International Journal of Research in Medical Sciences
Kalra V et al. Int J Res Med Sci. 2025 Jun;13(6):2398-2403
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20251434

Original Research Article

Profiling of kidney disease patients undergoing hemodialysis

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Received: 27 March 2025
Revised: 03 May 2025
Accepted: 05 May 2025

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ABSTRACT

Background: Kidney failure represents a substantial global health challenge; however, hemodialysis functions as a vital treatment for end-stage renal disease (ESRD). This study offers insights into the causes (and) demographic distribution of kidney failure among patients undergoing hemodialysis in Haryana and Uttar Pradesh, India. Although there are various factors contributing to this condition, understanding the nuances is essential because it can help to formulate better healthcare strategies.
Methods: A cross-sectional study (conducted by DCDC kidney care) involved 3,254 patients undergoing hemodialysis across Haryana and Uttar Pradesh. Data collected on demographic parameters, clinical characteristics and as per the clinical history of kidney failure were analyzed. Descriptive statistics helped to analyse age, gender and perceived causes of kidney failure; however, regional variations were highlighted. This study is significant, because it provides insights into the complexities of kidney failure, although it does have its limitations.
Results: The majority of patients undergoing hemodialysis were middle-aged, with the highest representation in the 41-50 years (25.1%) and 31-40 years (22.1%) age groups. Male patients constituted 70.9% of the population. Hypertension was identified as the most prevalent cause of kidney failure (60.35%), followed by diabetes (17.02%) and painkiller misuse (21.30%). Self-reported causes varied regionally; blood pressure was the leading cause in both Haryana (68.3%) and Uttar Pradesh (45.6%). However, excessive drug use (13.7%) and other unspecified causes (15.6%) were more prominent in Uttar Pradesh. These findings underscore regional disparities in awareness, risk factors and healthcare practices.
Conclusions: The study highlights the multifactorial nature of kidney failure, with hypertension, diabetes, and medication misuse being the primary contributors. Regional variations in the perceived causes of kidney failure reflect differences in risk factor awareness and healthcare practices between Haryana and Uttar Pradesh. Tailored interventions addressing modifiable risk factors and regional disparities are crucial for effective prevention and management of kidney failure.

Keywords: Kidney failure, Hemodialysis, Hypertension, Diabetes, Medication misuse, Regional disparities, Haryana, Uttar Pradesh, ESRD, Risk factors

INTRODUCTION

Chronic kidney disease (CKD) has emerged as a significant global health challenge, impacting populations in both high-income and low-to-middle-income countries.[1] CKD is a progressive condition that compromises kidney function over time, impairing the organ's ability to filter blood and eliminate metabolic waste, fluids and electrolytes.[2] This dysfunction contributes to severe complications, including cardiovascular disease, anemia and bone disorders; however, ESRD represents the most advanced stage of CKD. It occurs when kidneys can no

longer maintain physiological homeostasis, necessitating life-sustaining treatments such as hemodialysis or kidney transplantation.[3] Although some interventions exist, the burden of CKD continues to rise, because many individuals remain undiagnosed or receive inadequate care.

Globally, kidney disorders rank as the 12th leading cause of mortality and the 17th leading cause of disability.[4] Despite this recognition, lack of national renal registry in India poses challenges in accurately quantifying prevalence of CKD and ESRD.[5] Nevertheless, available data suggest a rising burden, driven by an aging population and the increasing prevalence of diabetes mellitus and hypertension-key risk factors for CKD development and progression. These trends signal an urgent need for targeted preventive measures and healthcare strategies; however, addressing this issue remains complex.[6] Hemodialysis remains a cornerstone treatment for ESRD, providing symptomatic relief and life prolongation for patients with kidney failure.[7] Understanding the demographic, clinical and regional factors influencing CKD and its progression to ESRD is crucial for improving healthcare delivery and outcomes; this study seeks to provide a comprehensive analysis of these factors. It examines age and gender distribution, etiologies of kidney failure, patient perceptions and regional disparities. The findings aim to highlight critical risk factors and identify knowledge gaps-this informs tailored interventions to mitigate the burden of CKD and improve the quality of care for patients requiring hemodialysis. Although challenges exist, progress can be made.

The primary objective of this study is to analyze the demographic, clinical and regional factors associated with patients undergoing hemodialysis, with a specific focus on understanding the age and gender distribution, leading etiologies of kidney failure, patient perceptions of causative factors, and regional disparities. This comprehensive analysis aims to identify key risk factors and gaps in awareness to inform targeted public health interventions, improve healthcare delivery and ultimately mitigate the burden of CKD and its progression to ESRD.

METHODS

Study design

The DCDC kidney care, a leading dialysis provider, conducted this cross-sectional research to collect data about patients with kidney disease needing hemodialysis medical treatment in Haryana and Uttar Pradesh states of India. Our research focused on understanding basic data from patients receiving hemodialysis while examining their age, health background and kidney failure reasons.

