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Octogenarians on dialysis; navigating survival amidst struggles

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ABSTRACT

Introduction: The escalating longevity facilitated by medical advancements has led to a surge in elderly individuals grappling with chronic kidney disease (CKD) and progressing to end-stage renal disease (ESRD).

Objectives: Our study addresses the paucity of research on octogenarians undergoing dialysis, a highly co-morbid and frail subset, particularly in the context of a resource-limited setting like India.

Patients and Methods: A retrospective observational study at Kasturba Medical College and Hospital in Manipal, India, examined 18 octogenarian dialysis patients from 2017 to 2022. Clinical details, including age, co-morbidities, dialysis patterns, and laboratory data, were collected. The Cox-proportional hazards model assessed factors influencing survival.

Results: The majority-initiated dialysis in emergencies (72%), predominantly via central venous catheters. Hospitalizations post-dialysis were common (median 2.5). Survival rates at 1, 3, and 5 years were 61%, 54%, and 44%, respectively. Sudden cardiac death (64%) emerged as the predominant cause, with a significant impact of a higher Charlson comorbidity index on survival (HR 3.11; 95% CI [1.21-7.89]; $P = 0.018$).

Conclusion: Octogenarian dialysis patients, marked by substantial co-morbidities, exhibit reduced survival, particularly with higher comorbidity scores. Hospitalizations contribute significantly to morbidity. Our study underscores the need for nuanced care strategies tailored to this vulnerable population.

Original Article

Implication for health policy/practice/research/medical education:
Dialysis in the very elderly, especially octogenarian patients, needs careful consideration of their co-morbidities before initiating dialysis. This study highlights the clinical profile of octogenarian patients on dialysis and gives insights into the vascular access characteristics, hospitalization, and factors associated with poor survival. This knowledge may be beneficial in decision-making around dialysis for elderly end-stage kidney disease patients.

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Introduction

The remarkable advancements in medical science that have contributed to the increased longevity of people stand as one of the most significant achievements of the past century (1). Despite the rising prevalence of lifestyle-related diseases such as diabetes, hypertension, heart disease, and obesity, medical science has ensured that even individuals with these co-morbidities can enjoy extended lifespans (2). Consequently, we are witnessing a growing population of individuals living longer with these conditions, eventually leading to the development of chronic kidney disease (CKD) and progressing toward end-stage renal disease (ESRD), necessitating renal replacement therapy.

Elderly patients, especially those aged 75 years and above, are experiencing one of the most rapid increases in the incidence rates of ESRD among various age groups in the developed world (3). Providing renal replacement therapy for this geriatric population presents a formidable challenge, given the multitude of comorbidities and frailty

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they often exhibit. Reduced lifespan, diminished quality of life, and studies revealing limited benefits with aggressive therapies often justify a supportive care approach for this group of patients (4). While age is a crucial factor in determining clinical outcomes in dialysis, several other variables, such as nutritional status, functional capacity, and the extent of underlying co-morbid conditions, also come into play.

Our study focused on a cohort of octogenarians undergoing dialysis, representing a highly co-morbid and frail group that has received limited attention in the existing literature. We aimed to investigate the clinical profile of these patients, their dialysis patterns, hospitalization rates, and factors associated with survival. Given the relatively limited research conducted on this population in a developing, resource-limited country like India and the Indian subcontinent, our study has the potential to provide novel insights into the complex interplay of factors that determine prognosis and outcomes in these patients.

Objectives

The primary objective of our research was to examine the clinical profile of octogenarian patients undergoing dialysis at our center, focusing on factors such as age at initiation, co-morbidities, hospitalizations, and survival. Our secondary objective was to identify factors associated with a higher risk of poor survival.

