ORIGINAL ARTICLE

Causes and Profiles Pertaining to the Emergency Room Admission of Stage V Chronic Kidney Disease Patients Undergoing Regular Hemodialysis at a Tertiary Hospital in Surabaya, Indonesia

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ABSTRACT

Introduction: Chronic kidney disease (CKD) is characterized by decreased kidney function, with a glomerular filtration rate below 60 mL/min/1.73 m² persisting for at least three months. Hemodialysis is a common therapy for stage V CKD, yet complications may arise requiring emergency treatment. This study aimed to elucidate the causes and profiles of stage V CKD patients on regular hemodialysis who were admitted to the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

Methods: A retrospective cross-sectional design and purposive sampling were used in this descriptive observational study. A univariate analysis was conducted on data collected from 72 stage V CKD patients who underwent regular hemodialysis and were admitted to the emergency room between January and March 2023. The inclusion criteria comprised stage V CKD patients undergoing regular hemodialysis in the emergency room. Patients with incomplete medical records were excluded. The collected data encompassed patients' age, sex, hemodialysis duration, interdialytic weight gain (IDWG), comorbidities, and complications.

Results: Among the 72 patients, the predominant demographic was male (51.4%), primarily aged 56–65 years (30.6%), with a hemodialysis duration of ≤12 months (65.3%), an IDWG of 1–2 kg (16.7%), and hypertension (54.2%). The complications leading to patient admission in the emergency room mostly included anemia (77.8%), metabolic acidosis (54.2%), urinary tract infection (23.6%), hyperkalemia (19.4%), pulmonary edema (18.1%), and pneumonia (18.1%).

Conclusion: Stage V CKD patients on regular hemodialysis are primarily admitted to the emergency room due to complications, including anemia, metabolic acidosis, urinary tract infections, hyperkalemia, pulmonary edema, and pneumonia.

Keywords: Chronic kidney disease (CKD); hemodialysis; health issues; diabetes; complications

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Highlights:

1. Since almost all patients with stage V chronic kidney disease (CKD) undergo routine hemodialysis, it is important to assess its associated complications to help improve patient outcomes.
2. This study reports the prevalence of comorbid diseases and the diagnostic outcomes of patients experiencing complications in the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.
3. The findings of this study provide valuable insights to patients, researchers, and future medical personnel regarding the characteristics of stage V CKD patients who regularly undergo hemodialysis and present to the emergency room.

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INTRODUCTION

Chronic kidney disease is a functional and structural disorder persisting for more than three months, which can be assessed by changes in glomerular filtration rate (LFG) to less than 60 mL/min/1.73 m² (Vaidya & Aeddula, 2024). This disease can be categorized into five stages based on the glomerular filtration rate. In stage V chronic kidney disease, the glomerular filtration rate is below 15 mL/min/1.73 m², accompanied by the occurrence of severe complications. The treatment for this disease involves renal replacement through routine hemodialysis or kidney transplantation. Chronic kidney disease affects more than 10% of the global population, or about 800 million people (Kovesdy, 2022). The number of patients undergoing hemodialysis therapy has reached 1.5 million people worldwide, with an increase of 8% every year. According to research conducted by Lv & Zhang (2019), the prevalence of stage V chronic kidney disease requiring renal replacement is estimated to be

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between 4.902 and 7.083 million.

The prevalence of chronic kidney disease in Indonesia is estimated to be 3.8%, with a range from approximately 1.8% to 6.4% across regions. In 2018, West Sumatra province reported a prevalence of chronic kidney disease that resulted in 90 fatalities due to complications, with around 410 individuals undergoing hemodialysis (Ministry of Health of the Republic of Indonesia, 2019). The most common causes of chronic kidney disease include hypertension, diabetes mellitus, and glomerulonephritis, which affect 550,000, 418,000, and 238,000 patients, respectively (Ministry of Health of the Republic of Indonesia, 2017). Individuals with hypertension have a 3.2 times greater risk of developing stage V chronic kidney disease. In 2018, diabetes mellitus was identified as the most prevalent diagnosis for initiating renal replacement therapy in the United States in 2018 (Nordheim & Jenssen, 2021).