Participants

The study selected patients undergoing hemodialysis treatment across all DCDC kidney care centres in Haryana and Uttar Pradesh. It included 3254 participants who represented different age groups, mix of genders and types of patients.

Exact place of study

Study carried out at Uttar Pradesh (34 centers) and Haryana (24 centers) at DCDC kidney care (Dialysis units).

Period of study

Study conducted from 23 July 2024 to 23 August 2024.

Inclusion criteria

The inclusion criteria for the study consisted of adult patients aged 18 years or older who were receiving hemodialysis at DCDC kidney care centres. Only those patients who provided informed consent and were able to communicate their perceptions regarding the causes of kidney failure were included

Exclusion criteria

Conversely, the exclusion criteria involved patients with incomplete medical records or those unwilling to participate, pediatric patients below 18 years of age, and patients who were unable to provide reliable responses due to cognitive or other impairments.

Data collection

The data collection process involved a structured questionnaire, which was administered during routine hemodialysis sessions. Information was gathered on the following:

Demographics: Age, gender, and state of residence.

Clinical background: Duration of hemodialysis and comorbidities.

Perceived causes of kidney failure: Self-reported reasons including hypertension, diabetes, medication misuse, kidney stones, and other conditions.

State-wise differences: Comparison of perceived causes and demographic characteristics between patients in Haryana and Uttar Pradesh.

The data was collected simultaneously from all centres in August 2024, ensuring consistency in the administration of the questionnaire and accuracy in recording responses.

Measures and outcomes

Primary outcome: The distribution of perceived causes of kidney failure among patients.

Secondary outcomes: Age and gender distribution, state-wise variations in self-reported causes and the prevalence of comorbidities such as hypertension and diabetes.

Procedures

Patient recruitment

Eligible participants were identified during their dialysis sessions. Verbal and written informed consent were obtained before participation.

Questionnaire administration

Trained healthcare professionals conducted face-to-face interviews using the structured questionnaire to ensure clarity and minimize bias.

Data validation

Collected data were cross-verified for accuracy and completeness before analysis.

Data analysis

Descriptive statistical methods were used to analyse the data. Frequencies and percentages were calculated for demographic variables, perceived causes of kidney failure, and other relevant factors. State-wise comparisons between Haryana and Uttar Pradesh were conducted to highlight regional differences. The data were processed using statistical software to ensure accuracy and reliability.

RESULTS

The finding presents all useful data about patients who needed hemodialysis treatment. High blood pressure was identified as the primary cause of kidney failure. Regional differences between Haryana and Uttar Pradesh surfaced because local populations understood kidney failure differently and reacted to risk factors in different ways. This research shows that kidney failure results from multiple factors while demonstrating why area-specific treatment plans need to address risk factors in different parts of the nation.

Table 1 finding highlight the age distribution of patients undergoing hemodialysis. The data was grouped into age bins, with the majority of the patients falling within the age ranges of 31-40 years (22.1%), 41-50 years (25.1%), and 51-60 years (20.4%). This indicates that a significant proportion of patients are middle-aged. Lowest frequency was observed in the youngest (1-10 years, 0.2%) and oldest (above 80 years, 0.4%) age categories. These findings provide insights into the age demographics of patients, which can guide resource allocation and tailored medical interventions for specific age groups.

Table 2 illustrating gender distribution of patients undergoing hemodialysis reveal a significantly higher proportion of males (70.9%) compared to females (29.1%). This indicates that male patients represent the majority of the study population. The data underscores potential gender-related differences in the prevalence or progression of kidney diseases necessitating hemodialysis.

Table 3 provides an overview of the various causes of kidney failure among patients receiving hemodialysis, with the number of patients and corresponding percentages for each cause. The leading cause of kidney failure among patients undergoing hemodialysis was high blood pressure, accounting for 60.35% of cases. Diabetes was the second most common cause, affecting 17.02% of patients. A significant overlap was noted with 11.71% of patients reporting both diabetes and high blood pressure as contributing factors. Painkiller usage was reported by 21.30% of the patients, indicating its substantial role in kidney failure. Other causes included kidney stones (10.36%), family history of kidney disease (5.59%), and other associated diseases (5.22%). These findings highlight the multifactorial nature of kidney failure and the need for targeted preventive measures addressing modifiable risk factors.

Table 1: Age distribution of patients undergoing hemodialysis.

