Section: Miscellaneous

Original Research Article

CLINICAL PROFILE, ETIOLOGY, COMORBIDITIES, AND TREATMENT PATTERNS AMONG PATIENTS WITH CHRONIC KIDNEY DISEASE ATTENDING A TERTIARY CARE HOSPITAL IN ODISHA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Chronic kidney disease (CKD) represents an increasing public health and clinical challenge in India, driven largely by the rising burden of non-communicable diseases such as diabetes and hypertension. Delayed diagnosis and limited access to renal replacement therapy contribute to significant morbidity, mortality, and financial hardship. The objective is to assess the clinical profile, etiology, comorbidities, treatment status, and direct treatment-related costs among CKD patients attending a tertiary care hospital in Odisha.

Materials and Methods: A hospital-based cross-sectional study was conducted among 180 adult CKD patients attending the nephrology outpatient department and dialysis unit of PGIMER & Capital Hospital, Bhubaneswar, Odisha. Data on sociodemographic characteristics, CKD etiology, comorbidities, and treatment modalities were collected using a semi-structured schedule and verified through medical records. Descriptive statistics and Chi-square tests were used for analysis. Institutional ethical approval and informed consent were obtained.

Results: The mean age of patients was 54.1 ± 13.8 years, with males comprising 72.2%. Diabetic nephropathy (40.0%) and hypertensive nephropathy (27.2%) were the leading etiologies. Hypertension (61.7%) and type 2 diabetes mellitus (48.9%) were the most common comorbidities. Advanced CKD (Stages 4–5) constituted 61.1% of the study population. Hemodialysis was the predominant treatment modality (35.0%), while peritoneal dialysis (3.3%) and renal transplantation (3.3%) were less frequently utilized. A majority of dialysis services were accessed from private hospitals. Median monthly expenditure for dialysis was ₹10,500, in addition to transportation and medication costs. Utilization of financial protection schemes was partial. The study highlights a substantial burden of CKD among individuals in their productive years, with diabetes and hypertension as key etiological and comorbid factors. Limited public sector dialysis capacity and reliance on private services contribute to financial stress among patients and families.

Conclusion: Strengthening early CKD detection in primary care, improving NCD management, expanding renal replacement capacity, and enhancing financial protection mechanisms are essential to reduce the clinical and economic burden of CKD in resource-constrained settings.

Keywords: Chronic kidney disease, Diabetes mellitus, Hypertension, Comorbidity, Hemodialysis, Renal replacement therapy, Renal transplantation, Financial burden.

INTRODUCTION

Chronic kidney disease (CKD) has emerged as an important global public health challenge. According to the Global Burden of Disease (GBD) 2015 report, CKD ranked as the 12th leading cause of mortality worldwide, with a 37.1% increase in CKD-related deaths over the past decade.[1,2] Even in high-income countries, the healthcare expenditures associated with CKD, dialysis, and renal transplantation are substantial and often unsustainable for health systems.[3]

Low- and middle-income nations, including India, are witnessing an increasing burden of CKD due to rapid lifestyle transitions, epidemiological shifts, rising life expectancy, and the high prevalence of non-communicable diseases such as diabetes and hypertension. The true magnitude of CKD in India remains uncertain due to the absence of a national renal registry and standardized screening methods. Reported prevalence estimates vary widely, ranging from 2.9% to 16.54% in different population-based and hospital-based studies employing heterogeneous diagnostic criteria.[4,5] Limited awareness regarding CKD and delayed access to diagnostic services frequently result in detection only at advanced stages (Stage 4 or Stage 5), when complications are significant and treatment options become limited.[6]

CKD commonly affects individuals in their productive years, with diabetic nephropathy recognized as one of the leading etiological factors. A considerable proportion of patients with diabetes may develop nephropathy within ten years of diagnosis.[7] The coexistence of type 2 diabetes mellitus, hypertension, and other metabolic risk factors further increases susceptibility to CKD.[8,9] Financial implications for families are substantial, as out-of-pocket expenditure for dialysis and medications remains high in many settings.[10]

In India, the capacity of public healthcare institutions to manage CKD continues to be constrained by shortages of nephrologists, limited dialysis units, and low availability of renal transplantation services. Consequently, a large share of CKD care is delivered through the private sector, increasing cost burdens on households. Although national and state-level financial assistance schemes exist, coverage and accessibility vary across regions. In Odisha, tertiary care institutions such as PGIMER & Capital Hospital in Bhubaneswar serve as major referral centers for CKD patients, yet evidence on the clinical profile, comorbidities, treatment patterns, and economic burden among CKD patients remains limited.

