Original Article

An Analysis of Demography and Clinical Spectrum of Chronic Kidney Disease: A Tertiary Hospital-based Study

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Abstract

Background: Chronic kidney disease (CKD) is a condition characterized by a gradual loss of kidney function over a period of time. Patients with CKD stages 1–3 (glomerular filtration rate [GFR] >30 mL/min/1.73 m²) are frequently asymptomatic; absence of symptoms associated with a reduction in GFR; without clinically evident disturbances in water or electrolyte balance or endocrine/metabolic derangements. In general, these disturbances become clinically manifest with CKD stages 4–5 (GFR < 30 mL/min/1. 73 m²).

Aim of the Study: The aim of the study was to analyze the symptoms, signs, and laboratory investigations of patients with CKD.

Materials and Methods: A total of 178 consecutive patients of CKD were included in the study. The presenting clinical symptoms and signs were observed and analyzed. Related laboratory investigations were undertaken and analyzed for the benefit of identifying and correlating with the clinical spectrum of the disease.

Observations Results: A total of 178 consecutive patients of CKD admitted in five medical units of a tertiary teaching hospital of North Kerala state were included in the study. There were 106/72 males (59.55%) and 29/72 females (40.44%). The male to female gender ratio was 1:1.47. Patients belonged to the age group between 18 and 78 years with a mean age of 51.35 ± 2.75 years. 87/178 (48.87%) patients belonged to the age group of 39–58 years. Gastrointestinal tract related symptoms such as anorexia were seen in 76/178 (42.69%), nausea in 52/178 (29.21%), and vomiting in 57/178 (32.02%) patients. Pallor due to anemia was observed in 91/178 (51.12%) patients and hypertension (HTN) (blood pressure >140/90 mmHg) was present in 54/178 (30.33%) patients. Edema was observed in 65/178 (36.51%) patients, left ventricular hypertrophy in 45/72 (25.28%) patients.

Conclusions: Glomerulonephritis, HTN, and diabetes mellitus were the most common risk factors in causing CKD. The most common clinical presentations were anemia, fatigue, anorexia, nausea, vomiting, dyspnea, hiccups, itching, HTN, and edema. As the clinical spectrum of CKD is diverse, further studies are needed to recognize the various presentations of this disease at an early stage in the local population. Early diagnosis and management of these conditions may prevent or delay the progress to end-stage renal disease.

Key words: Chronic kidney disease, Creatinine, Dialysis, Glomerular filtration rate, Renal failure

INTRODUCTION

Chronic kidney disease (CKD) is an important chronic disease prevalent globally especially in Kerala due to an increasing proportion of elderly population and rise in prevalence of chronic non-communicable diseases.[1] Furthermore, the important reason for the increase in CKD is increasing in the incidence of diabetes mellitus (DM) and hypertension (HTN) among these populations.[2] Non-communicable diseases such as DM and HTN have a poor prognosis when associated with CKD. It also increases cardiovascular mortality in several folds.[3,4] The prevalence of CKD including its milder forms globally is about 5–7% and is likely to be more in the developing countries.[3] Undiagnosed and mistreated CKD may progress to end-stage renal disease (ESRD) or renal

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failure necessitating renal transplantation or Dialysis. The prevalence rate in India is not clear because community-based studies designed to detect advanced stages of CKD has shown lower prevalence and screening studies which detect all stages show higher prevalence.[5] Prevalence of DM and HTN is higher in Kerala state.[6] In Kerala hospital records also show a large number of cases on dialysis for renal failure.[7] Hence, it is likely that chronic renal failure is a real burden in the state of Kerala. CKD is gradual in progress and is described in five stages according to the severity depending on the glomerular filtration rate (GFR). The definition of CKD was introduced by de National Kidney Foundation Kidney Disease Improving Global Outcomes (KDOQI) in 2002 and later adopted by the international group KDIGO in 2004.[5] CKD is described as an ailment lasting 3 or more months with either damage of kidney (i.e., albuminuria) or reduced kidney function (i.e., a GFR of <60 mL/min per 1.73 m²) irrespective of the etiology.[8] Kidney damage refers to pathologic abnormalities documented by biopsy or imaging, alterations in urinary sediment or proteinuria (proteinuria/creatinuria >200 mg/g and albuminuria/creatinuria >30 mg/g),[9] CKD in itself is associated with increasing age, high blood pressure (BP), high blood sugar, high three triglycerides, and history of stroke.[10] The most common cause of CKD is DM.[11] CKD has various clinical presentations depending in part on the extent of reduction of kidney mass and quickness of loss of kidney function.[12] CKD is generally unrecognized in the early stages, as there are no particular symptoms.[6] The function of the kidney is assessed in routine clinical practice using serum creatinine (Scr) concentration, blood urea nitrogen level and urine analysis.[13] Accumulating literature evidence shows that these biomarkers are not optimal to detect kidney disease in early stages.[14-16] According to KDIGO CKD has to be diagnosed, classified, and staged by GFR.[17] GFR is very important in clinical practice for diagnosis, management, drug dosing, and assessing the prognosis of CKD in addition to its utility for research and public health.[1,18,19] The earlier stages of CKD are difficult to detect in a community-based study and hence the present study was conducted to observe the end stages of the disease which often remain diagnosed due to accompanying severe health problems.