Patients and Methods

Study design

This retrospective observational study was conducted at Kasturba Medical College and Hospital in Manipal, Karnataka, India. We included all patients aged 80 years and above who underwent dialysis or were under follow-up at our hospital during the period from January 1st, 2017, to December 31st, 2022. Inclusion criteria encompassed patients aged 80 years and above with a confirmed diagnosis of CKD who had been on maintenance dialysis for at least three months, irrespective of the age at which dialysis was initiated. Exclusion criteria encompassed patients who had started dialysis for acute kidney injury or suspected acute-on-CKD, those lost to follow-up, and individuals who transitioned to conservative care after the initial period on dialysis.

Clinical details

We collected clinical details of the patients, including age at dialysis initiation, age at their last follow-up or time of death, body mass index (BMI), gender, and co-morbidities. The Charlson comorbidity score was calculated at baseline during dialysis initiation (5). Details related to dialysis, such as dialysis access, frequency, and duration (for hemodialysis patients), were also recorded. Information on patient hospitalizations after dialysis initiation and mortality was documented. Laboratory data were gathered, including hemoglobin and albumin (averaged over the last six months). The investigators had access to outpatient, inpatient, and dialysis-related records from the medical records department for the purpose of this study. The primary outcome measure was survival on dialysis.

Statistical analysis

Continuous variables were expressed as mean with standard deviation (SD) or median with inter-quartile range (IQR) after plotting for normality. Categorical variables were expressed as numbers and percentages. Survival of patients was calculated using life table analysis to calculate one year, three years, and five years of survival. The Cox-proportional hazards model was conducted to assess the effects of baseline characteristics on survival. All the data analysis was done using IBM SPSS statistics for Windows, version 22.0. A p-value <0.05 was considered significant.

Results

Baseline characteristics

During the study period, 18 patients aged above 80 years were undergoing dialysis. The majority of the cohort comprised males (66%). The mean age at the initiation of dialysis was 80 years (± 3.86). Approximately 44.4% of the patients had CKD attributable to diabetic kidney disease, and more than half had a prior history of ischemic heart disease. Notably, nearly 72% of the patients-initiated dialysis on an emergency basis, with an equal number being commenced via a central venous catheter (CVC). It is noteworthy that only one patient was receiving maintenance dialysis through a tunneled dialysis catheter before their demise; the remaining patients had functional arterio-venous fistulas for dialysis. Furthermore, one patient transitioned to peritoneal dialysis after the initial use of hemodialysis through a temporary CVC. The median Charlson comorbidity index for the cohort stood at 8 (IQR 8-9) (Table 1 for baseline characteristics).

Hospitalizations

After the initiation of dialysis, patients continued to require hospitalizations, with a median number of 2.5 (IQR 1.5-5.5) admissions. The most prevalent reason for admission was volume overload, accounting for 36.4% of all admissions (Figure 1).

Survival

As of the last follow-up, 11 patients (61.1%) have unfortunately passed away. A life table analysis revealed survival rates of 61%, 54%, and 44% at 1, 3, and 5 years,

Table 1. Baseline characteristics

Baseline characteristics	Dialysis group (n = 18)
Age in years (SD)	
Last follow-up/death	83.611 (2.852)
HD initiation	80.111 (3.848)
Gender (%)	
Male	12 (66.666)
Female	6 (33.333)
BMI at HD initiation (SD)	22.348 (4.452)
Primary renal disease (%)	
Diabetic kidney disease	8 (44.444)
Hypertensive nephropathy	5 (27.777)
CTIN	5 (27.777)
Comorbidities (%)	
Diabetes	11 (61.111)
Hypertension	18 (100)
Ischemic heart disease	10 (55.555)
CVA	3 (16.666)
PVD	2 (11.111)
Other	11 (61.111)
Charlson comorbidity index (SD)	8.44 (1.300)
HD access at initiation (%)	
CVC	13 (72.222)
Brachiocephalic AVF	5 (27.777)
Present HD access (%)	
CVC	1 (5.555)
Brachiocephalic AVF	16 (88.888)
Peritoneal	1 (5.555)
HD duration (IQR)	32.5 (6-68.25)
HD frequency (%)	
Twice weekly	17 (94.444)
Thrice weekly	1 (5.555)
CKD Duration prior to HD initiation (IQR)	5 (5-7.5)
HD Initiation (%)	
Planned	5 (27.777)
Emergency	13 (72.222)
Biochemical parameters (SD)	
Hemoglobin (g/dL)	9.233 (1.115)
Albumin (g/dL)	3.566 (0.779)
No. of hospitalizations (IQR)	2.5 (1-5.5)
Mortality (%)	11 (61.1%)