Stage V chronic kidney disease patients undergoing regular hemodialysis may experience certain complications. Shortness of breath, fatigue, nausea, vomiting, itching (pruritus), pain during cannulation, and sleep disturbances are the most common problems reported by these patients (Kusniawati, 2018). Medical records from Abdoel Wahab Sjahranie Regional General Hospital in Samarinda, Indonesia, from September to January 2014 showed that 116 patients with chronic kidney disease presented to the emergency department with complaints including weakness, nausea, vomiting, and tightness (Arista & Ismahmudi, 2015). These factors may suggest that chronic kidney disease patients who undergo hemodialysis seek emergency care. In patients undergoing hemodialysis, it is important to consistently monitor blood pressure, heart condition, electrolyte balance, and fluid intake, as electrolyte imbalances may cause hyperkalemia and deficiencies in iron or folic acid due to blood loss into the dialyzer, which may result in anemia (Arista & Ismahmudi, 2015).

No prior research has been conducted on the causes of stage V chronic kidney disease patients who underwent regular hemodialysis being admitted to the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. Therefore, undertaking this research was imperative to fill the existing gap. The purpose of this study was to determine the causes and characteristics pertaining to stage V chronic kidney disease patients who underwent regular hemodialysis and were admitted to the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, during the period from January to March 2023.

METHODS

This descriptive study used a retrospective cross-sectional design and a purposive sampling method. This descriptive research organized an overview of the subjects under study utilizing sample or population data (Kesmodel, 2018). In this study, we conducted secondary data analysis of medical records to elucidate the causes of stage V chronic kidney disease patients on regular hemodialysis necessitating care in the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, in the period between January and March 2023.

The population of this study comprised medical records of all stage V chronic kidney disease patients who underwent regular hemodialysis at the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, from January to March 2023. The samples were gathered from the population using the purposive sampling method, resulting in a sample size that encompassed all patients fulfilling the inclusion requirements (Napitupulu et al., 2024). The established inclusion criteria for this study required the medical records to contain complete data on age, sex, hemodialysis durations, weight gain between hemodialysis sessions, chief complaints, physical examinations, and supporting examinations, which resulted in 72 samples. The exclusion criteria for this study were patient medical records with incomplete data. The collected data were subjected to descriptive analysis using Microsoft Excel for Windows, version 16.0 (Microsoft Inc., Redmont, WA, USA). The analysis results were presented in the form of frequencies and percentages. The Health Research Ethics Committee of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, approved the research protocol and issued a certificate number 1441/LOE/301.4.2/IX/2023 on September 9, 2023.

RESULTS

Throughout the period between January and March 2023, 82 patients with stage V chronic kidney disease who underwent regular hemodialysis were admitted to the emergency room at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. However, only 72 samples from the patients' medical records met the inclusion criteria for this study. The characteristics of the patients in this study were categorized according to age, sex, hemodialysis durations, interdialytic weight gain (IDWG), comorbid diseases, and diagnostic outcomes. The frequency and percentage for each characteristic of the subjects are presented in Table 1.

The results indicated that the patients in this study were primarily male, with 37 individuals representing 51.4% of the total samples. The predominant age group of the stage V chronic kidney disease patients who underwent regular hemodialysis in the emergency room was 56–65 years, comprising 30.6% of the cohort. The majority of the patients underwent hemodialysis for a duration of 12 months or less, indicating that the 47 individuals (65.3%) were classified as new to the treatment. Most of the patients with complete data (16.7%) experienced a weight gain of 1–2 kg between two dialysis sessions. Hypertension was the most common comorbid disease observed in the stage V chronic kidney disease patients, affecting 39 individuals (54.2%). The prevalent diagnostic outcomes encountered by the patients comprised six complications: anemia in 56 individuals (77.8%), metabolic acidosis in 39 individuals (54.2%), urinary tract infections in 17 individuals (23.6%), hyperkalemia in 14 individuals (19.4%), pulmonary edema in 13 individuals (18.1%), and pneumonia in 13 individuals (18.1%).

Table 2 shows the distribution of the stage V chronic kidney disease patients categorized by hemoglobin levels to identify the presence of anemia. The classification of anemia included mild, moderate, and severe categories. The results indicated that most of the patients, accounting for 30 individuals (41.7%), exhibited moderate anemia, characterized by hemoglobin levels of 7–8 g/dL. Furthermore, 20 patients (27.8%) suffered from severe anemia, defined by hemoglobin levels below 7 g/dL. There were six patients (8.3%) who presented with mild anemia, indicated by hemoglobin levels of 9–10 g/dL, whereas 11 patients (5.3%) demonstrated normal hemoglobin levels of

more than 10 g/dL. As many as five patients (6.9%) did not check their hemoglobin levels, resulting in the lack of data for this group.