To address these gaps, the present hospital-based cross-sectional study was undertaken to identify the common etiologies of CKD, assess coexistence of comorbid conditions, document current treatment patterns, and evaluate the direct cost burden among CKD patients attending PGIMER & Capital Hospital, Bhubaneswar, Odisha.

MATERIALS AND METHODS

This hospital-based cross-sectional study was conducted among patients with chronic kidney disease (CKD) attending the Nephrology outpatient department and dialysis unit of PGIMER & Capital Hospital, Bhubaneswar, Odisha. Known CKD patients aged ≥18 years who were clinically stable and willing to participate were included. Patients with acute kidney injury, critically ill patients, and those unwilling to provide informed consent were excluded.

Sample size was calculated as 180, assuming the prevalence of the most common comorbidity among CKD patients with 95% confidence interval and 20% relative precision based on a South Indian study.[11] Data were collected using a pre-tested, semi-structured schedule between January 2024 and November 2024. CKD was defined as kidney damage or reduced glomerular filtration rate for ≥3 months, as documented by treating physicians or confirmed through medical records, in accordance with established clinical criteria.[12]

Information was collected on sociodemographic characteristics, CKD etiology, stage of illness, coexisting diseases, and current treatment modalities including dialysis and transplantation. Verification of diabetes mellitus, hypertension, and other comorbidities was done through case records and discharge summaries. Direct treatment-related expenditure including dialysis, medications, and transport was recorded for descriptive analysis. Utilization of governmental and non-governmental financial assistance schemes was also documented.

Descriptive statistics were expressed as mean, standard deviation, median, proportions, and 95% confidence intervals. Associations between treatment status and selected epidemiological variables were examined using the Chi-square test. Statistical significance was considered at $p<0.05$. Data analysis was performed using IBM SPSS trial version. Institutional ethics committee approval was obtained prior to the study, and written informed consent was taken from all participants.

RESULTS

A total of 180 CKD patients participated, with ages ranging from 19 to 86 years (mean age 54.1 ± 13.8 years). Nearly half (49.4%) belonged to the 41–60 year age group, indicating considerable disease burden among productive age groups. Elderly patients (>60 years) constituted 30.6%. There was a male predominance (72.2%).

A significant proportion were engaged in manual occupations prior to the onset of illness, while only 15% reported any current income, mostly among early-stage CKD patients. The majority belonged to lower socioeconomic strata according to state classification systems, and 82.2% were currently married. The sociodemographic characteristics are presented in [Table 1].

Table 1: Sociodemographic Characteristics of the Study Participants (n = 180)

Characteristic	Category	Frequency (n)	Percentage (%)
Age group (years)	18–40	38	21.1
	41–60	89	49.4
	>60	53	29.5
Sex	Male	130	72.2
	Female	50	27.8
Education level	Illiterate	15	8.3
	Up to Higher Secondary	108	60.0
	Graduate & Above	57	31.7
Socioeconomic status	Priority/Low income group	118	65.5
	BPL	47	26.1
	APL	15	8.4
Marital status	Married	148	82.2
	Unmarried	12	6.7
	Widow/Widower/Separated	20	11.1
Family type	Joint/Extended	69	38.3
	Nuclear	111	61.7
Addiction history	Past smoking	72	40.0
	Alcohol use	15	8.3
	Tobacco (smokeless)	22	12.2

Among 180 participants, 61.1% were in advanced CKD stages (Stage 4 and Stage 5) including patients on dialysis. The mean duration of CKD was 5.7 ± 4.4 years (range: 3 months to 24 years). Reported family history of kidney disease was noted in 7.2% of patients, recurrent urinary tract infection in 12.8%, and history of prolonged NSAID use (>1 month) in 16.1%.

Verification of case records indicated that the most frequent etiology was diabetic nephropathy, followed by hypertensive nephropathy. The distribution of major etiologies in the study population was as follows: diabetic nephropathy (≈40%), hypertensive nephropathy (≈27%), mixed diabetic-hypertensive (≈6%), immune-mediated etiologies (≈9%), infection related (≈4%), congenital causes (≈3%), toxic nephropathy (≈3%), and transplant rejection in a small proportion. Etiological distribution and 95% CI for proportions are shown in [Table 2].