SD, Standard deviation; BMI, Body mass index; HD, Hemodialysis; CTIN, Chronic tubulointerstitial nephritis; CVA, Cerebrovascular accident; PVD, Peripheral vascular disease; CVC, Central venous catheter; AVF, Arteriovenous fistula

respectively. Notably, two patients initiated dialysis before the age of 75 years and exhibited impressive dialysis vintage with durations of 8 years (106 months) before their demise and 10 years (130 months), remaining alive at the last follow-up. Sudden cardiac death emerged as the most common cause, accounting for 64% of the cases, with seven patients experiencing these events in the comfort of their homes (Figure 2).

Factors predicting survival duration

A Cox proportional hazards model was employed to analyze survival duration, with the following variables included in the model: age at dialysis initiation, BMI at dialysis initiation, Charlson comorbidity index, the presence of diabetes, and the presence of ischemic heart disease. The hazard ratio was found to be significant for a higher Charlson comorbidity index (HR – 3.11; 95% CI [1.21-7.89]; P = 0.018). However, the remaining parameters did not reach statistical significance (Table 2).

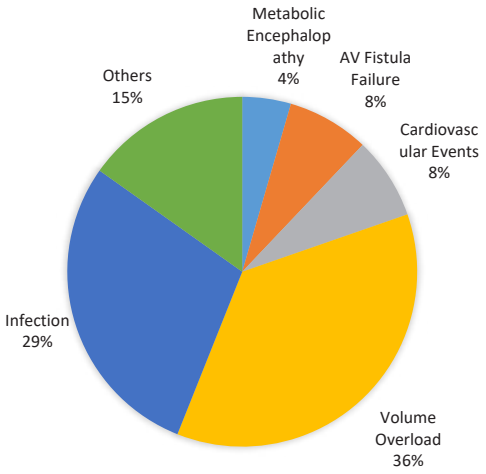

Figure 2. Causes for hospitalization post-dialysis initiation.

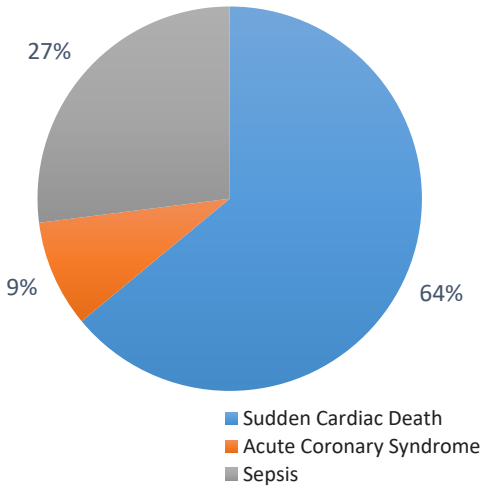

Figure 2. Causes of mortality.

Table 2. Cox proportional hazards model

Variable	HR	95% CI	*P* value
Charlson comorbidity index	3.11	1.21–7.99	0.018
Age at dialysis initiation	1.15	0.91–1.44	0.221
Diabetes mellitus	0.16	0.02–1.03	0.055
BMI at dialysis initiation	0.96	0.79–1.16	0.674
Ischemic heart disease	0.21	0.03–1.65	0.139

CI, Confidence interval; HR, Hazard ratio; BMI, Body mass index.

