive of volume overload in 242 (72.7%) and Oliguria (69%) were the chief presenting complaint. An overwhelming majority of the patients in the study presented in stage 5 CKD (264, 79.2%). 167 (50.15%) patients were found to have some form of cardiovascular disease. Cigarette smoking was prevalent in 32.7%, alcohol consumption in 6.91%, NSAID use in 5.1% and herbominerals in 4.5%. The mean hemoglobin in the study was 8.42 g/dl. Mean phosphate level in the study was 5.94 mg/dl. There was significant statistical correlation between hemoglobin level and stage of CKD and also between serum phosphate level and stage of CKD.
Conclusions: Early detection of CKD by screening of high risk individuals will go a long way in retarding the progression of ESRD. This will help in bringing down the huge burden due to mismatch between demand and availability of resources for renal replacement therapy in developing countries like India, especially for patients belonging to lower socioeconomic group.

Keywords: CKD, Clinical profile, Epidemiological profile, ESRD, Etiology of CKD, Risk factors

INTRODUCTION

Chronic kidney disease (CKD) is defined as abnormalities of kidney structure or function, present for>3 months, with implications for health. Kidney damage refers to a broad range of abnormalities observed during clinical assessment, which may be insensitive and non-specific for the cause of disease but may precede

reduction in kidney function. Markers of kidney damage are albuminuria (>30 mg/24 hours), urine sediment abnormalities, tubular disorders resulting in electrolyte abnormalities, abnormalities detected by histology, structural abnormalities detected by imaging or history of kidney transplantation. GFR (glomerular filtration rate) is generally accepted as the best overall index of kidney function. Decreased GFR implies a GFR<60 ml/min/1.73 m2.[1]

CKD is classified based on cause, GFR category, and albuminuria category. The cause of CKD is assigned based on presence or absence of underlying systemic diseases and location of known or presumed pathologic abnormalities (glomerular, tubule-interstitial, vascular or cystic and congenital diseases).[1]

GFR category is assigned as G1 (>90ml/min/1.73m^2), G2 (60-89ml/min/1.73m^2), G3a (45-59ml/min/1.73m^2), G3b (30-44ml/min/1.73m^2), G4 (15-29ml/min/1.73m^2) and G5 (<15 ml/min/1.73m^2). Albuminuria categories are A1 (<30mg/24hr), A2 (30-300mg/24hr) and A3 (>300mg/24hr).[1]

The clinical course is typically a progressive loss of nephron function ultimately leading to end stage renal disease (ESRD) characterized by hypertension, anemia, renal bone disease, nutritional impairment, neuropathy, impaired quality of life and reduced life expectancy ultimately needing some form of renal replacement therapy. This puts a substantial burden on global health resources since all modalities of treatment are expensive. In a developing country like India only 3% to 5% of all patients with ESRD get some form of renal replacement therapy[2]. Hence planning for prevention of CKD based on screening and identification of the at-risk population is the only practical solution possible for India.

Aims and objectives: To study the clinico-epidemiological profile of patients presenting for the first time with chronic kidney disease.

METHODS

This study was conducted between January 2008 and June 2008 for a period of six months at a Government tertiary referral institution in south India. During this period, all newly diagnosed cases of chronic kidney disease based on the National Kidney foundation definition were included in this study.[1] All the patients were evaluated based on detailed history taking, clinical examination and laboratory investigations after an informed consent was obtained from them. Staging of CKD was done based on the National Kidney Foundation (NKF/KDOQI) staging system.[1] GFR was estimated using the abbreviated MDRD (modification of diet in renal disease) formula.[3]

RESULTS

Of the total 333 patients included in the study, 217 (65%) were males and 116 (35%) were females. Majority (275, 82.59%) of the patients were between 21-60 years of age (Table 1). 86.48% of the patients belonged to low socioeconomic status with a family income of <Rs 5000/- per month.

Table 1: Age and sex distribution of the study population.

Age group (years)	Total	%	Male	Female
<20	22	6.61	11 (3.3%)	11 (3.3 %)
21-40	117	35.14	63 (18.9%)	54 (16.2%)
41-60	158	47.45	119 (35.73%)	39 (11.71%)
>60	36	10.81	24 (7.2%)	12 (3.6%)
Total	333	100	217 (65%)	116 (35%)

Table 2: Etiological diagnosis.