MATERIALS AND METHODS

A total of 178 consecutive patients of CKD admitted in five medical units of a tertiary teaching hospital of North Kerala state were included in the study. An Ethical Committee Clearance certificate as obtained before commencement of the study. An Ethical Committee cleared consent form was used for the study.

Type of Study
This was a prospective cross-sectional and analytical study.

Duration of Study
This study was from November 2016 to November 2018.

Institute of Study
This study was conducted at the Department of Medicine Kannur Medical College, Kannur, Kerala.

Inclusion Criteria
(1) Patients aged between 18 and 78 were included. (2) Patients with signs and symptoms of uremia for >3 months were included. (3) Patients with raised blood urea and creatinine for >3 months and small kidney sizes on ultrasound examination were included. (4) Patients with who were on dialysis were included.

Exclusion Criteria
(1) Patients below the age of 18 and above 78 years were excluded. (2) Patients on dialysis and having comorbidities such as malignancy and chronic liver diseases were excluded. (3) Patients with chronic obstructive pulmonary disease and heart failure were excluded. Patient's demographic data and baseline clinical data were collected with the help of the questionnaire to include patient's history and physical examination. History and duration of nausea, vomiting, hiccups, anorexia, abdominal pain, diarrhea, headache, dyspnea, puffy face, leg edema, amount of urine passed in 24 h, itching, body aches, fatigue, loss of libido, and amenorrhea were among the symptoms elicited. History of DM, HTN, and renal stones in the past was also noted. The family history of renal failure, DM and HTN were recorded. A detailed physical examination was undertaken in every patient. The pulse, BP, anemia, edema, JVP, pigmentation, leukonychia, scratch marks, Ecchymosis, asterixis, and half and half nails were recorded in particular. Examination of the other systems was carried out in all patients. The gastrointestinal system was examined for abdominal tenderness and visceromegaly. Cardiovascular system was examined for signs of pericarditis, pericardial effusion and left ventricular hypertrophy (LVH). Respiratory system was examined for signs of pleural effusion. Central nervous system was examined for disturbed higher mental functions, involuntary movements, and signs of neuropathies. All patients were subjected to laboratory and radiological investigations. Complete blood count was done for Hb%, total lymphocyte counts, differential leukocyte counts, platelet count, and erythrocyte sedimentation rate. Urine analysis was performed for albumin, glucose, pus cells, red blood cells (RBCs), casts and crystals. Urea, creatinine, sodium, potassium,

chloride, bicarbonate, calcium, phosphorus, uric acid, total proteins, albumin, and alkaline phosphatase were done to assess the degree of renal involvement. Urine creatinine clearance was calculated using Cockcroft-Gault equation. Blood sugar was done to detect undiagnosed DM or to assess the control of diabetes. Spot urine was collected for albumin to creatinine ratio to estimate total 24 h urinary protein excretion. Ultrasound abdomen was done to assess the size of kidneys. Chest X-ray was requested to detect pleural and pericardial effusions and cardiomegaly. X rays of hands were done to detect subperiosteal erosions. In selected patients, ECG and ECHO were done to look for signs of pericarditis, pericardial effusion, LVH, and ischemia. Parathyroid hormone, renal perfusion scans, antinuclear antibodies, anti-double-stranded DNA, and renal biopsies were done when indicated to confirm the underlying cause. All the data were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

A total of 178 consecutive patients of CKD admitted in five medical units of a tertiary teaching hospital of North Kerala state were included in the study. Among the 178 consecutive CKD patients, there were 106/72 males (59.55%) and 72/178 females (40.44%). The male to female gender ratio was 1:1.47. Patients belonged to the age group between 18 and 78 years with a mean age of 51.35 ± 2.75 years. 87/178 (48.87%) patients belonged to the age group of 39–58 years. 55/178 patients belonged to the age group of 18–38 years and 36/178 patients belonged to the age group of 59–78 years [Table 1].

Duration of symptoms among the patients was between 3 and 6 months in 112/178 patients (62.92%), 6–9 months in 42/178 (27.77%) patients, and 9–12 months in 34/178 (19.10%) patients [Table 2].