Discussion

Managing end-stage kidney disease in the very elderly presents not only a therapeutic challenge but also raises ethical and social concerns. Our study represents one of the most extensive Indian series focusing on dialysis in very elderly individuals, specifically octogenarians, with a median age at the initiation of dialysis set at 80 years. For context, Jeloka et al included elderly patients with a median age of 71.7 years undergoing dialysis. Similar to our study, diabetes emerged as the predominant cause of end-stage kidney disease (6). Moreover, elderly patients often bear a considerable burden of co-morbidities. Chae et al found that nearly one-third of elderly patients on dialysis have four or more co-morbidities, as evaluated by the Charlson comorbidity index (7). In our cohort of octogenarians, the co-morbidity burden was notably high, with a median Charlson comorbidity index (CCI) score of 8.4. Similarly, Bento et al, studying Portuguese octogenarian patients with a mean age of 84 years at HD initiation, reported a mean CCI score of 8, reaffirming the significant co-morbidity burden in this age group.

In addition to co-morbidities, we also examined the vascular access patterns of our patients. A striking 72% of patients initiated dialysis through temporary uncuffed dialysis catheters. While data specific to very elderly dialysis patients in India is limited, results from multi-center studies by the Nephrology Association of Karnataka (NAK) group and online survey findings by Bansal et al show that nearly 75% of Indian patients commence dialysis using uncuffed dialysis catheters (8,9). Roldao et al, in their retrospective cohort of very elderly patients over 80 years, found nearly 75% initiated dialysis through central venous catheters (10). Moreover, prospective registry data from the ANZDATA revealed that almost 50% of elderly dialysis patients over 75 years started dialysis without permanent access in place (11). The preference for arteriovenous fistulas (AVF) as the recommended vascular access option, as per numerous guidelines, raises concerns regarding its suitability for very elderly patients. Given their comorbidity burden, reduced life expectancy, and compromised vasculature, very elderly patients exhibit reduced patency after AVF surgery. Patients above 65 years tend to experience almost twice the failure rate compared to their younger counterparts (12).

Patients on dialysis are prone to multiple hospitalizations, contributing significantly to both morbidity and increased healthcare costs. In our study, every patient experienced at least one hospitalization after dialysis initiation. A longitudinal cohort study by van Loon et al, focusing on elderly dialysis patients with a median age of 75 years, revealed that nearly 50% of patients required at least one hospitalization within the initial six months of dialysis initiation (13). In a retrospective cohort study by Clark et al, elderly patients underwent a median of two hospitalizations over a median follow-up period of 2.4 years, a finding consistent with our study (14).

As per available data, elderly patients, in general, exhibit poorer survival compared to younger patient cohorts. While some studies have reported lower survival rates in patients on hemodialysis aged over 75, others argue that age alone is not a reliable predictor of poor outcomes for patients on chronic dialysis. Instead, it should involve the consideration of patient comorbidities, functional status, and other complications. Unfortunately, data from India regarding this aspect are scarce, with only a few studies addressing this issue. In our study, survival rates were 61%, 54%, and 44% at 1, 3, and 5 years, respectively. In comparison, Jeloka and colleagues' study among Indian patients reported a 1-year and 3-year survival rate of 78% and 23.6%, respectively. While our 1-year survival rate was lower in comparison, our 3-year and 5-year survival rates exceeded those reported by Jeloka et al (6). Wachterman et al, studying elderly patients over 65 years in the US, found a 1-year survival rate of 45% after dialysis initiation (15). It is essential to note that the data from both the Indian and US studies were based on patient cohorts from 1998-2014, while our study is more recent, potentially accounting for the improved survival seen in our patients. Our study revealed an inverse relationship between survival and a higher comorbidity score, as assessed by CCI. This observation aligns with a study in the Taiwanese population by Wu et al, where higher comorbidities among elderly dialysis patients were associated with poorer survival (16). Similarly, Pyart et al, studying a cohort of elderly patients with a median age of 78 years referred for pre-dialysis counselling, found that a higher CCI was linked to poorer survival (17). Another study by Peri et al, with a patient cohort featuring a median age of 83.7, included CKD patients primarily due to hypertension (37%) and diabetic kidney disease. This study demonstrated a survival benefit with hemodialysis, particularly when patients had a low comorbidity index. The average number of comorbidities in their study was 3.1, primarily featuring coronary artery disease, followed by peripheral vascular disease. Cardiovascular events were