Table 1. Characteristics of stage V chronic kidney disease patients on regular hemodialysis who were admitted to the emergency room

Variables	n (%)
Sex	
Male	37 (51.4)
Female	35 (48.6)
Age (years)	
5–11	3 (4.2)
12–16	7 (9.7)
17–25	1 (1.4)
26–35	9 (12.5)
36–45	10 (13.9)
46–55	15 (20.8)
56–65	22 (30.6)
>65	5 (6.9)
Hemodialysis duration (month)	
≤12	47 (65.3)
13–24	2 (2.8)
25–36	4 (5.6)
>36	7 (9,.7)
No data	12 (16.7)
IDWG (kg)	
<1	11 (15.3)
1–2	12 (16.7)
>2	5 (6.9)
No data	44 (61.1)
Comorbidities	
Hypertension	39 (54.2)
Diabetes mellitus	22 (30.6)
Diagnostic outcomes	
Anemia	56 (77.8)
Metabolic acidosis	39 (54.2)
Urinary tract infection	17 (23.6)
Hyperkalemia	14 (19.4)
Pulmonary edema	13 (18.1)
Pneumonia	13 (18.1)

Table 2. Distribution of haemoglobin levels in patients with and without anemia

Categories	Hb levels (g/dL)	n (%)
Anemia		
Severe	<7	20 (27.8)
Moderate	7–8	30 (41.7)
Mild	9–10	6 (8.3)
Normal	>10	11 (15.3)
No data	-	5 (6.9)

As shown in Table 3, the results indicated that the stage V chronic kidney disease patients who experienced metabolic acidosis displayed prevalence rates that varied according to the examinations of pH and bicarbonate acid (HCO3) levels. The examination of bicarbonate acid levels revealed that 39 patients (54.2%) experienced metabolic acidosis. This finding was in contrast to the pH level examination results, indicating that metabolic acidosis was observed in only 14 individuals (19.5%). This discrepancy might be related to the compensation in pH level measurement.

Table 4 presents the results of the potassium level examination in stage V chronic kidney disease patients who underwent regular hemodialysis and were admitted to the emergency room. According to the examination, as many as four patients (5.6%) experienced hyperkalemia with a mild severity, characterized by potassium levels of 5.1–5.4 mmol/L. In addition, ten patients (13.9%) exhibited moderate to severe hyperkalemia, with potassium levels of 5.5 mmol/L or above. The majority of the patients displayed normal potassium levels ranging from 3.5 to 5.0 mmol/L, as represented by 31 individuals (43.1%). This prevalence rate indicated that most patients did not experience hyperkalemia. In this study, 25% of the total samples demonstrated low potassium levels below 3.5 mmol/L, which were categorized as hypokalemia. However, this was not included in the diagnostic outcomes that led to emergency room admissions for stage V chronic kidney disease patients on regular hemodialysis. Hypokalemia was not categorized as a complication of the patients' disease and was excluded from discussion in this study.

Table 5 presents a summary of the complication distribution in patients with stage V chronic kidney disease. The results indicated that the majority of the patients had urinary tract infections, as observed in 17 patients or 23.6% of the total samples. Furthermore, the patients' chest radiograph revealed that pulmonary edema was present in 13 individuals, representing 18.1% of the total samples. Pneumonia was also observed in 13 patients, indicating a prevalence rate of 18.1%.