Gastrointestinal tract related symptoms such as anorexia were seen in 76/178 (42.69%), nausea in 52/178 (29.21%), and vomiting in 57/178 (32.02%) patients. Pallor due to anemia was observed in 91/178 (51.12%) patients, HTN (BP >140/90 mmHg) was present in 54/178 (30.33%) patients. Edema was observed in 65/178 (36.51%) patients, LVH in 45/72 (25.28%) patients. The other common presenting symptoms were fatigability in 46/178 (25.84%), dyspnea in 35/178 (19.66%), headache in 32/178 (17.97%), hiccups in 24 (13.48%), and itching in 21/72 (11.79%) patients [Table 3].

Pallor due to anemia was observed in 111/178 (62.35%) patients, HTN (BP >140/90 mmHg) was present in

Table 1: The age and gender incidence of the study group (n–72)

Age groups (year)	Male – 106 (%)	Female – 72 (%)
18–38	33 (18.05)	22 (12.35)
39–58	56 (31.46)	31 (17.41)
59–78	17 (09.55)	19 (10.67)

Table 2: The duration of symptoms in the study group (n-72)

Duration of symptoms (%)	Male – 106 (%)	Female – 72 (%)
3–6 months–112 (62.92)	71 (39.88)	41 (23.03)
6–09 months–42 (23.59)	24 (13.48)	18 (10.11)
9–12 months–34 (19.10)	21 (11.79)	13 (07.30)

Table 3: The incidence of symptoms in the study group (n-72)

Symptom	Incidence (%)
Anorexia	76 (42.69)
Nausea	52 (29.21)
Body aches/fatigue	46 (32.02)
Vomiting	57 (34.72)
Abdominal pain	40 (22.47)
Headache	32 (17.97)
Hiccups	24 (13.48)
Dyspnea	35 (19.66)
Diarrhea	17 (09.55)
Itching	21 (11.79)
Unconsciousness	09 (05.05)
Fits	07 (03.93)
Restless	19 (10.67)
Leg parasthesia/numbness	10 (05.61)
Tremors	08 (04.49)

54/178 (30.33%) patients. Edema was observed in 65/178 (36.51%) patients, LVH in 45/72 (25.28%) patients [Table 4].

The mean values of raised blood urea were 94 with a range of 40–110 and a standard deviation of 35.24. The mean value of Scr was 14.80 with a range of 8.10–21.30 and a standard deviation of 06.10. Decreased creatinine clearance (mmol/24 h) with its mean value was 4.15 with a range of 2.10–9.20 and a standard deviation of 2.60. The mean value of reduce hemoglobin was 7.0 with a range of 4.25–10.40 and a standard deviation of 2.75. There were 104/178 (58.42%) patients with anemia and pallor. Among these 104 patients, 45/104 (43.26%) had normocytic anemia, 41/104 (39.42%) had microcytic anemia, and the remaining 18/44 (17.30%) patients had macrocytic anemia. Proteinuria and glycosuria were present in all the patients with casts in 155/178 (87.07%) patients. Pus cells were observed on urine examination in 61/178 (34.26%) patients and RBCs in 39/178 (21.91%) patients. The mean value of spot urine albumin to creatinine ratio was 45 mg/gm (± 12.50 SD) [Table 5].

The decrease in the size of the kidney was observed in 18/178 (10.11%) patients. In this study, it was observed that among the etiological factors of CKD, glomerulonephritis was seen in 66/178 (37.07%) patients followed by 59/178 with HTN (33.14%) and diabetic nephropathy in 42/178 (23.59%) patients. Other etiologies were a renal stone disease in 17/178 (09.55%) and polycystic kidney disease in 14/178 (07.86%). The etiology of CKD remains unknown in 16/178 patients (08.98%).

DISCUSSION

CKD is a commonly encountered progressive ailment ultimately terminating in ESRD. Costly renal replacement therapy remains the final treatment option for ESRD patients and not frequently affordable in our country[20,21] setup. In the recent past, many consensus panels and workgroups have suggested promoting a more aggressive approach to the screening and treatment of CKD.[4,22,23]