Diagnosis	Total	%	Male	Female
CGN	170	51.05	110 (33.03%)	60 (18.01%)
Diabetic nephropathy	73	21.92	47 (14.11%)	26 (7.8%)
Hypertensive nephropathy	26	7.81	19 (5.7%)	7 (2.1%)
Tubulointestitial disease	16	4.80	10 (3.00%)	6 (1.8%)
ADPKD	8	2.40	6 (1.8%)	2 (0.60%)
Obstructive uropathy	4	1.20	4 (1.2%)	0 (0%)
miscellaneous	3	0.90	1 (0.30%)	2 ((0.6%)
Unknown	33	9.91	20 (6%)	13 (3.9%)
	333	100.00	217 (65.16%)	116 (34.34%)

Chronic glomerulonephritis was by far the most common etiological diagnosis (51%) followed by diabetic nephropathy (22%), hypertensive nephrosclerosis (7%) and chronic tubulointestitial disease (4%) (Table 2).

24% had diabetes mellitus while 84% of the patients had hypertension (Table 3 and 4). Dyspnea (75.68%), symptoms suggestive of volume overload in 242 (72.7%) and oliguria (69%) were the chief presenting complaints (Table 5).

Table 3: Age-wise distribution and duration of diabetes mellitus.

Age group (years)	Number	Duration of diabetes mellitus (years)	Number
<20	0	<5	19 (5.7%)
21-40	6	5-10	32 (9.6%)
41-60	58	11-15	17 (5.10%)
>60	16	16-20	9 (2.7%)
Total	80 (24.02%)	>20	3 (0.90%)

Table 4: Age-wise distribution and duration of hypertension in CKD.

Age group (years)	Number	Duration of diabetes mellitus (years)	Number
<20	14	<5	226 (80.14%)
21-40	103	5-10	38 (13.4%)
41-60	137	11-15	15 (5.3%)
>60	28	>15	3 (1.06%)
Total	282 (84.68%)		282 (100%)

Table 5: Presenting symptoms.

Presenting complaint	Number	%
Dyspnea	252	75.68
Volume overload	242	72.67
Oliguria	231	69.36
GI symptoms	223	66.97
Neuromuscular	168	50.45
Pruritus	11	3.3

An overwhelming majority of the patients in the study presented in stage 5 CKD (264, 79.2%) (Table 6). The mean GFR in the study, calculated by MDRD formula was 10.81.[3]

167 (50.15%) patients were found to have some form of cardiovascular disease, of which 83.9% had ventricular hypertrophy, 16% had ischemic heart disease and 7% had congestive heart failure (Table 7).

Table 6: CKD stage at presentation.

CKD stage	Number	%	Male	Female
3	9	2.70	5 (1.5%)	4 (1.2%)
4	60	18.02	39 (11.71%)	21 (6.3%)
5	264	79.28	173 (51.9%)	91 (27.32%)
Total	333	100.00	217 (65.16%)	116 (34.83%)

Table 7: Age-wise distribution of cardiovascular disease in CKD.

Age group (years)	Number	%
<20	6	3.59
21-40	53	31.74
41-60	89	53.29
>60	19	11.38
Total	167	100

Family history of diabetes mellitus, hypertension and CKD were present only in a small percentage of tumors (8.71%,12.91%,1.2%). Cigarette smoking was prevalent in 32.7%, alcohol consumption in 6.91%, NSAID use in 5.1% and herbominerals in 4.5% (Table 8).

Table 8: Habits in the study population.

Habit	Number	%
Smoking	109	32.73
Tobacco chewing	23	6.90
Alcohol	20	6.00
NSAID use	17	5.10
Herbominerals	15	4.5

Table 9: Hemoglobin distribution.

Hemoglobin g/dl	Number	%	Male	Female
>11	32	9.61	24 (7.2%)	8 (2.4%)
7-11	216	64.86	141 (42.3%)	75 (22.5%)
<7	85	25.53	52 (15.6%)	33 (9.9%)
Total	333	100.00	217 (65.16%)	116 (34.83%)

The mean hemoglobin in the study was 8.42 g/dl varying within a range of 4g/dl to 16.8 g/dl. Anemia was present in 90.3% and 25.53% had a hemoglobin less than 7g/dl (Table 9 and 10). Mean phosphate level in the study was 5.94 mg/dl varying within a range of 2.8 to 11.9mg/dl. Only 12.91% of the patients had serum phosphate level below the recommended value in CKD of 4.7mg/dl (Table 11 and 12).

Table 10: Stage-wise distribution of hemoglobin levels.

Hemoglobin g/dl	Stage 3	Stage 4	Stage 5
>11	3 (0.9%)	15 (4.5%)	14 (4.2%)
7-11	2 (0.6%)	40 (12.01%)	174 (52.25%)
<7	4 (1.2%)	5 (1.5%)	76 (22.82%)
Total	9 (2.7%)	60 (18.01%)	264 (79.2%)

P <0.0005.

Table 11: Serum phosphate distribution.