Table 3. Distribution of pH and bicarbonate acid levels in patients with and without metabolic acidosis

Categories	pH levels	n (%)	HCO_3 levels (mmol/L)	n (%)
Metabolic acidosis				
Severe	<7.2	3 (4.2)	<12	3 (4.2)
Mild-moderate	7.2–7.34	11 (15.3)	12–23	36 (50.0)
Normal	7.35–7.45	28 (38.9)	≥24	8 (11.1)
No metabolic acidosis	>7.45	11 (15.3)	-	-
No data	-	19 (26.4)	-	25 (34.7)

Table 4. Distribution of potassium levels among the patients

Category	Potassium levels (mmol/L)	n (%)
Hypokalemia	<3.5	18 (25.0)
Normal	3.5–5.0	31 (43.1)
Hyperkalemia		
Mild	5.1–5.4	4 (5.6)
Moderate-severe	≥5.5	10 (13.9)
No data	-	9 (12.5)

Table 5. Distribution of urinary tract infection, pulmonary edema, and pneumonia among the patients

Variables	n (%)
Urinary tract infection	
Positive	17 (23.6)
Negative	55 (76.4)
Pulmonary edema	
Positive	13 (18.1)
Negative	59 (81.9)
Pneumonia	
Positive	13 (18.1)
Negative	59 (81.9)

DISCUSSION

In this study, most of the stage V chronic kidney disease patients who underwent regular hemodialysis in the emergency department from January to March 2023 were male. Similarly, a recent survey conducted by Saragih et al.

(2024) revealed that among stage V chronic kidney disease patients undergoing hemodialysis, there were 50 male subjects (69.4%) and 22 female subjects (30.6%). Men are considered more prone to kidney disorders compared to women. Hormonal influences, physical conditions, daily routines, and the composition of urine or the presence of natural calcium-containing compounds such as oxalate, phosphate, and amino acid cysteine, as well as male lifestyle factors such as smoking, can increase the risk of chronic kidney disease. Smoking elevates pressure on the kidneys, which results in increased workload above the normal capacity for these organs. In addition, the testosterone hormone in men can affect kidney development. Low testosterone levels, which decline with advancing age, can contribute to the development of chronic kidney disease (Al Kamaliah et al., 2021).

The stage V chronic kidney disease patients undergoing regular hemodialysis in the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, throughout the period from January to March 2023 mainly fell within the age group of 56–65 years (30.6%). The findings of this study are consistent with those of prior research conducted by Artiany & Aji (2021), who found the highest distribution of patients at dr. Esnawan Antariksa Air Force Hospital, Jakarta, Indonesia, in the age group of 56–65 years, as represented by 35 individuals (33.3%). Furthermore, the study also presented other similar findings, indicating that the predominant duration of hemodialysis was less than one year. It has been commonly known that kidney function declines with increasing age. The decline in kidney function usually occurs after the age of 40 years. Age-related decline in kidney function is associated with a decrease in tubular excretion rate and renal tubular function (Pranandari & Supadmi, 2015).

In the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, from January to March 2023, the majority of patients with stage V chronic kidney disease had undergone hemodialysis for less than 12 months, with a prevalence rate of 65.3%. This is in line with previous research undertaken by Saputra & Wiryansyah (2021), who found that 65.8% of the patients had a hemodialysis duration of less than a year. Patient compliance tends to improve as the duration of therapy increases, thereby reducing the risk of complications. The average duration of hemodialysis for newly treated patients at Dr. Pirngadi Regional General Hospital, Medan, Indonesia, is 7 months. Patients with chronic kidney disease who are new to hemodialysis demonstrate a lower level of understanding regarding their condition compared to those who have undergone the treatment for a long time. These patients are also more prone to complications due to insufficient health education or knowledge about hemodialysis (Sari et al., 2022).

Interdialytic weight gain is the increase in weight observed in patients between hemodialysis sessions (Wong et al., 2017). The results obtained from this study indicated that most of the patients with complete data experienced weight gain of 1–2 kg, as represented by 16.7% of the total samples. In addition, the results also indicated that 6.9% of the samples exhibited interdialytic weight gain exceeding 2 kg. Patients exhibiting a weight gain of more than 2 kg in this study also reported symptoms of shortness of breath and fatigue. A high interdialytic weight gain is the result of patients not adequately limiting their fluid intake due to excessive thirst. Fluid accumulation in the body potentially interferes with lung and heart function, causing patients to experience fatigue and shortness of breath (Santoso et al., 2022). In earlier research conducted by Gultom et al. (2024), the highest prevalence of weight gain among the patients was less than 2 kg or 5% of their dry body weight, as observed in 51.67% of the samples. The study revealed that this weight gain was not related to the duration of hemodialysis. There have been varying findings, indicating that patients on hemodialysis for less than or more than 12 months may experience interdialytic weight gain, affected by their daily fluid and food intake. Thirst resulting in excessive drinking or over-hydration may affect patient adherence to fluid consumption interventions (Siagian et al., 2021).