the most common cause of death, followed by sepsis, in line with our study findings (18). Murtagh et al estimated the time from eGFR (estimated glomerular filtration rate) <15 mL/min/1.73 m^2 to death between patients on hemodialysis and those under active conservative management (involving the correction of volume overload, anemia, and nutritional status). The study suggested a survival benefit in patients over 75 years of age on dialysis over conservative management. However, this advantage was found to be lost when comorbidities exceeded two, particularly when one of them was ischemic heart disease (19). According to the study by Polkinghorne et al, using a central venous catheter as the initial HD access was associated with an increased 1-year mortality rate compared to arteriovenous (AV) fistula (20). Nevertheless, in our study, most patients initiated HD with an IJV as the access and were subsequently shifted to an AV fistula for maintenance HD. Therefore, this did not serve as a predictor of mortality in our case.

While some studies suggest a linear association between diabetes and mortality, and others argue that late-onset diabetes may be a favorable predictor, our study maintains a neutral standpoint where mortality is equally distributed among diabetics and non-diabetics. Notably, the strength of our study lies in it being one of the largest Indian and South Asian series of octogenarian patients on dialysis studied in the last 5 years, demonstrating improved survival compared to studies available almost a decade ago.

Conclusion

Octogenarian patients face a substantial burden of co-morbidities, which is associated with reduced survival, particularly among those with higher comorbidity scores. Moreover, these patients experience a significant number of hospitalizations following the initiation of dialysis, further contributing to their overall morbidity.

Limitations of the study

It is important to acknowledge the limitations of this study. Firstly, this research is based on a single-center study, which may restrict the generalizability of the findings. Variations in dialysis protocols and preferences for vascular access across different centers could potentially influence the results. Secondly, due to the retrospective nature of the study, we were limited to obtaining data from patients in electronic medical records (EMR) over the last five years. This constraint may have resulted in a smaller sample size, potentially affecting the study's comprehensiveness and external validity.

Authors' contribution

Conceptualization: Srinivas Vinayak Shenoy, Jhalak Agrohi.
Data curation: Srinivas Vinayak Shenoy, Jhalak Agrohi, Saksham Kohli.
Formal analysis: Srinivas Vinayak Shenoy, Daksh Agrohi.
Investigation: Daksh Agrohi, Jhalak Agrohi, Saksham Kohli.
Methodology: Srinivas Vinayak Shenoy, Saksham Kohli, Mohan Varadanayakanahalli Bhojaraja.
Project administration: Srinivas Vinayak Shenoy.
Resources: Jhalak Agrohi.
Supervision: Srinivas Vinayak Shenoy, Shankar Prasad Nagaraju.
Validation: Shankar Prasad Nagaraju, Attur Ravindra Prabhu, Dharshan R, Indu Rao.
Visualization: Jhalak Agrohi, Saksham Kohli.
Writing–original draft: Srinivas Vinayak Shenoy, Jhalak Agrohi, Saksham Kohli.
Writing–review & editing: Srinivas Vinayak Shenoy, Saksham Kohli, Mohan Varadanayakanahalli Bhojaraja, Shankar Prasad Nagaraju, Attur Ravindra Prabhu, Dharshan Rangaswamy, Indu Ramachandra Rao.

Availability of data and materials

Any additional data required beyond what is available in the article can be shared with the request being sent to the corresponding author.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

The research conducted in this study adhered to the principles outlined in the Declaration of Helsinki and was approved by the ethics committee of Kasturba hospital and medical college Manipal, with reference number IEC2:34/2023. Informed consent for the study was obtained at the time of admission. The authors have fully complied with ethical issues, such as plagiarism, data fabrication, and double publication.

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