

# Clinical assessment of etiological risk factors of chronic kidney disease in patients admitted for dialysis to a tertiary care hospital



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## ABSTRACT

**Background:** Chronic kidney disease (CKD) is defined as a reduced glomerular filtration rate, increased urinary albumin excretion, or both, and it is an increasing public health problem with a prevalence of 8–16%. However, there is a paucity of such studies evaluating risk factors among dialysis patients in India and also there could be associated setting specific varied contributory factors. Hence, we have undertaken this study to assess common risk factors in CKD patients admitted for dialysis to a Tertiary Care Hospital. **Aims and Objectives:** To assess the clinical presentation and the common risk factors in CKD patients admitted for dialysis to tertiary care hospital. **Materials and Methods:** The present study was cross-sectional study in which 100 CKD patients admitted to the dialysis unit of tertiary care hospital were included on the basis of predefined inclusion and exclusion criteria and were analyzed as regards the history of illness, environment, and physical behavior was collected based on various pre-validated questionnaires (The WHO STEP wise approach to chronic disease risk factor Surveillance questionnaire for NCDs, dietary questionnaire, environmental/occupational questionnaire, and patient history questionnaire) in a face-to-face interview with participants and their family members. Etiological Risk Factors and clinical assessment of patients were studied.  $P < 0.05$  was taken as statistically significant. **Results:** 49 (49%) of the study participants were from the age group of 41 to 60 years with the mean age of the  $51.9 \pm 12.3$  years. There was a male ponderance with M: F ratio being 1:0.61. The most common underlying condition responsible for end-stage renal disease (ESRD) was hypertension (25%) followed by diabetes mellitus (21%), glomerulonephritis (18%), analgesic nephropathy (15%), and renal stones (8%). CKD of unknown etiology was present among 7% and polycystic kidney 6%. Common clinical presentation in studied cases was anorexia (61%) followed by easy fatigability (58%) patients, Facial puffiness (49%), weakness (45%), and oliguria (44%). **Conclusion:** Male gender, advancing age, and occupational exposure to nephrotoxic metals were the baseline risk factors. Hypertension and diabetes mellitus were the two most common comorbidities among ESRD patients which are the important risk factors for progression to ESRD.

**Key words:** Chronic kidney disease; End-stage renal disease; Dialysis; Etiology; Hypertension; Diabetes mellitus

## INTRODUCTION

The definition of chronic kidney disease (CKD) has been evolving over a period of time. Current guidelines define CKD as a condition in which there is a reduction of glomerular filtration rate (GFR) to the level  $<60$  mL/min per  $1.73$  m<sup>2</sup> or

the presence of markers of kidney damage or both of at least 3 months duration irrespective of the etiological cause of such a reduction in GFR or presence of markers of kidney damage.<sup>1</sup>

With increasing sedentary lifestyle secondary to rapid industrialization and automation there is an evolving pandemic

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of obesity, metabolic syndrome and its consequences such as the development of hypertension and type II Diabetes mellitus. There are wide geographic variations in the diseases or risk factors causing CKD. The most common cause of CKD in sub-Saharan Africa is malaria. Schistosomiasis is a common cause of renal failure due to urinary tract obstruction in parts of the Middle East, Diabetes mellitus and hypertension are the two most common causes of CKD in most countries of Europe, Asia and America. CKD of unknown etiology (CKDu) is also being increasingly reported from isolated, predominantly rural locations across Asia and Africa.<sup>2</sup> Diabetes and hypertension remain one of the common causes of CKD in developing world including India. Irrespective of etiology in the initial stage there could only be a biochemical abnormality. Eventually, there will be loss of the excretory, metabolic and endocrine functions of the kidney leading to the clinical symptoms and signs of renal failure. These changes are referred to as uraemia. Progression of CKD to a stage where life cannot be sustained with renal replacement therapy (RRT), it is called end stage renal disease/failure (ESRD).<sup>3</sup>

The clinical presentation of CKD usually consist of signs and symptoms such as anorexia easy fatigability Facial puffiness weakness and Oliguria. In long standing Uremia the features such as pericarditis, encephalopathy, peripheral neuropathy and gastrointestinal symptoms such as anorexia, nausea and vomiting may be present.<sup>4</sup> The diagnostic work up usually consists of renal function tests (Blood urea, serum creatinine), Urine examination (haematuria and/or proteinuria), renal imaging (USG, CT, MRI and radionuclide scanning) and in selected cases renal biopsy. Management strategies may include slowing progression of CKD to ESRD and subsequently once the ESRD has established then RRT (haemodialysis) or renal transplant are the only available treatment options.<sup>5</sup>