Comorbid diseases, especially hypertension, largely contribute to stage V chronic kidney disease. This study noted that 54.2% of the stage V chronic kidney disease patients had hypertension. This is in line with the findings of a study conducted by Artiany & Aji (2021), who found a hypertension prevalence rate of 54.61% among the patients. The relationship between hypertension and chronic kidney disease is characterized by the occurrence of diminishing renal function increases blood pressure, which in turn becomes the main factor that triggers kidney damage. In this study, diabetes mellitus was the second most common comorbidity following hypertension among chronic kidney disease patients, with a prevalence rate of 30.6%. This finding is comparable to a study undertaken by Yumassik et al. (2022), who recorded a diabetes mellitus prevalence rate of 32.7%. Diabetic nephropathy is the leading cause of renal failure, caused by hyperglycemia, intraglomerular hypertension, and mesangial cell proliferation. Glomerulosclerosis decreases blood flow and impairs glomerular basement membrane permeability, characterized by albuminuria resulting from diabetes mellitus.

The results of this study indicated that anemia was a prevalent complication among those with stage V chronic kidney disease. Anemia manifests in stage V chronic kidney disease patients due to multiple factors, such as relative erythropoietin (EPO) deficiency, red blood cell lifespan shortening, uremia-induced erythropoiesis inhibitors, and impaired iron homeostasis (Hashmi et al., 2024). In this study, the patients who had anemia predominantly exhibited moderate severity (41.7%). This finding supports an earlier study carried out by Natalia et al. (2019), who investigated the association between glomerular filtration rate and the severity of anemia in patients with stage V chronic kidney disease at Dr. Mohammad Hoesin Central General Hospital, Palembang, Indonesia. The study revealed that 44.9% of the total samples demonstrated moderate anemia. Patients with stage V chronic kidney disease are unable to maintain the balance of body fluids and electrolytes, which causes uremia or the retention of urea and nitrogen, as well as low hemoglobin levels. This may result in the manifestation of anemia symptoms, such as weakness, eye fogginess, and a pale face.

Metabolic acidosis ranked as the second leading complication in this study. This diagnostic outcome was determined through the examination of pH and HCO3 levels. The prevalence of metabolic acidosis, assessed according to HCO3 levels, was higher than that determined using pH levels, with 39 patients (54.2%) compared to 14 patients (19.4%), respectively. According to Kim (2021), stage V chronic kidney disease patients exhibit a higher prevalence of metabolic acidosis (46.4%) than those with stage IV chronic kidney disease (27.6%). The

capacity of the kidneys to synthesize ammonia and excrete hydrogen ions decreases as renal function declines. As a result, patients with diminished glomerular filtration rates have reduced bicarbonate levels (Brinkman, 2024). Compensation in pH levels may occur by the excretion or retention of acids or bases. The pH levels in the blood can remain within normal ranges due to the control over the partial pressure of carbon dioxide (pCO2) and HCO3 levels Hasanah & Livana (2021).

Urinary tract infections may arise as a complication in patients with stage V chronic kidney disease undergoing hemodialysis. The results of bacterial laboratory examination serve as indicators for urinary tract infections. Research conducted by Thapa et al. (2023) revealed a urinary tract infection prevalence rate of 15.8% among the patients, as confirmed by positive bacteria cultures. At Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, patients who exhibited urinary tract infections, as indicated by positive bacterial cultures, were predominantly male (23.6%). Deltourbe et al. (2022) assert that anatomical factors cannot account for the prevalence of urinary tract infections, as the length of the urethra does not change with increasing age. However, urinary tract infections in men may occur as a result of urodynamic changes, such as prostate enlargement due to old age or immunological and biochemical abnormalities. In women with stage V chronic kidney disease, urinary tract infections may manifest due to the short female urethra and the close proximity of the urinary tract to the rectum.

