World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

The Relationship Between Urea, Creatinine, and Hemoglobin Values and the Duration of Conventional Hemodialysis in Chronic Kidney Failure Patients at Bahteramas Regional Hospital in 2025

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World Journal of Advanced Research and Reviews, 2026, 29(01), 1466-1476

Publication history: Received on 15 December 2025; revised on 24 January 2026; accepted on 26 January 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.29.1.0196

Abstract

Chronic kidney disease (CKD) is a progressive condition that significantly reduces patients' quality of life and contributes to increasing morbidity and mortality worldwide. Hemodialysis is the primary renal replacement therapy for patients with end-stage CKD; however, metabolic and hematological abnormalities such as elevated urea and creatinine levels and decreased hemoglobin levels remain common. This study aimed to analyze the relationship between urea, creatinine, and hemoglobin levels and the duration of conventional hemodialysis in CKD patients at Bahteramas Regional General Hospital in 2025. An observational analytical study with a cross-sectional design was conducted among 197 CKD patients undergoing conventional hemodialysis, selected using systematic random sampling from a population of 387 patients treated between 2024 and November 2025. Data were analyzed using Pearson correlation and multiple linear regression tests. The results showed a statistically significant negative correlation between urea levels and the duration of hemodialysis ($r = -0.423$; $p = 0.000$), indicating that longer hemodialysis duration was associated with lower urea levels. Creatinine levels were also negatively correlated with hemodialysis duration, although the correlation was very weak ($r = -0.176$; $p = 0.013$). In contrast, hemoglobin levels demonstrated a significant positive correlation with the duration of hemodialysis ($r = 0.354$; $p = 0.000$). Multiple linear regression analysis revealed that urea and hemoglobin levels had a significant partial effect on the duration of hemodialysis, with urea being the most dominant factor, followed by hemoglobin, while creatinine showed no significant effect. These findings suggest that urea and hemoglobin levels are important indicators associated with the duration of conventional hemodialysis in CKD patients.

Keywords: Ureum; Creatinin; Hemoglobin; Hemodialysis

1. Introduction

Health plays a strategic role in improving the quality of life and human productivity and is a key factor in successful human resource development. Healthy individuals are able to contribute optimally to social and economic life, while chronic health problems can reduce community well-being and productivity (WHO, 2025). One health problem that remains a serious threat globally and nationally is kidney failure, which significantly impacts the quality of life of sufferers (Ministry of Health of the Republic of Indonesia, 2022).

Kidney failure is a condition where the kidneys lose their ability to filter metabolic waste and regulate the body's fluid balance, both acutely and chronically. Causes include diabetes mellitus, hypertension, obesity, smoking, severe infections, and an unhealthy lifestyle. Clinical manifestations of kidney failure include changes in urination frequency,

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edema, fatigue due to anemia, nausea, shortness of breath, and increased blood pressure. If left untreated, it can lead to serious complications such as anemia, cardiovascular disease, electrolyte disturbances, infections, and decreased quality of life (Ministry of Health of the Republic of Indonesia, 2024; Lenny et al., 2024). Based on the duration and nature of kidney damage, kidney failure is classified into Acute Kidney Injury (AKI) and Chronic Kidney Disease (CKD), where CKD is characterized by a progressive and persistent decline in kidney function for more than three months (Levey et al., 2020; Goyal et al., 2025).

Globally, the prevalence of CKD continues to increase and is estimated to affect approximately 10–14% of the world's population in 2020, with the number of cases reaching 673 million in 2022 and increasing to approximately 850 million individuals in 2023–2024. The mortality rate from CKD is projected to increase by 41.5% by 2040, making it one of the leading causes of death in the future (Hock, 2020; Wang et al., 2025; Francis et al., 2024). In Indonesia, the prevalence of CKD reached 3.8 per 1,000 population or around 739,208 people in 2018 and continues to increase until 2024, with the number of end-stage CKD patients undergoing hemodialysis reaching 134,057 people and an increase of 18–32% since 2018 (Ministry of Health of the Republic of Indonesia, 2023; Putri et al., 2024).