In India, high prevalence of CKD has been noted in the states of Andhra Pradesh, Odisha, Goa, and Maharashtra. The renal biopsy findings have shown tubular atrophy and interstitial fibrosis with little or no involvement of the glomerular and vascular compartments. The incidence and prevalence of RRT have been increasing substantially in the last three decades. The majority of patients with ESRD are getting their RRT in the form of haemodialysis, few with peritoneal dialysis and few with renal graft.<sup>6</sup>

Despite exponential increase in patients on RRT. There is paucity of studies evaluating risk factors for development of ESRD. Among dialysis patients in India there could be associated setting specific varied contributory factors. We therefore have undertaken this study to analyse clinical presentation and to assess common risk factors in CKD patients admitted for dialysis.

## Aims and objectives

To assess clinical presentation and the common risk factors in CKD patients admitted for dialysis to Tertiary Care Hospital.

## MATERIALS AND METHODS

This was a cross-sectional study conducted over a period of 2 years from January 2021 to December 2022 in the department of general medicine at Dr. PDM medical college Amravati, Maharashtra, India. The study was approved by the Institutional Ethical committee (vide approval letter no 469/2021). Written informed consent was obtained from all study subjects. 100 patients with CKD were included in this study on the basis of a predefined inclusion and exclusion criteria.

All cases of CKD admitted for dialysis to dialysis unit were analyzed with regard to the history of illness, environment, and physical behavior was collected based on various pre-validated questionnaires (The WHO STEP wise approach to chronic disease risk factor Surveillance questionnaire for NCDs, dietary questionnaire, environmental/occupational questionnaire, and patient history questionnaire) in a face-to-face interview with participants and their family members. Clinical features were determined on the basis of a detailed history as well as a through clinical examination. Clinical and laboratory finding were obtained from each case.

The sample size was calculated with  $n = (DEFF * Np [1-p]) / (d^2 / Z_{1-\alpha/2}^2 * [n-1] + p * [1-p])$  using OPENEPI software version 3. Varughese and Abraham<sup>7</sup> in their study titled, CKD in India: A Clarion Call for Change, found that prevalence of CKD was 17%. Considering this prevalence of 17% with 95% confidence interval and 8% absolute precision, minimum calculated sample size came out to be 85 but for convenience of calculations, we have decided to round up this figure to nearest whole number, i.e., 100.

Data were collected in pre-structured pro forma (Annexure I- case record sheet) which was pilot tested and after ensuring its validity. The data collected was then analyzed using SPSS IBM version 20. Means were compared using Student *t*-test while qualitative variables compared using Chi-square and Fischer's exact test of significance. For statistical purposes  $P < 0.05$  was taken as statistically significant.

## Inclusion criteria

1. All patients between diagnosed with CKD according to the kidney disease: Improving global outcome criteria
2. Patients ready to give informed and written consent to be part of study
3. Age between 18 and 80 years.

### Exclusion criteria

1. Cases of renal transplantation
2. Cognitive impairment
3. Refusal to give consent
4. Cases of acute kidney injury
5. Patients having comorbid conditions likely to give rise to clinical features similar to CKD such as systemic autoimmune conditions and urological malignancies.

## RESULTS

In the present facility-based cross-sectional observational study, we have included total 100 cases of CKD admitted for dialysis to dialysis unit. Majority, 49 (49%) of the study participants were from the age group of 41–60 years followed by 27 (27%) from the age group of 61 to 80 years, 24% from 21 to 40 years. Mean age of the patients was 51.9±12.3 years with the majority (62%) of the patients were males. 16% had a history of occupational exposure to nephrotoxic metals. 23% cases had a history of use of bore well water (hard water) as a source of drinking water. In this study, majority, 47 (47%) were addicted to alcohol, 35 (35%) were addicted to smoking while 38 (38%) did not have any of this addiction. In the current study, most common comorbidity was hypertension present in 61 (61%) patients followed by diabetes mellitus in 48% patients, cardiovascular diseases in 23%, renal stones in 8%, polycystic kidney in 6% (Table 1).

