

Characteristic of Patients Undergoing Initiation of Emergency Hemodialysis at Ngoerah Hospital Denpasar in 2023

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ARTICLE INFO	ABSTRACT
<p><i>Article history:</i> Received: January 4, 2026 Accepted: April 13, 2026 Published Online: April 24, 2026</p> <hr/> <p><i>Corresponding Author:</i> Kadek Sinta Dwi Saraswati, Department of Internal Medicine, Universitas Udayana, Denpasar, Indonesia, sintadwi.saraswati@gmail.com</p>	<p>Background: Initiation of emergency hemodialysis is associated with higher morbidity and mortality compared to planned hemodialysis. Identifying the characteristics of patients undergoing emergency hemodialysis is essential to improving clinical outcomes.</p> <p>Objective: This study aimed to describe the clinical characteristics of patients who initiated emergency hemodialysis at Ngoerah Hospital in Denpasar in 2023.</p> <p>Methods: This cross-sectional descriptive study used secondary data obtained from the patient registry. Total sampling was used to include all patients who initiated emergency hemodialysis at Ngoerah Hospital between January 1 and March 31, 2023. Data were analyzed descriptively.</p> <p>Results: A total of 70 patients were included. The mean age was 54.54 ± 14.6 years, and 52.3% were male. The most common etiology of CKD was obstructive nephropathy (32.8%), followed by diabetic kidney disease (21.4%). Major comorbidities included heart disease (35.7%), malignancy (25.8%), and diabetes mellitus (21.4%). The most frequent indications for emergency hemodialysis were metabolic acidosis (71.8%). Temporary jugular vein central venous dialysis catheters were the most commonly used vascular access (67.6%). Only 21.1% of patients had received pre-dialytic monitoring. The median estimated glomerular filtration rate (eGFR) was 5.69 mL/min/1.73 m², the median serum creatinine was 8.47 mg/dL, and the median serum potassium level was 5.6 mEq/L.</p> <p>Conclusion: Patients initiating emergency hemodialysis at Ngoerah Hospital demonstrated diverse clinical characteristics. The high prevalence of metabolic acidosis along with low rates of pre-dialytic monitoring, highlights the need for improved early detection and management of CKD to reduce emergency hemodialysis initiation.</p> <p>Keywords: Emergency hemodialysis, patient characteristics, chronic kidney disease, Ngoerah Hospital Denpasar.</p>

Introduction

Chronic kidney disease (CKD) represents a global health problem, with its prevalence steadily increasing every year. Chronic kidney disease is defined as kidney damage that occurs for more than 3 months, in the form of structural or functional abnormalities, with or without a decrease in glomerular filtration rate or

a glomerular filtration rate <60ml/minute/1.73m² for 3 months with or without kidney damage. CKD is a condition of progressive loss of kidney function, which ultimately results in the need for kidney replacement therapy, such as dialysis or kidney transplantation.¹

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Chronic kidney disease affects approximately 800 million people worldwide. The prevalence of CKD is 8.6% and 9.6% in men and women in high-income countries, and 10.6% and 12.5% in men and women in low- and middle-income countries.² A meta-analysis of 100 studies involving 6,908,440 patients reported a global prevalence of CKD stages 1–5 is 13.4% and 10.6% for CKD stages 3–5. The prevalence of CKD based on stage is 3.5% (stage 1), 3.9% (stage 2), 7.6% (stage 3), 0.4% (stage 4), and 0.1% (stage 5).³ In Indonesia, based on 2018 Riskesdas data, the prevalence of CKD reached 3.8% of the population.⁴ Chronic kidney disease has emerged as one of the main causes of death throughout the world, and is one of the non-communicable diseases that has shown an increase in mortality during the last 2 decades.²

Risk factors for CKD include old age, long-term exposure to nephrotoxins (non-steroidal anti-inflammatory drugs [NSAIDs], antibiotic therapy such as gentamicin), chemotherapy, history of nephrolithiasis or recurrent urinary tract infections, the presence of comorbidities (diabetes, hypertension, autoimmune diseases, chronic infections), family history of kidney disease, and genetics.⁵