In Southeast Sulawesi Province, the prevalence of CKD increased from 0.2% in 2013 to 0.35% in 2018 (Sari, Bahar, & Hikmawati, 2024). Data from Bahteramas Regional Hospital shows an increasing trend in CKD cases in both outpatient and inpatient settings. In outpatient care, 373 cases were recorded in 2022, 347 cases in 2023, and increased to 451 cases in 2024, and 202 cases in the January–June 2025 period. Meanwhile, inpatient care recorded 542 cases in 2022, increased to 771 cases in 2023 and 880 cases in 2024, and 547 cases in January–June 2025. The death rate due to CKD also ranked highest in the last three years, namely 77 cases in 2022, 123 cases in 2023, 164 cases in 2024, and 76 cases in January–June 2025 (Bahteramas Regional Hospital, 2024).

Management of CKD includes prevention through a healthy lifestyle and early detection, as well as conservative therapy and renal replacement therapy. The Ministry of Health encourages the implementation of the CERDIK movement and early detection through urinalysis and estimated glomerular filtration rate (eGFR) in high-risk groups. Medical therapy includes dietary adjustments, the use of antihypertensive medications such as ACE inhibitors and ARBs, and the management of complications such as anemia and mineral metabolism disorders. In patients with GFR <15 ml/minute/1.73 m^2 accompanied by severe complications, hemodialysis is the primary therapy (KDIGO, 2024; Kurniawati et al., 2025).

Hemodialysis is a kidney replacement therapy that functions to externally filter blood to remove metabolic waste products, maintain fluid and electrolyte balance, and improve the clinical condition of patients with end-stage CKD. Conventional hemodialysis is the most widely used method, performed 2–3 times per week with a duration of 3–5 hours per session (KDIGO, 2021; Ministry of Health of the Republic of Indonesia, 2023). Globally, the number of hemodialysis patients is estimated to increase from more than 2.5 million in 2020 to 5.4 million in 2030 (Thurlow et al., 2021). In Indonesia, the number of hemodialysis patients increased from 77,892 in 2017 to approximately 134,000 in 2024, with BPJS costs reaching IDR 2.9 trillion (Fahny, Rahma, & Gurning, 2025). At Bahteramas Regional Hospital, the number of conventional hemodialysis patients was recorded at 262 in 2022, 258 in 2023, 208 in 2024, and increased to 304 in the January–November 2025 period.

CKD patients undergoing hemodialysis often experience elevated urea and creatinine levels, as well as decreased hemoglobin levels. Elevated urea and creatinine reflect the accumulation of uremic toxins due to suboptimal blood cleansing, while decreased hemoglobin occurs due to decreased erythropoietin production and shortened red blood cell lifespan. These conditions contribute to anemia and worsen patients' quality of life (Fujita et al., 2019; Badura et al., 2024). Without adequate hemodialysis, patients are at risk of developing severe uremia, electrolyte disturbances, pulmonary edema, heart problems, and even death within a relatively short time (Marianna & Astutik, 2024; Setyoningsih & Ismasari, 2024).

Previous studies have shown that high urea and creatinine levels are associated with low hemoglobin levels and the duration of hemodialysis therapy, and that hemodialysis can increase hemoglobin levels as an indicator of therapy effectiveness (Mohtar et al., 2021; Margono, 2025). However, studies on the relationship between urea, creatinine, and hemoglobin levels and the duration of conventional hemodialysis are still limited, particularly at Bahteramas Regional Hospital. Therefore, this study was conducted to analyze the relationship between urea, creatinine, and hemoglobin levels and the duration of conventional hemodialysis in patients with chronic kidney disease at Bahteramas Regional Hospital in 2025.

2. Materials and methods

This study was conducted at Bahteramas Regional General Hospital, Southeast Sulawesi Province, using an observational analytical quantitative design using a cross-sectional approach. The independent variables studied included urea, creatinine, and hemoglobin levels, while the dependent variable was the duration of conventional hemodialysis. This study aimed to analyze the relationship between these laboratory parameters and the duration of hemodialysis therapy in chronic kidney disease patients in 2025. The study population was all 387 chronic kidney disease patients undergoing conventional hemodialysis at Bahteramas Regional General Hospital between 2024 and November 2025. The sample size of 197 patients was determined based on sample size calculations and selected using systematic random sampling techniques to ensure sample representativeness and minimize selection bias. Inclusion criteria included chronic kidney disease patients actively undergoing conventional hemodialysis, aged ≥18 years, having undergone hemodialysis for more than six months, and having complete and verifiable medical records, including pre-dialysis laboratory data (urea, creatinine, and hemoglobin). Exclusion criteria included patients who discontinued hemodialysis due to death, hospital transfer, or non-medical reasons, as well as unverifiable laboratory data. The data used consisted of secondary and primary data. Secondary data were obtained from patient medical records, including the duration of hemodialysis (in months) and the results of the most recent pre-dialysis laboratory test closest to the time of the study. Primary data were collected using a form prepared by the researcher to ensure data accuracy and consistency through confirmation with doctors and nurses in the hemodialysis unit. Data collection was conducted through observation of medical records and interviews with health workers. The data obtained were analyzed using IBM SPSS version 23, including univariate, bivariate, and multivariate analyses. This study was conducted in accordance with the principles of research ethics and has obtained permission from Bahteramas Regional General Hospital, the National Unity and Politics Agency of Kendari City, and ethical approval from the Health Research Ethics Commission of the Indonesian Academy of Medical Sciences (IAKMI) of Southeast Sulawesi.