In our study, most common presenting complaint was anorexia reported by 61 (61%) patients followed by easy fatigability (58%) and Facial puffiness in 49 (49%). Complaints such as muscle cramps (19%), chest pain (12%), pelvic pain (11%), generalized edema (7%) and micturition hesitancy (6%) were less common (Table 2).

In the present study, the most common underlying condition responsible for ESRD was hypertension noted among 25 (25%) cases followed by diabetes mellitus among 21 (21%), glomerulonephritis in 18 (18%), analgesic nephropathy among 15 (15%), renal stones in 8 (8%), while CKDu was present among 7 (7%) and polycystic kidney in 6 (6%) (Table 3).

In the present study, on studying hematological markers, we have seen that mean erythrocyte count, mean Hb, mean hematocrit, mean platelet count, mean TLC, mean neutrophil count, and mean lymphocyte count was within the range of normality while mean Neutrophil to lymphocyte ratio was raised more than the range of normality (Table 4).

In the present study, the most common complication of ESRD was anemia noted among 52 (52%) cases followed

**Table 1: Distribution of patients according to baseline characteristics**

Baseline characteristic	n (%)
Age group	
21–40	24 (24)
41–60	49 (49)
61–80	27 (27)
Gender	
Male	62 (62)
Female	38 (38)
Comorbidities	
DM	48 (48)
Hypertension	61 (61)
CVD	23 (23)
Kidney stones	8 (8)
Polycystic kidney	6 (6)
Occupational exposure to heavy metals	
Yes	16 (16)
No	84 (84)
Source of drinking water	
Bore well	23 (23)
Municipality	57 (57)
Ro water purifier	20 (20)
Addiction	
Smoking	35 (35)
Alcoholism	47 (47)
No addiction	38 (38)

DM: Diabetes mellitus, CVD: Cardiovascular disease

**Table 2: Presenting complaints in studied cases**

Presenting complaints	Number of patients (%)
Anorexia	61 (61)
Ankle swelling	41 (41)
Breathlessness	22 (22)
Chest pain	12 (12)
Easy fatigability	58 (58)
Facial puffiness	49 (49)
Generalized edema	7 (7)
Headache	38 (38)
Itching	36 (36)
Micturition hesitancy	6 (6)
Muscle cramps	19 (19)
Nausea	28 (28)
Oliguria	44 (44)
Polyuria	28 (28)
Pelvic pain	11 (11)
Vomiting	27 (27)
Weakness	45 (45)

by ischemic heart disease in 23 (23%), stroke in 13 (13%), and death among 4 (4%) patients (Table 5).

## DISCUSSION

The present study was a cross sectional observational study, recruited 100 CKD patients on dialysis for analyzing etiological risk factors, clinical presentation and complications. Most of the study participants (49%) were from the age group of 41 to 60 years followed by from the age group of 61 to 80 years (27%) and from 21 to 40 years

**Table 3: Distribution of cases according to underlying cause of chronic kidney disease**

Underlying cause of CKD	Number of patients (%)
DM	21 (61)
Hypertension	25 (41)
Polycystic kidney disease	6 (22)
Renal stones	8 (12)
Unknown etiology	7 (58)
Analgesic nephropathy	15 (49)
Glomerulonephritis	18 (7)
Total	100 (100)

CKD: Chronic kidney disease, DM: Diabetes mellitus

**Table 4: Hematological markers in chronic kidney disease patients**

Hematological parameter	Value
RBC count	4.2
Hb (g/dL)	10.6
Hematocrit (%)	35.2
Platelets (cells/ $\mu$ L)	1.3
Total leucocyte count ( $10^3/\text{mm}^3$ )	5.8
Neutrophils ( $10^3/\text{mm}^3$ )	6.3
Lymphocytes ( $10^3/\text{mm}^3$ )	1.6
Neutrophils/lymphocyte ratio	4.5

Hb: Hemoglobin, RBC: Red blood cell

**Table 5: Distribution of cases according to complications of chronic kidney disease**

Complications in cases of CKD	Number of cases (%)
Anemia	52 (52)
IHD	23 (23)
Stroke	13 (13)
Death	4 (4)