The early stages of CKD are generally asymptomatic, and symptoms usually appear in stages 4 or 5. Some common symptoms and signs in the advanced stages of CKD include nausea, loss of appetite, vomiting, weight loss, weakness, sleep disturbances, oliguria, decreased consciousness, muscle cramps, leg swelling, pruritus, and shortness of breath due to pulmonary edema. On physical examination, signs are often found in the form of skin pigmentation, scratch marks due to pruritus, and uremic frost.⁶ The diagnosis of CKD is made based on clinical conditions, time, and laboratory examination, most often by estimating eGFR as a marker of filtration, such as serum creatinine or by looking at the presence of albumin in urine.^{5,6} In the end-stage of CKD, patients require renal replacement therapy, with hemodialysis being the most commonly used modality. However, not all patients can start hemodialysis in a planned manner. In many cases, patients must undergo

emergency initiation of hemodialysis. Studies show that only around 10.5% of end-stage renal disease (ESRD) patients have arteriovenous fistula (AVF) access at the time of hemodialysis initiation.⁷

Emergency hemodialysis is a hemodialysis procedure that is carried out suddenly in patients with life-threatening clinical conditions, such as severe uremia, hyperkalemia, fluid overload, or uncontrolled metabolic acidosis. Emergency hemodialysis initiation is often associated with an increased risk of morbidity, mortality, and more expensive medical costs compared to planned hemodialysis initiation. Therefore, understanding the characteristics of patients undergoing emergency hemodialysis is essential to improve patient management and clinical outcomes. Previous studies showed that acute kidney injury (AKI) is the leading contributor to emergency hemodialysis initiation, followed by stroke, diabetes, and heart failure. To avoid the need for emergency initiation of hemodialysis, patients with end-stage renal disease (ESRD) should be referred to a nephrologist early. In addition, ESRD patients with a clinical history of AKI, stroke, diabetes, or heart failure should be carefully observed and given pre-planned initiation of dialysis.⁸

Identification of patient characteristics encompasses various aspects, such as demographics, etiology of kidney disease, indications for hemodialysis, comorbidities, and pre-dialytic monitoring. A better understanding of these characteristics may help in the development of more effective prevention, early detection, and management strategies to reduce the incidence of emergency hemodialysis and improve patient clinical outcomes.⁹

Ngoerah Hospital in Denpasar, one of the main referral centers in Bali, handles a large number of hemodialysis cases, including emergency cases. However, specific data on the characteristics of patients initiating emergency hemodialysis at this hospital remain limited. This study aims to fill this knowledge gap by analyzing the characteristics of patients undergoing

emergency hemodialysis initiation at Ngoerah Hospital, Denpasar, during the period 1 January - 31 March 2023.

Methods

The research method used is a cross-sectional descriptive study based on secondary data from the patient register. Subjects were all patients who initiated emergency hemodialysis in the hemodialysis ward at Ngoerah Hospital, Denpasar, from January 1 to March 31, 2023. This study used a total sampling method, in which all patients who met the subject selection criteria were included. The inclusion criteria used were patients who were undergoing emergency hemodialysis initiation who had complete register data (age, gender, ethnicity, etiology, comorbidities, emergency HD indications, vascular access, pre-dialytic monitoring, kidney function, and electrolytes) in the Hemodialysis ward at Ngoerah Denpasar Hospital from

January 1 to March 31, 2023. Exclusion criteria were registered data outside Ngoerah Denpasar Hospital or incomplete register data. The sample size comprised all cases that met the inclusion and exclusion criteria, namely 70 samples. Data analysis was carried out using descriptive analysis. Data are presented in a frequency distribution table.

Results

A total of 70 patients who initiated emergency hemodialysis and met the inclusion and exclusion criteria were included in this study. This research was conducted to examine the characteristics of all patients who underwent emergency initiation of hemodialysis at Ngoerah Hospital from 1 January to 31 March 2023. Data on patient characteristics are presented in Table 1.