Age (binned) (in years)		N	%	Valid %	Cumulative %
Valid	1.00-10.00	5	0.2	0.2	0.2
	11.00-20.00	89	2.7	2.7	2.9
	21.00-30.00	472	14.5	14.5	17.4
	31.00-40.00	719	22.1	22.1	39.5
	41.00-50.00	817	25.1	25.1	64.6
	51.00-60.00	664	20.4	20.4	85.0
	61.00-70.00	375	11.5	11.5	96.5
	71.00-80.00	101	3.1	3.1	99.6
	Above 80	12	0.4	0.4	100.0
	Total	3254	100.0	100.0	

Table 2: Gender distribution of patients undergoing hemodialysis.

Gender		N	%	Valid %	Cumulative %
Valid	Male	2306	70.9	70.9	70.9
	Female	948	29.1	29.1	100.0
	Total	3254	100.0	100.0	

Table 3: Causes of kidney failure in patients undergoing hemodialysis.

Cause of kidney failure	N	Percentage (%)
Diabetes	554	17.02
Blood pressure	1964	60.35
Diabetes and blood pressure	381	11.71
Kidney stones	337	10.36
Painkiller usage	693	21.30
Family history of kidney disease	182	5.59
Other associated diseases	170	5.22

Table 4: Self-reported reasons for kidney failure in patients undergoing hemodialysis.

According to you, what is the reason for your kidney failure?		N	%	Valid %	Cumulative %
Valid	Blood pressure	1770	54.4	54.4	54.4
	Blood pressure and diabetes both	94	2.9	2.9	57.3
	Diabetes	292	9.0	9.0	66.3
	Excessive use of drugs	316	9.7	9.7	76.0
	Fever and infection	218	6.7	6.7	82.7
	Kidney stone and other kidney problems	114	3.5	3.5	86.2
	Others	421	12.9	12.9	99.1
	Urinary infection	29	0.9	0.9	100.0
	Total	3254	100.0	100.0	

Table 5: Perceived causes of kidney failure among hemodialysis patients by state.

As per clinical history, what is the reason for your kidney failure?										
State		**Blood pressure**	**BP and diabetes both**	**Diabetes**	**Excessive use of drugs**	**Fever and weakness**	**Kidney stone and other kidney problems**	**Others**	**Urinary infection**	**Total**
Haryana	Count	864	36	125	44	19	54	110	13	1265
	% within state	68.30	2.80	9.90	3.50	1.50	4.30	8.70	1.00	100
Uttar Pradesh	Count	906	58	167	272	199	60	311	16	1989
	% within state	45.60	2.90	8.40	13.70	10	3.00	15.60	0.80	100
Total	Count	1770	94	292	316	218	114	421	29	3254
	% within state	54.40	2.90	9.00	9.70	6.70	3.50	12.90	0.90	100

Table 4 summarize patient's self-reported reasons for kidney failure, presenting the frequency, percentage, valid percentage, and cumulative percentage for each stated cause.

As per clinical history for kidney failure indicate that blood pressure was the most commonly cited cause, reported by 54.4% of the patients. A smaller proportion (2.9%) attributed their condition to a combination of blood pressure and diabetes, while 9.0% identified diabetes alone

as the primary cause. Excessive use of drugs was reported by 9.7% of patients, while fever and infection were mentioned by 6.7%. Causes such as kidney stones and other kidney-related problems accounted for 3.5% and urinary infections were the least cited cause at 0.9%. Notably, 12.9% of patients attributed their kidney failure to other unspecified reasons, reflecting a range of possible factors. These findings emphasize the prevalence of hypertension and diabetes as major contributors to kidney failure, along with the significance of other risk factors such as medication misuse.

Table 5 display the distribution of perceived causes of kidney failure as reported by patients from Haryana and Uttar Pradesh, along with total percentages for each cause across both states. The perceived causes of kidney failure varied significantly between Haryana and Uttar Pradesh. In Haryana, the majority (68.3%) attributed their condition to blood pressure, with smaller proportions reporting diabetes (9.9%) and other causes like kidney stones or other kidney problems (4.3%). Meanwhile, patients in Uttar Pradesh showed a more diverse range of causes. Blood pressure was still the leading cause (45.6%), but excessive drug use (13.7%), fever and weakness (10.0%), and other unspecified causes (15.6%) were also prominent. Overall, across both states, blood pressure emerged as the most commonly cited reason (54.4%), followed by other causes (12.9%) and excessive drug use (9.7%). These findings highlight regional differences in the perceived etiologies of kidney failure, reflecting variations in awareness, risk factors, and health conditions.