Table 2: Etiology of Chronic Kidney Disease Among Study Participants (n = 180)

Etiology	Frequency (n)	Percentage (%)	95% CI
Diabetic nephropathy	72	40.0	(33.0 – 47.4)
Hypertensive nephropathy	49	27.2	(20.9 – 33.4)
Mixed (Diabetic + Hypertensive)	11	6.1	(2.7 – 9.5)
Immune-mediated (e.g., IgA nephropathy)	16	8.9	(4.9 – 12.9)
Infection-related (e.g., chronic pyelonephritis)	7	3.9	(1.0 – 6.8)
Congenital/hereditary	5	2.8	(0.4 – 5.2)
Toxic nephropathy (NSAIDs, herbal)	6	3.3	(1.0 – 6.0)
Transplant rejection	2	1.1	(0 – 2.7)
Other/undetermined	12	6.7	(3.0 – 10.4)

Nearly half (≈47%) had one or more comorbid conditions in addition to CKD. Hypertension and type 2 diabetes mellitus were the two most commonly reported. Other coexisting illnesses included coronary artery disease, chronic obstructive pulmonary disease (COPD), cerebrovascular events, malignancies, and psychiatric illness. A history of viral hepatitis was also noted in a small proportion. Prevalence of comorbidities across sex categories and corresponding 95% confidence intervals are presented in [Table 3].

Table 3: Distribution of Comorbidities by Sex (n = 180)

Comorbidity	Male (n = 130)	Female (n = 50)	Total n (%)	95% CI
Hypertension	82 (63.1%)	29 (58.0%)	111 (61.7)	(54.5 – 68.4)
Diabetes mellitus	65 (50.0%)	23 (46.0%)	88 (48.9)	(41.6 – 55.6)
Coronary artery disease	28 (21.5%)	14 (28.0%)	42 (23.3)	(17.3 – 29.4)
COPD	16 (12.3%)	4 (8.0%)	20 (11.1)	(6.5 – 15.7)
Cerebrovascular accident	11 (8.5%)	5 (10.0%)	16 (8.9)	(4.7 – 13.1)
Malignancy	4 (3.1%)	2 (4.0%)	6 (3.3)	(0.7 – 5.9)
Hepatitis B/C	3 (2.3%)	2 (4.0%)	5 (2.8)	(0.4 – 5.2)
Recurrent UTI (past)	15 (11.5%)	8 (16.0%)	23 (12.8)	(7.9 – 17.6)
Urinary calculi (past)	4 (3.1%)	3 (6.0%)	7 (3.9)	(1.0 – 6.8)

Mean duration of diabetes was approximately 9.6 years, and retinopathy and peripheral neuropathy were documented among diabetics. Mean duration of hypertension was nearly 9 years, indicating long-standing risk exposure among this group.

At the time of study, a majority of patients were either undergoing hemodialysis or in Stage 5 pre-dialysis CKD. Hemodialysis was the predominant treatment modality, with a smaller proportion on peritoneal dialysis or following renal transplantation. Most dialysis-dependent patients received treatment from private healthcare facilities due to limited dialysis capacity and waiting time constraints in public sector units. Gender differences were observed in treatment categories, with fewer women undergoing dialysis or transplantation compared to men. Younger patients were more likely to have undergone renal transplantation. The distribution of treatment modalities and associations with selected variables are presented in [Table 4].

Table 4: Treatment Status of CKD Patients (n = 180)

Treatment Category	Frequency (n)	Percentage (%)
Stage 1–3 CKD (Conservative management)	38	21.1
Stage 4 CKD (Pre-dialysis)	28	15.6
Stage 5 CKD (Pre-dialysis)	39	21.7
Hemodialysis	63	35.0
Peritoneal dialysis	6	3.3
Post-renal transplant (follow-up)	6	3.3

Direct out-of-pocket expenditure among dialysis-dependent patients included costs for dialysis sessions, drugs, and travel. Median monthly expenditure for hemodialysis ranged from ₹9,000 to ₹13,000, while travel costs constituted an additional financial burden for many families. Patients who underwent renal transplantation reported high procedural costs, particularly for those opting for private hospitals. Utilization of government health protection schemes such as Biju Swasthya Kalyan Yojana and other support mechanisms was documented, although coverage remained partial and insufficient for long-term management requirements.

Table 5: Cost of Treatment and Support System Utilization (n = 180)

Cost/Support Parameter	Median Value (INR)	IQR	Percentage Utilizing (%)
Monthly hemodialysis cost	10,500	8,000–13,000	–
Monthly peritoneal dialysis cost	14,000	12,000–18,000	–
Monthly medication cost	2,800	2,000–4,200	–
Monthly transport expenditure	3,000	2,000–4,000	–
Transplant procedure cost	3,00,000	2,40,000–4,00,000	–
BSKY/Other government schemes utilized	–	–	42.2
NGO/Charity-based support	–	–	18.9

DISCUSSION

In the present hospital-based study conducted at PGIMER & Capital Hospital, Bhubaneswar, Odisha, the mean age of CKD patients was situated within the productive age group, with a male predominance. Similar demographic patterns were observed in a South Indian screening project, where mean age was reported as 52.7 ± 17.0 years with higher representation among men (58.7%).[4] However, in that study the predominant age cluster was 60–69 years, whereas our study captured relatively younger age groups (40–60 years), possibly reflecting survival bias toward earlier stages and ongoing treatment accessibility in our cohort.