Table 1. Patients Characteristic

	n (%) (n = 70)
Age (Years), mean \pm SD	54,54 \pm 14,6
Gender, n (%)	
Male	37 (52,3)
Female	33 (47,1)
Ethnic, n (%)	
Balinese	48 (68,5)
Javanese	17 (24,2)
West Nusa Tenggara	2 (2,8)
East Nusa Tenggara	2 (2,8)
Armenia	1 (1,4)
Etiology, n (%)	
Obstructive Nephropathy	23 (32,8)
Diabetic kidney disease	15 (21,4)
Nephrosclerosis	7 (10,0)
Contrast-induced nephropathy	3 (4,3)
Chronic Pyelonephritis	4 (5,7)
Lupus nephritis	2 (2,8)
Diabetic kidney disease and Nephrosclerosis	3 (4,3)
Others	12 (17,1)
Unknown	3 (4,3)

Comorbidities, n (%)		
Heart disease		25 (35.7)
Malignancy		18 (25.8)
Diabetes mellitus		15 (21,4)
Hypertension		7 (10.0)
Pneumonia		5 (7.1)
Sepsis		9 (12.9)
Others		17 (24.3)
Indication, n (%)		
Anuria		7 (9,9)
Metabolic Acidosis		51 (71,8)
Doubling Creatinine		6 (8,5)
Pulmonary Edema		13 (18,3)
Hyperkalemia		39 (54,9)
Anemia, n (%)		
Yes		42 (60.0)
No		28 (40,0)
Vascular Access, n (%)		
Temporary femoral vein CDL		21 (30.0)
Temporary jugular vein CDL		46 (65.8)
Tunneled jugular vein CDL		3 (4,2)
Pre-dialytic monitoring, n (%)		
Yes		15 (21,1)
No		55 (78,9)
eLFG, median (min-max)		5,69 (1,13-36,23)
Creatinin, median (min-max)		8,47 (1,71-37,70)
Potassium, median (min-max)		5,6 (1,3-8,98)

* CDL: Catheter Double Lumen

The average patient age was 54.54 years with a standard deviation of 14.6 years. Gender distribution showed a slight male predominance, with 37 patients (52.3%) male and 33 patients (47.1%) female. The majority of patients were Balinese, at 48 (68.5%), followed by Javanese, at 17 (23.9%). There were also 2 patients each from West Nusa Tenggara and East Nusa Tenggara Timur (2.8%), and 1 patient (1.4%) from Armenia. The most common etiology of CKD is obstructive nephropathy (32.8%), followed by diabetic kidney disease in second place (21.4), and then nephrosclerosis (10%). Other etiologies that occur in small numbers include contrast-induced nephropathy, chronic pyelonephritis, lupus nephritis, a combination of diabetic kidney disease and nephrosclerosis, and others. There was also an unknown etiology (4.3%). In terms of comorbidities, 25 patients (35.7%) had heart disease, 18 patients (25.8%) had malignancy, and 15 patients (21.4%) had diabetes mellitus. Hypertension was found in 7 patients (10%), pneumonia in 5 patients (7.1%), sepsis in 9 patients (12.9%), and others in small numbers, if accumulated at (24.3%).

The main indications for emergency hemodialysis were varied, with metabolic acidosis being the most common (51 patients, 71.8%), followed by hyperkalemia (39 patients, 54.9%), pulmonary edema (13 patients, 18.3%), anuria (7 patients, 9.9%), and doubling creatinine (6 patients, 8.5%). Anemia was found in 42 patients (60%). For vascular access, the majority of patients used a temporary jugular vein catheter double lumen (CDL) (46 patients, 65.8%), followed by a temporary femoral vein CDL (21 patients, 30%), and a tunneled jugular vein CDL (3 patients, 4.2%). None of them had AVF for hemodialysis access. Only 15 patients (21.1%) received pre-dialytic monitoring, while 55 patients (78.9%) did not. The median patient eLFG value was 5.69 with a range of 1.13-36.23. Median serum creatinine was 8.47 with a range of 1.71-37.70, and median potassium was 5.6 with a range of 1.3-8.98.