DISCUSSION

The present study provides critical insights into the demographic characteristics, gender distribution, and underlying causes of kidney failure among patients undergoing hemodialysis, Highlighting key trends and patterns to support the design of targeted healthcare interventions. In study findings, patients from 31 to 40 years and 41 to 50 years show the highest numbers receiving hemodialysis treatment with 22.1% and 25.1% respectively. Research shows that middle-aged people have a higher chance of developing kidney failure due to hypertension and diabetes. The 1-10 and 80 years plus age groups appear rarely among hemodialysis patients because kidney failure occurs naturally less often in children under 10 and advancing age limits the ability of those over 80 to survive until kidney failure takes effect. Our research shows that focus on stopping kidney failure should begin with middle-aged patients who need better medical control of hypertension and diabetes. Research groups led by Kumar et al and Burrows et al show that middle-aged people suffer kidney damage mostly due to ongoing medical conditions and unhealthy daily routines.[8,10] Kumar et al shows why early treatment helps slow the massive increase of ESRD among this age group.[9]

Our study demonstrates that male make up 70.9% of patients in hemodialysis while only 29.1% are female. The results support Ahmed et al who showed that natural protection from estrogen in female kidneys combined with more diabetes and high blood pressure in men leads to this gender difference.[11] The research by Kumar et al shows that healthcare access problems plus delayed medical detection makes women receive treatment much later than men.[9] Behavioral contributors, such as smoking and alcohol use, further exacerbate kidney damage in males, as noted by Kumar et al.[12] Addressing both biological and sociocultural factors is vital for reducing these disparities and improving outcomes for both genders.

Another major finding indicated that patient with high blood pressure caused 60.35% of kidney failures and diabetes accounted for 17.02%, with an additional 11.71% of cases linked to hypertension and diabetes together. Patients taking painkillers develop kidney damage at a rate of 21.30% showing how unrestricted medication use harms renal health. Research by Gejjalagere et al shows that hypertension and diabetes cause most cases of CKD worldwide.[5] Studies from Ghimire et al show NSAIDs can damage the kidneys so stricter medication rules need to be enforced and patients should learn more about drug side effects.[7] Our patient outcomes show how different factors work together to create kidney failure which demands comprehensive tests and prevention planning. Self-reported causes of kidney failure largely align with clinical findings, with hypertension (54.4%) being the most frequently cited cause. However, discrepancies were noted, as some patients attributed their condition to excessive drug use (9.7%) or fever (6.7%). These gaps in patient awareness reflect a pressing need for educational initiatives to enhance understanding of kidney disease risk factors. Similar trends were observed by Sanket et al who emphasized the importance of addressing misconceptions and promoting accurate knowledge about CKD.[6]

Regional variations reported different sources of kidney failure on each side of the Haryana-Uttar Pradesh border. According to patients in Haryana hypertension stood as the leading culprit at 68.3% of cases but in Uttar Pradesh patients identified several other major contributors including drug abuse at 13.7% and fever and weakness at 10.0%. The distinctions result mostly from changes in medical care availability alongside lifestyle and disease knowledge. The observed regional variations align with findings from other studies that emphasize the influence of geographic, socioeconomic, and cultural factors on disease perceptions and risk factors. Kumar et al noted significant regional disparities in CKD prevalence and associated risk factors across India, often linked to differences in healthcare accessibility and awareness.[8] Similarly, Chakravarti et al highlighted that rural populations, particularly in Uttar Pradesh, tend to report a broader spectrum of perceived causes, including fever and weakness, due to limited access to diagnostic facilities and health education.[13] Similarly, Shipra et al found that hypertension awareness and management were significantly better in northern states like Haryana compared to others, reflecting regional healthcare system

strengths.[14] These studies underscore necessity for region-specific educational and healthcare interventions to address CKD effectively. To summarize, emphasis must be placed on importance of early detection and management of modifiable risk factors such as HTN, diabetes and medication use to prevent kidney failure. Observed demographic and regional variations underscore need for customized healthcare strategies to address unique needs of different patient populations.

Limitations

Although the study sheds light on the causes of renal failure among hemodialysis patients in Haryana and Uttar Pradesh, it is important to acknowledge many methodological limitations. Being a cross-sectional study, it limits the capacity to determine causality or see changes over time by capturing patient impressions and clinical data at one moment in time. Relying on self-reported causes raises the risk of recall bias and misclassification, especially in situations where patients do not grasp the medical justifications for their renal failure. The exclusion of patients with cognitive impairments and insufficient medical records may also have contributed to selection bias, hence restricting the generalizability of the results. Regional variations observed between Haryana and Uttar Pradesh can potentially indicate different degrees of awareness instead of true variations in disease cause. Moreover, using descriptive statistics without multivariable analysis limits more in-depth investigation of confounding variables affecting the causes of renal disease.

CONCLUSION

The study conducted by DCDC kidney care analysis reveals that hypertension, diabetes, and medication misuse are the primary causes of kidney failure among patients undergoing hemodialysis. Regional differences in perceived causes highlight variations in awareness and healthcare practices between Haryana and Uttar Pradesh. These findings emphasize the need for targeted interventions to address modifiable risk factors and regional disparities in kidney failure management.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kalra V, Agarwal D, Anis Y. Profiling of kidney disease patients undergoing hemodialysis. Int J Res Med Sci 2025;13:2398-403.