However, it is difficult to recognize CKD in early stages due to its subtle and broad range of clinical spectrum presentations resulting in late referrals and restricted treatment options. Early recognition and timely treatment would arrest or delays the disease progression and necessity for renal replacement therapy. Among the 178 consecutive CKD patients, there were 106/72 males (59.55%) and 72/178 females (40.44%). The male to female gender ratio was 1:1.47. In the present study, CKD is more common in males and then in females. CKD happens most frequently in 5th and/or decades. In the present study, the patients belonged to the age group between 18 and 78 years with a mean age of 51.35 ± 2.75 years. 87/178 (48.87%) patients belonged to the age group of 39–58 years. 55/178 patients belonged to the age group of 18–38 years and 36/178 patients belonged to the age group of 59–78 years. This finding is in accordance with the studies done in India, Lahore, Karachi, 17 18 USA and China.[24-26] In this study, it was observed that among the etiological factors of CKD, glomerulonephritis was seen in 66/178 (37.07%) patients followed by 59/178 with HTN (33.14%) and diabetic nephropathy in 42/178 (23.59%) patients. Other etiologies were a renal stone disease in 17/178 (09.55%) and polycystic kidney disease in 14/178 (07.86%). The etiology of CKD remains unknown in 16/178 patients (08.98%). The studies conducted in China, India, and Lahore[24-26] and Karachi observed matching our outcome. In many parts of the world, the studies showed that glomerulonephritis was the major cause of CKD.[27-29] In this study, HTN was the second common cause of CKD. In a similar study in India also shows 23 similar results.[30] In the present study, DM was observed in 62/178 (34.83%) patients as a cause of CKD. This is in accordance with similar studies.[22,30] The incidence of renal stone disease and polycystic kidney disease was comparatively low in this study as a cause of CKD when compared to obstructive uropathy especially children as

Table 4: The clinical signs observed in the study group (n–72)

Signs	Frequency (%)
Pallor	111 (62.35)
Edema	65 (36.51)
HTN	54 (30.33)
LVH	45 (25.28)
Raised JVP	13 (18.05)
Hepatomegaly	12 (16.66)
Pleural effusion	08 (11.11)
Leukonychia	06 (08.33)
Ascites	05 (06.94)
Dry skin	04 (05.55)
Pulmonary edema	06 (08.33)
Pigmentation	04 (05.55)
Half and half nails	03 (04.16)
Bone tenderness	03 (04.16)
Pericardial effusion	02 (2.77)
Pericardial rub neuropathy	02 (02.77)

Table 5: The laboratory investigations with mean values and ranges (n–72)

Lab investigations	Incidence (mean values)	Range; standard deviation
Raised blood urea (mg/dl)	94	40−110±35.24
Raised serum creatinine (mg/dl)	14.80	8.10−21.30±6.10
Decreased creatinine clearance (mmol/24 h)	4.15	2.10−9.20±2.60
High spot urine albumin to creatinine ratio (mg/g)	45	36−69±12.50
Reduced hemoglobin (g/dl)	7.0	4.25−10.40±2.75
FBS (mg/dl)	120	90−150±15
RBS (mg/dl)	210	140−310±45
Raised serum sodium (mmol/l)	143	±
Raised serum potassium (mmol/l)	5.3	4.80−6.30±0.90
Low serum calcium (mg/dl)	6.20	5.15−7.95±1.10
High serum phosphate (mg/dl)	7.10	6.10−8.25±1.40
Alkaline phosphatase (μ/l)	176	65−285±37.45
Raised uric acid (mg/dl)	9.1	9.0−10.20±1.05
24 h urine for protein (g/24 h)	3.20	1.10−.05±1.15

FBS: Fasting Blood Sugar, RBS: Random Blood Sugar

reported by Jamro *et al*.[21] A study performed on children demonstrated that reflux nephropathy is a common cause of CKD.[21] In the present study, there was no patient with reflux nephropathy which may be due to the fact that our patients were >18 years of age. The incidence of cystic kidney disease in our study was low. Similar results were found in a study by Jamro *et al*.[21] Earlier studies in literature showed a varied clinical spectrum of CKD. The present study also authenticates the presence of variable clinical characteristics in patients with CKD as most of the patients showed the involvement of different organ systems. The gastrointestinal tract symptoms were highly common in a presentation such as anorexia, nausea, and vomiting. This is in similar to the studies done at Mayo Hospital, Lahore and kidney center Karachi which showed that nausea and vomiting were the predominant clinical features.[24,26] Cardiovascular symptoms such as dyspnea, edema, and HTN were predominant in the present study. Our findings match with studies conducted in Nigeria and China.[30,31] In a study conducted in France LVH was quiet frequent as it was observed in the present study.[32] In the present study, the neurological signs such as paraesthesia, numbness, and tremors were less frequently encountered when compared to the studies by Prakash *et al*.[30] from China. Seizures were observed in 3/72 patients (04.16%) in the present study. Pulmonary edema was an uncommon finding in the present study when compared to the study at Lahore which showed a high percentage of pulmonary edema.[26] In the present study, anemia was observed as a universal sign similar to the study by Jamr*o et al*.[21]

CONCLUSIONS

Glomerulonephritis, HTN, and DM were the most common risk factors in causing CKD. The most common clinical presentations were anemia, fatigue, anorexia, nausea, vomiting, dyspnea, hiccups, itching, HTN, and edema. As the clinical spectrum of CKD is diverse, further studies are needed to recognize the various presentations of this disease in the local population at an early stage. Early diagnosis and management of these conditions may prevent or delay the progress to ESRD.

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