Discussion

Age is an important factor in the characteristics of emergency hemodialysis patients. Studies show that patients initiating emergency hemodialysis tend to be older than those undergoing planned hemodialysis. This can be associated with an increased risk of comorbidities and decreased kidney function with increasing age.^{8,10} The results of this study show that the average age of patients undergoing emergency hemodialysis is 54.54 ± 14.6 years. In a study in San Francisco, the mean age of patients undergoing emergency hemodialysis initiation was 45.9 ± 14.5 years and was not significantly different from the age of patients undergoing standard hemodialysis initiation.¹¹ In a study in Japan of 151 patients undergoing emergency hemodialysis initiation, the average age of patients was 65.7 ± 14.7 years, with 16.6% of patients aged over 80 years.⁸ In a Korean study of 146 patients undergoing emergency hemodialysis initiation, 54 patients were predominantly aged 35-65 years (7%).¹² In a study in Taiwan from 2010-2017, patients undergoing emergency hemodialysis initiation were dominated by patients aged >75 years as much as 40%.¹⁰

Gender also plays a role in the characteristics of emergency hemodialysis initiation patients. Research shows that men have a higher tendency to undergo emergency hemodialysis initiation than women. Factors such as differences in lifestyle, diet, and smoking habits are hypothesized to contribute to this difference.⁸ In this study, patients undergoing emergency hemodialysis initiation were predominantly male, 52.3%. This is similar to a study in Taiwan, which reported that 58% of patients initiating emergency hemodialysis were male, and to a study in Korea, which reported that 59.6% were male.^{10,12} Studies in the United States also showed that 55.6% of men initiated emergency hemodialysis.¹¹ In a study in Japan, 70.2% of patients undergoing emergency hemodialysis initiation were men.

Comorbidities are another important characteristic of emergency hemodialysis patients. Heart disease, malignancies, diabetes mellitus, and hypertension are often found in patients undergoing emergency hemodialysis. These comorbidities can worsen the patient's condition and increase the risk of complications during hemodialysis procedures.¹² In this study, the etiology of kidney disease was mostly caused by obstructive nephropathy, which was dominated by cervical cancer in 11.2% of patients. In Korea, the most common comorbidity was hypertension at 63.9%, followed by CKD at 23.9% and HIV infection at 8.2%.¹² In the United States, as many as 50.3% experienced DM, and 12.4% had a history of hypertension.¹¹ Study in Japan, as many as 37.7% had DM, 88.1% had hypertension, 41.7% had heart disease, 13.9% had stroke, 17.9% had cancer, and 13.2% experienced acute kidney injury.⁸

The most common indication for emergency hemodialysis in this study was metabolic acidosis (71.8%), followed by hyperkalemia (54.9%), pulmonary edema (18.3%), anuria (9.9%), and doubling of creatinine (8.5%). In a similar study in Korea, the main indications for initiating emergency hemodialysis were encephalopathy (33.5%), severe uremia (28%), acute pulmonary edema (19.8%), persistent anuria (11.6%), and hyperkalemia (5.4%).¹² In a Japanese study, indications for initiation of emergency hemodialysis were heart failure (n = 20), uremia (n = 18), AKI or Rapid progressive Glomerulonephritis (RPGN) (n = 11), hyperkalemia and/or acidosis (n = 3), and others (n = 19).⁸

In this study, vascular access for hemodialysis was dominated by temporary jugular vein catheter double lumen (67.6%), followed by temporary femoral vein CDL (28.2%), and last tunneled jugular vein CDL (4.2%). In a study in Korea, vascular access was a catheter in 97.2% (femoral site in 53.4% and jugular in 43.8%) and an arteriovenous fistula in 2.7%.¹² In emergency situations, a non-tunneled central venous catheter (CVC) is the main choice

because it can be installed quickly and used immediately. Common insertion sites include the internal jugular, subclavian, or femoral veins, with the internal jugular vein often the first choice due to lower complication risk and patient comfort. Although CVCs allow immediate vascular access, their use is associated with risks such as infection, thrombosis, and catheter dysfunction. Therefore, plans to transition to a more optimal long-term vascular access, such as an arteriovenous fistula or graft, should be considered as soon as the patient's condition has stabilized. Appropriate selection and management of vascular access at the initiation of emergency hemodialysis is not only crucial for the success of the emergency procedure, but also has a significant impact on patient morbidity and mortality.¹³