Unemployment and financial dependence were notable in our population, consistent with other literature highlighting socioeconomic implications of CKD in India. In the aforementioned screening project, hypertension and diabetes presented in 59.5% and 9.9% of screened participants, respectively.[4] In contrast, our hospital-based CKD cohort demonstrated higher proportions of diabetes and hypertension, supporting the evidence that these comorbidities are strongly associated with CKD progression and are frequently present by the time care is sought in secondary or tertiary facilities. Increasing age, male sex, hypertension, and diabetes have been identified as significant predictors of CKD in community studies,[4] and the clinical burden observed in our patients aligns with these known risk determinants.

Previous hospital-based studies have similarly reported male predominance and productive age involvement among CKD patients, with diabetes and hypertension being major contributors and chronic NSAID use a relevant secondary risk factor in a proportion of subjects.[13] In our cohort, diabetic nephropathy constituted the leading cause, followed by hypertensive nephropathy, which is consistent with patterns reported from other low- and middle-income countries.[14] While etiological patterns vary geographically, glomerulonephritis and toxic nephropathy continue to contribute meaningfully in some Indian states.

A notable observation was the gender disparity in access to advanced CKD treatment modalities including hemodialysis, peritoneal dialysis, and renal transplantation. This phenomenon has been documented in other LMIC settings, where cultural, socioeconomic, and healthcare access barriers influence treatment uptake among women.[15] Given that cardiovascular disease and cerebrovascular disease frequently coexist with CKD, the compounded risk of morbidity and mortality is

substantial, as reflected in our data. Cardiovascular disease represents one of the leading causes of death among patients with CKD,[2] reinforcing the need for integrated NCD management strategies.

Early detection of CKD among high-risk groups such as diabetics and hypertensives, and strengthening of primary care systems to provide affordable biochemical testing and risk counseling could delay progression to end-stage renal disease (ESRD). Studies have indicated that diabetes and hypertension not only contribute to CKD onset but also accelerate its progression when not optimally controlled.[19,20] Management of moderate to advanced CKD may benefit from shared-care models, wherein nephrologists remotely supervise case management through primary care providers, facilitating follow-up continuity.

Once ESRD is established, therapeutic options include maintenance hemodialysis, peritoneal dialysis, and renal transplantation. Although peritoneal dialysis is widely regarded as a suitable modality for resource-constrained settings, its adoption remains limited in India.[21] In our study too, only a small proportion received peritoneal dialysis. Due to limited capacity in the public sector, private hospitals and charitable trusts shoulder a major portion of dialysis services, a trend noted in other Indian studies.[22] While dialysis and transplantation from private facilities expand access, out-of-pocket expenditure can be considerable, particularly among patients with diabetes, who incur higher treatment costs.[23]

Hospital-based evidence from Western Odisha also documented a high reliance on private dialysis (88%) and catastrophic health expenditure among CKD households (91%), underscoring the financial vulnerabilities associated with renal replacement therapy.[24] In our study, although 70% of dialysis was received in private facilities, a notable proportion of patients utilized state-sponsored financial protection schemes such as Biju Swasthya Kalyan Yojana, reducing overall cost burdens compared with earlier reports. Nonetheless, the long-term sustainability of CKD management remains challenging in the context of rising NCD burden.

Given the high and increasing prevalence of diabetes and hypertension, there is an urgent need to strengthen NCD programs for early detection, lifestyle modification counseling, improved diabetes and BP control, and prevention of complications. Community-level support systems fill temporary gaps but are unlikely to serve as durable solutions as CKD incidence and survival rates increase. Hence, integrated preventive strategies are essential to reduce future CKD incidence and financial hardship.

CONCLUSION

CKD in our hospital-based population predominantly affected individuals in their productive years, with diabetes and hypertension emerging as major etiological and comorbid contributors. A considerable proportion of patients required dialysis, most of which was accessed through private sector facilities, leading to substantial treatment-related expenditure despite partial utilization of government-supported schemes. Gender disparities in treatment uptake and coexistence of cardiovascular comorbidities highlight additional layers of vulnerability. Strengthening primary care services for early CKD screening among diabetics and hypertensives, improving NCD management, and expanding accessible renal replacement services are essential for reducing disease burden and financial hardship in resource-limited settings.