Serum phosphate mg/dl	Number	%	Male	Female
>4.7	43	12.91	31 (9.3%)	12 (3.6%)
4.7-6.5	192	57.59	128 (38.43%)	64 (19.21%)
>6.5	98	29.46	58 (17.41%)	40 (12.01%)
Total	333	100.00	217 (65.16%)	116 (34.83%)

Table 12: Stage-wise distribution of serum phosphate levels.

Serum phosphate mg/dl	Stage 3	Stage 4	Stage 5
>4.7	4 (1.2%)	20 (6.00%)	17 (5.10%)
4.7-6.5	5 (1.5%)	27 (8.10%)	160 (48.04%)
<6.5	0 (0%)	13 (3.9%)	87 (26.12%)
Total	9 (2.7%)	60 (18.01%)	264 (79.27%)

P <0.005.

DISCUSSION

Chronic kidney disease represents the entire spectrum of disease that occurs following initiation of kidney damage. National Kidney foundation[2] defined CKD as 1) kidney damage for ≥3 months as defined by structural or functional abnormalities of the kidney, with or without decreased GFR or 2) GFR <60ml/min/1.73m^2 for ≥ 3 months with or without kidney damage. The GFR is considered the best measure of overall kidney function. A GFR <60ml/min/1.73m^2 represents loss of one half or more of adult level normal kidney function. The normal GFR varies according to patient age, sex and body mass index.[3]

Male gender has been recognized as an important factor in the development of CKD.[4,5] In our study, of the 333 patients with CKD, 65.17% were males which was concordant with the CKD registry of India report where males constituted 68% of the total CKD patients and CMC Vellore study where 62% were males, probably reflects the faster decline in GFR in males as compared to females due to hormonal influence.[5-7] Because of the documented age related decline in GFR, the prevalence of CKD increases with age.[8] This was seen in our study too with a majority of patients in the age group of 41-60 years with a mean of 43.81±14.87 years. The mean age in the CKD registry of India report[6] was 48.3±16.6 years and CMC Vellore study was 38.2±14.5 years.

A large majority, 84.38%, of the patients in out study were illiterate of only had primary level education and all patients belonged to the low socioeconomic group with 84.68% having a monthly family income of <Rs 5000/-. Though a relationship between low socioeconomic status and illiteracy has been established in previous related studies, the same cannot be inferred from our study because we mostly cater to patients of low socioeconomic status.[9,10]

Among the etiological factors has a contributing to CKD, chronic glomerulonephritis (CGN) was the most common cause of CKD (51.05%) which was concordant with the CMC Vellore study where CGN was the diagnosis in 70.5%.[7] Diabetic nephropathy (21.92%), hypertensive nephrosclerosis (7.81%) and tubulointestitial disease (4.8%) were the other common causes of CKD in our study. In 9.91% of the cases, etiology was unknown. Thus even with the epidemic of non-communicable diseases like diabetes and hypertension in developing countries, CGN still continues to be the most common cause of CKD.

24.02% of the CKD patients has diabetes mellitus in our study, of which 63.75% had a known duration of <10 years and 23.75%, less than 5 years. In the CKD registry of India report, 40.7% of diabetics had a duration of <10 years and 16.9%, less than 5 years.[6] This emphasizes the importance of checking for the presence of microalbuminuria and proteinuria at the time of diagnosis of type 2 Diabetes mellitus.

In our study, while 84.68% had hypertension, only in 8.41% was CKD due to hypertensive nephrosclerosis. In the CKD registry of India report, 71% had hypertension, but only in 19.8% the cause of CKD was hypertensive nephrosclerosis.[7]

Cigarette smoking was prevalent in 32.73%, alcohol consumption in 6.91%, use of nephrotoxic agents like

NSAIDS in 5.1% and herbominerals in 4.5% which might have contributed to the faster progression of the disease in these patients. This is consistent with the CKD registry of India report, where cigarette smoking was prevalent in 32%, alcohol consumption in 6.4% and NSAID use in 2%.[6] Family history of diabetes (8.71% (hypertension (12.91%) and CKD (1.2%) were present only in a small number of patients.

Dyspnea was the most common symptom (75.68%) followed by symptoms of volume overload in 72.67%, oliguria in 69.36%, gastrointestinal symptoms in 66.97% and neuromuscular symptoms in 50.45%. Thus emphasizing the need for a high index of suspicion even in patients presenting with symptoms related to other systems.

An overwhelming majority (79.28%) of the patients in our study presented with stage 5 CKD. Only 18.03% presented with stage 4 CKD, 2.7% in stage 3 and none in stage 1 or 2. These findings were consistent with the observations made in the CKD registry of India report, where 50.3% presented in stage 5, 24% in stage 4 and 19.1% in stage 3.[6] This reflects the lack of awareness about CKD among the public and the failure of medical practitioners to screen the at risk population and to diagnose CKD at an early stage, which would enable appropriate treatment to be instituted so as to prevent or reduce the rate of progression of CKD.