A total of 78.9% of patients in this study did not undergo pre-dialytic monitoring. Studies in Taiwan showed that in 2010, as many as 75% of emergency dialysis patients did not undergo pre-dialytic monitoring, but this had decreased to 59% by 2017.¹⁰ Pre-dialytic monitoring plays a crucial role in preventing the initiation of hemodialysis. Close, regular monitoring can help identify early changes in kidney function, allowing time for intervention before the patient's condition worsens to the point of requiring emergency hemodialysis. The pre-dialytic monitoring program includes routine checks of kidney function, blood pressure management, blood sugar control in patients with diabetes, monitoring of nutritional status, and evaluation of electrolyte balance. In addition, patients are educated about healthy lifestyles, adherence to treatment, and recognition of symptoms of worsening kidney function. By implementing pre-dialytic monitoring strategies, medical teams can slow the progression of CKD, reduce the risk of acute complications, and enable more controlled planning for dialysis initiation. This not only increases the patient's physical and psychological readiness to initiate renal replacement therapy but also reduces the burden on the health system by reducing the incidence of emergency hemodialysis, which often requires more resources. Therefore, implementing a pre-dialytic monitoring program is one strategy to

prevent the initiation of emergency hemodialysis and improving the quality of care for CKD patients.¹⁴

This research has several clinical implications for the management of patients undergoing initiation of emergency hemodialysis. First, a better understanding of patient characteristics can help medical teams identify risk factors and perform more accurate risk stratification. This can lead to increased awareness and readiness among the medical team to handle cases that may require emergency hemodialysis. Second, identifying patterns of comorbidities among emergency hemodialysis patients can help develop more comprehensive and integrated treatment protocols that take into account the complexity of the patient's condition. Third, understanding patient demographic characteristics can help in planning hemodialysis unit resources and capacity, especially to accommodate emergency hemodialysis needs.

Conclusion

The characteristics of patients undergoing initiation of emergency hemodialysis at Ngoerah Hospital, Denpasar, show variations in demographic and clinical aspects. The high percentage of metabolic acidosis and hyperkalemia as indications, as well as the low rate of pre-dialytic monitoring, indicate the need for improvements in early detection and management of CKD patients to reduce the need for emergency hemodialysis.

Limitations of the Study

This study has several weaknesses that warrant consideration. First, the use of a cross-sectional descriptive study design limits the ability to draw causal conclusions or analyze changes in patient characteristics over time. Second, secondary data sources from patient registers can introduce bias regarding the completeness and accuracy of the data, especially if there are inconsistencies in recording or input errors. Third, the relatively short data collection period (3 months) may not be representative enough to comprehensively describe patient characteristics,

especially if there are seasonal variations in emergency hemodialysis cases. Fourth, the study was conducted at only one type A hospital, limiting the generalizability of the findings to broader populations or other hospital settings. Fifth, the absence of a comparison group (e.g., elective hemodialysis patients) limits the ability to identify unique characteristics of emergency hemodialysis patients. Lastly, data analysis limited to descriptive methods may not reveal more complex relationships between variables or potential risk factors for emergency hemodialysis.

Declarations

Ethics approval and consent to participate

This study received approval from the ethics committee of Ngoerah Hospital Denpasar.

Competing interests

There are no conflicts of interest in writing this article.

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Author's Contribution

Idea/concept: KSDS. Design: KSDS. Control/supervision: YK. Data collection/processing: KSDS. Analysis/interpretation: KSDS, YK. Literature review: KSDS. Writing the article: KSDS. Critical review: YK. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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