REFERENCES

1. Neuen BL, Chadban SJ, Demaio AR, Johnson DW, Perkovic V. Chronic kidney disease and the global NCDs agenda. BMJ Glob Health 2017;2:e000380.
2. Ene-Iordache B, Perico N, Bikbov B, Carminati S, Remuzzi A, Perna A, et al. Chronic kidney disease and cardiovascular risk in six regions of the world (ISN-KDDC): A cross-sectional study. Lancet Glob Health 2016;4:e307-19.
3. Ojo A. Addressing the global burden of chronic kidney disease through clinical and translational research. Trans Am Clin Climatol Assoc 2014;125:229-43.
4. Anupama Y, Uma G. Prevalence of chronic kidney disease among adults in a rural community in South India: Results from the kidney disease screening (KIDS) project. Indian J Nephrol 2014;24:214-21.
5. Ahlawat R, Tiwari P, D'Cruz S, Singhal R. Prevalence of chronic kidney disease in India: A systematic review and meta-analysis of observational studies. Value Health 2015;18:A509.
6. Shaikh M, Woodward M, John O, Bassi A, Jan S, Sahay M, et al. Utilization, costs, and outcomes for patients receiving publicly funded hemodialysis in India. Kidney Int 2018;94:440-5.
7. Agarwal SK. Chronic kidney disease and its prevention in India. Kidney Int Suppl 2005;68:S41-5.
8. Vijayakumar G, Arun R, Kutty VR. High prevalence of type 2 diabetes mellitus and other metabolic disorders in rural central Kerala. J Assoc Physicians India 2009;57:563-7.
9. Thankappan KR, Sivasankaran S, Sarma PS, Mini G, Khader SA, Padmanabhan P, et al. Prevalence, correlates, awareness, treatment and control of hypertension in Kumarakom, Kerala: Baseline results of a community-based intervention program. Indian Heart J 2006;58:28-33.
10. 12th Plan Kerala State Planning Board Expert Committee on Health. Available from: https://kerala.gov.in/documents/10180/2926ef37-1cff-452b-83f3-69473c1a7707. [Last accessed on 2018 Aug 16].
11. Haveri SP, NM S, MM J, Nath AS. Burden of renal failure among adults in rural Kerala: A community-based study. Indian J Forensic Community Med 2016;3:288-91.
12. Webster AC, Nagler EV, Morton RL, Masson P. Chronic kidney disease. Lancet 2017;389:1238-52.
13. Patil VC, Kulkarni C, Rajput A, Patil HV, Agarwal V. Incidence, etiology and clinical profile of newly detected chronic kidney disease (CKD) at teaching hospital. Res J Pharm Biol Chem Sci 2015;6:1092-110.
14. Evans PD, Taal MW. Epidemiology and causes of chronic kidney disease. Medicine 2011;43:450-3.
15. Carrero JJ, Hecking M, Ulasi I, Sola L, Thomas B. Chronic kidney disease, gender, and access to care: A global perspective. Semin Nephrol 2017;37:296-308.
16. Horowitz B, Miskulin D, Zager P. Epidemiology of hypertension in CKD. Adv Chronic Kidney Dis 2015;22:88-95.
17. Hamrahian SM, Falkner B. Hypertension in chronic kidney disease. Adv Exp Med Biol 2017;956:307-25.

18. Go AS, Chertow GM, Fan D, McCulloch CE, Hsu C. Chronic kidney disease and the risks of death, cardiovascular events, and hospitalization. N Engl J Med 2004;351:1296-305.
19. Agarwal SK, Srivastava RK. Chronic kidney disease in India: Challenges and solutions. Nephron Clin Pract 2009;111:c197-203.
20. Koye DN, Magliano DJ, Nelson RG, Pavkov ME. The global epidemiology of diabetes and kidney disease. Adv Chronic Kidney Dis 2018;25:121-32.
21. Jha V. Peritoneal dialysis in India: Current status and challenges. Perit Dial Int 2008;28(Suppl 3):S36-41.
22. Khanna U. The economics of dialysis in India. Indian J Nephrol 2009;19:1-4.
23. Satyavani K, Kothandan H, Jayaraman M, Viswanathan V. Direct costs associated with chronic kidney disease among type 2 diabetic patients in India. Indian J Nephrol 2014;24:141-7.
24. Bradshaw C, Gracious N, Narayanan R, Narayanan S, Safeer M, Nair GM, et al. Paying for hemodialysis in Kerala, India: A description of household financial hardship in the context of medical subsidy. Kidney Int Rep 2019;4:390-8.