IHD: Ischemic heart disease, CKD: Chronic kidney disease

(24%). Mean age of the patients was  $51.9 \pm 12.3$  years. Majority (62%) of the patients were males. 16% had a history of occupational exposure to nephrotoxic metals. 23% cases had a history of use of Bore well water (hard water) as a source of drinking water. In this study, majority were addicted to alcohol (47%) and smoking (35%). Our findings are consistent with Delanaye et al.,<sup>8</sup> who noted majority of the patients between 41 and 70 years. Go et al.,<sup>9</sup> found that majority of the cases with declining eGFR had advancing age. Similarly, in our study also, most of the dialysis cases had advancing age. Tsai et al.,<sup>10</sup> found male sex to be a significant factor for development of CKD to ESRD. In the current study, most common comorbidity was hypertension in 61% and diabetes mellitus in 48% patients. This is in line with Kefale et al.,<sup>11</sup> who noted hypertension, DM, IHD, stroke and dyslipidemia as common comorbidities among CKD patients.

In our study, most common presenting complaint was anorexia (61%) followed by easy fatigability (58%),

Facial puffiness (49%), weakness (45%), Oliguria (44%) and Ankle swelling among (41%). Other less frequent complaints were headache, itching, nausea, polyuria, vomiting, breathlessness, muscle cramps, chest pain, pelvic pain, generalized edema, and micturition hesitancy. Most common underlying condition responsible for ESRD was hypertension noted among 25 (25%) cases followed by diabetes mellitus among 21 (21%), glomerulonephritis in 18 (18%), analgesic nephropathy among 15 (15%), renal stones in 8 (8%), while CKDu was present among 7 (7%) and polycystic kidney in 6 (6%) patients. These findings are in line with Alzamanan et al.,<sup>12</sup> who in their study reported that hypertension, diabetes mellitus, Polycystic Kidney and chronic intake of NSAIDs were the risk factors associated with chronic renal failure. Moparthi et al.,<sup>13</sup> reported in their study that hypertension, diabetes and analgesic abuse were chief morbidities for CKD; Chang et al.,<sup>14</sup> noted hypertension, diabetes mellitus, polycystic kidney, malignancy, IHD, CVD, hyperlipidemia, anemia and autoimmune diseases as underlying conditions and Vestergaard et al.,<sup>15</sup> reported that patients with hypertension and anemia were a high CKD risk population.

In the present study, on studying hematological markers we have found that mean erythrocyte count, mean Hb, mean hematocrit, mean platelet count, mean TLC, mean neutrophil count and mean lymphocyte count were within the range of normality while mean Neutrophil to lymphocyte ratio was raised more than the range of normality. Similar hematological findings were also reported by the authors such as Rahman et al.,<sup>16</sup> and George et al.<sup>17</sup>

In the present study, the most common complication of ESRD was anemia which was seen in 52 (52%) cases followed by ischemic heart disease (23%) and stroke (13%). Death occurred among 4 (4%) patients. These findings were consistent with authors such as Bello et al.,<sup>18</sup> who reported complication of anemia, cardiovascular disease, osteodystrophy, stroke, peripheral neuropathy, hyperkalemia and edema. Similarly, Vallianou et al.,<sup>19</sup> identified individuals with CKD as being at high risk for cardiovascular mortality and Kobo et al.,<sup>20</sup> observed an independent, graded association between a reduced estimated GFR and the risk of death, cardiovascular events, and hospitalization in a large, community-based population.

#### Limitations of the study

This was a cross-sectional study and patients were not followed up over a period of time to see how the disease evolved in presence of a particular comorbidity. This was the major limitation of our study.



## CONCLUSION

Male gender, advancing age, occupational exposure to nephrotoxic metals were the baseline risk factors. Hypertension and diabetes mellitus were the two most common comorbidities among ESRD patients followed by others like CVD, renal stones which are the important risk factors for progression to ESRD.

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**Authors Contribution:**

**SGV**- Concept and design of the study; interpreted the results, prepared first draft of manuscript and critical revision of the manuscript; **NSB**- Statistically analyzed and interpreted; reviewed the literature and manuscript preparation; **NAC**- Design of the study, statistically analyzed and interpreted, preparation of manuscript and revision of the manuscript; **SSV**- Concept and coordination of the overall study.

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