Pulmonary edema was one of the complications requiring the stage V chronic kidney disease patients on regular hemodialysis to be admitted to the Emergency Department of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The prevalence rate of pulmonary edema in this study was 18.1%, comparable to the 20.5% reported by Shaik et al. (2021). In their study, pulmonary edema was also identified as a complication in stage V chronic kidney disease patients undergoing regular hemodialysis. Patients with a hemodialysis duration of 12 months or less are more compliant with fluid restriction. Nevertheless, long-term therapy can cause complications, such as cardiovascular and non-cardiovascular dysfunctions as well as pulmonary edema. Pulmonary edema is not only related to patients' fluid compliance and hemodialysis duration. In this study, the weight gain observed among the patients was mainly attributable to fluid overload. The occurrence of fluid overload or excess body fluid during the interdialytic period contributes to pulmonary edema. In addition to pulmonary edema, this occurrence may also lead to pleural effusion and increased pulmonary capillary permeability (Zoccali et al., 2022).

The kidneys play a role in the regulation of potassium balance. Hyperkalemia, characterized by increased potassium levels, is a complication often observed in chronic kidney disease patients undergoing hemodialysis. The majority of patients in this study experienced moderate to severe hyperkalemia, with a prevalence rate of 13.9%. This finding is similar to that of a prior study conducted by Luo et al. (2016), who found a hyperkalemia prevalence rate of 20% in stage V chronic kidney disease patients. Patients with stage V chronic kidney disease may exhibit reduced potassium levels due to hemodialysis and gastrointestinal excretion. A low potassium intake may lead to elevated extracellular potassium levels as a result of reduced excretion by the kidneys. Otherwise, potassium levels increase after hemodialysis as potassium moves from intracellular to extracellular compartments (Shibata & Uchida, 2022).

There is a physiological relationship between the kidneys and lungs. Kidney disease can cause lung disorders or systemic processes involving both organ systems. Patients undergoing hemodialysis or other forms of renal replacement therapy are twice as prone to pneumonia as those with stage V chronic kidney disease. Lung infections are caused directly by toxic urea in the blood or indirectly by volume overload, which can lead to heart failure, pulmonary edema, anemia, atherosclerosis, hypertension, malnutrition, decreased immunity, electrolyte disturbances, and acid-base imbalance (Sinaga et al., 2017). This study showed that 18.1% of the chronic kidney disease patients had pneumonia, almost equivalent to 23.6% of patients who had urinary tract infections. Uremia can damage the defense system of the body and increase the risk of bacterial infections. Hence, stage V chronic kidney disease patients with low immunity experience a decreased production of B lymphocytes and immunoglobulins (Febriana, 2015).

The aforementioned findings of this study elucidate the main causes contributing to the emergency room admissions of stage V chronic kidney disease patients undergoing regular hemodialysis at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, in the period from January to March 2023. The data may aid health workers in recognizing risk factors and improving clinical management to reduce complications and mortality. The results of this study were presented in the form of frequency and percentage distributions categorized by certain variables, allowing readers to easily comprehend the data. In addition, this study serves as a valuable scientific reference related to stage V chronic kidney disease patients undergoing regular hemodialysis in Indonesia, which is still rarely available and provides a basis for further research. However, this study is not without limitations. The limitations of this study include the difficulty in determining the precise time of the patients' initial hemodialysis sessions, potentially affecting the analysis of therapy duration and patient compliance. Moreover, incomplete medical records as well as the absence of follow-up monitoring of patient history and activities post-hemodialysis might hinder the comprehensive analysis of the patients' physical condition.

CONCLUSION

This study concludes that stage V chronic kidney disease patients undergoing regular hemodialysis may present to the emergency room due to multiple complications, such as anemia, metabolic acidosis, hyperkalemia, pulmonary edema, urinary tract infection, and pneumonia, alongside several comorbidities including hypertension and diabetes mellitus.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest in this study.

ETHICS CONSIDERATION

The ethical approval for this study was granted by the Health Research Ethics Committee of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, under reference number 1441/LOE/301.4.2/IX/2023, issued on September 9, 2023.

FUNDING DISCLOSURE

This study did not receive any funding.

AUTHOR CONTRIBUTION

Each author played a role in every stage of this research, which included the conception and design, analysis and interpretation of the data, drafting of the article, provision of funding, administrative, technical, and logistical support, as well as collection and assembly of the data. Specifically, AD contributed to the conception and design, critical revision of the article for important intellectual content, final approval of the article, and provision of study materials or patients. AT provided statistical expertise and final approval of the article.

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