The mean hemoglobin level in the study was 8.42±2.20g/dl, 90.39% had anemia (cutoff taken as 11g/dl[66]), while 25.53% had a value less than 7g/dl. Prevalence of anemia increased from 66.6% in stage 3 to 94.7% in stage 5 CKD, and this correlation was statistically significant (p<0.0005). These findings were consistent with the CKD registry of India report[6] wherein anemia was present 32.6% of stage 3, 57.5% of stage 4 and 83.2% of stage 5 CKD.

The mean serum phosphate level in the study was 5.91±1.21mg/dl, with only 12.9% of the patients having a value below 4.7mg/dl (recommended value in CKD), while 29.46% had a value of >6.5mg/dl. The percentage of patients with serum phosphate levels more than or equal to 4.7mg/dl increased from 55.5% in stage 3 to 66.67% in stage 4 to 93.55% in stage 5. This correlation was found to be statistically significant.

CKD is said to be an important risk factor in development of cardiovascular disease, with 50.15% of the patients in our study having some form of cardiovascular disease. Left ventricular hypertrophy was the commonest (83.93%) in our study, while in the CKD registry of India report, ischemic heart disease (44.2%) was the commonest followed by left ventricular hypertrophy (31.6%).[6] Cardiovascular diseases are important preventable and potentially treatable co morbidity of early kidney disease.[11] Patients with CKD should be considered in the "highest risk" group for subsequent cardiac events and appropriately managed.[12]

For the treatment of any disease two important factors need to be considered- availability and affordability. As far as India is concerned, there is shortage of nephrologists as well as hemodialysis units and the cost of treatment makes the treatment inaccessible for most. The centre where this study was conducted was a government setup where a live kidney donor transplant programme was functional and routine maintainence hemodialysis facility is absent. In our study 54.65% of the patients were managed conservatively. 45.34% received some form of renal replacement therapy, majority being peritoneal dialysis (75.49%) only 4.5% underwent renal transplant. In the CKD registry study, 76.9% were managed conservatively and among the patients on dialysis, maintainence hemodialysis was the preferred mode of treatment. Only 2.5% of the patients received renal transplant.[6]

CONCLUSION

To execute a change in the management of patients with CKD,medical students, healthcare professionals and established physicians need to be educated about the prevalence and complications of CKD and the importance of early referral to nephrologist. Screening of high risk individuals- those with hypertension, diabetes mellitus, cardiovascular and other risk factors, lifestyle modification, physical exercise, abstinence from smoking will retard the progression to ESRD. This will help in bringing down the huge burden due to mismatch between demand and availability of resources for renal replacement therapy in developing countries like India, especially for patients belonging to lower socioeconomic group.

REFERENCES

1. National Kidney foundation. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation,classification and stratification. AM J Kidney Dis. 2002;39(2suppl1):S18.
2. Mani MK. Prevention of chronic renal failure at the community level. Kidney International. 2003;63:586-9.
3. Levey AS, Greene T, Kusek J, Beck GL; MDRD Study Group. Simplified equation to predict glomerular filtration rate from serum creatinine. J Am Soc Nephrol. 2000;11:155A.
4. Silbiger SR, Neugarten J. The impact of gender on the progression of chronic renal disease. Am J Kidney Dis. 1995;25:515-53.

5. Khalil RA. Sex hormones as potential modulators of vascular function in hypertension. Hypertension. 2005;46:249-54.
6. Rajapurkar MM. 2nd annual report, CKD registry of India, Proceedings of the 38th annual conference of Indian society of Nephrology, 13-15 Dec, 2007, Delhi.
7. Dharan KS, John GT, Neelakantan N. Spectrum of severe chronic kidney disease in India: A clinicopathological study. Natl Med J India. 2006;19:250-2.
8. Lindeman RD, Tobin J, Shock NW. Longitudinal studies on the rate of decline in renal function with age. J Am Geriatr Soc. 1985;33:278-85.
9. Gee GC, Payne-Struges DC. Environmental health disparities: A framework integrating psychosocial and environmental concepts. Environ Health Perspect. 2004;112:1645-53.
10. Volkova N, McClellan W, Klein M. Neighbourhood poverty and racial differences in ESRD incidence. J Am Soc Nephrol. 2008;19:356-64.
11. Foley RN, Parfrey PS. Cardiac disease in chronic uremia: clinical outcomes and risk factors. Adv Ren Replace Ther. 1997;4:234-8.
12. Levey AS, Beto JA, Coronado BE. National Kidney Foundation Task Force on Cardiovascular Disease. Am J Kidney Dis. 1998;32:853-906.