3. Results and discussion

3.1. Univariate Analysis

3.1.1. Respondent Characteristics

Table 1 Characteristics of Research Respondents

Age	**Number (n)**	**Percentage (%)**
25-44	28	14.2
45-59	72	36.5
≥ 60	97	49.2
Total	197	100
Gender	Number (n)	Percentage (%)
Man	108	54.8
Woman	89	45.2
Total	197	100
Comorbidities	Number (n)	Percentage (%)
There isn't any	26	13.2
Hypertension	112	56.9
Diabetes mellitus	5	2.5
Diabetes Mellitus + Hypertension	47	23.9
Hypercholesterolemia	7	3.6
Total	197	100

Source: Processed Primary Data, 2025

Table 1 shows that the majority of respondents were in the ≥60 years age group (97 people) (49.2%), followed by the 45–59 years age group (72 people) (36.5%), and the 25–44 years age group (28 people) (14.2%). Based on gender, the majority of respondents were male (108 people) (54.8%), while female respondents numbered 89 people (45.2%). Based on comorbidities, the majority of respondents had hypertension (112 people) (56.9%), followed by respondents with a combination of diabetes mellitus and hypertension (47 people) (23.9%). Respondents without comorbidities numbered 26 people (13.2%), while respondents with hypercholesterolemia were 7 people (3.6%) and diabetes mellitus were 5 people (2.5%).

3.2. Bivariate Analysis

Table 2 Results of the Analysis of the Relationship between Urea, Creatinine, and Hemoglobin Levels and the Length of Conventional Hemodialysis in Chronic Kidney Failure Patients at Bahteramas Regional Hospital in 2025

		urea	**Creatinine**	**Hemoglobin**	**Hemodialysis**
urea	Pearson Correlation	1	0.357	-0.153	-0.423
	Sig. (2-tailed)		0.000	0.032	0.000
	N	197	197	197	197
Creatinine	Pearson Correlation	0.357	1	-0.324	-0.176
	Sig. (2-tailed)	0.000		0.000	0.013
	N	197	197	197	197
Hemoglobin	Pearson Correlation	-0.153	-0.324	1	0.354
	Sig. (2-tailed)	0.032	0.000		0.000
	N	197	197	197	197
Hemodialysis Duration	Pearson Correlation	**-0.423**	**-0.176**	**0.354**	1
	Sig. (2-tailed)	**0.000**	**0.013**	**0.000**	
	N	**197**	**197**	**197**	**197**

Source: Primary Data Analysis Results Using SPSS, 2025

Table 2 above shows that the results of the Pearson correlation test showed a correlation coefficient value of r = −0.423 with a significance value of p = 0.000 (p < 0.05). Based on this significance value, it can be concluded that there is a statistically significant relationship between urea levels and the duration of conventional hemodialysis. Based on Pearson's degree of relationship guidelines, the correlation coefficient value is included in the moderate correlation category (0.41–0.60). The negative direction of the relationship indicates that the relationship is in the opposite direction, that is, the longer the patient undergoes conventional hemodialysis, the more urea levels tend to decrease. The relationship between urea levels and the duration of conventional hemodialysis in patients with chronic kidney failure reflects a complex and gradual process of metabolic and therapeutic adaptation. Urea as the end product of protein metabolism is influenced by the balance between nitrogen production and elimination capacity through dialysis, so its changes reflect not only the technical aspects of dialysis, but also the patient's physiological condition, the adequacy of therapy, and the dynamics of chronic disease (Kurniawan & Koesrini, 2019). In the early stages of hemodialysis, urea levels tend to be high and fluctuate due to the lack of metabolic equilibrium and the ongoing adjustment process to the dialysis regimen. Unstable uremic conditions and variations in dialysis efficiency between sessions cause urea levels in patients with short hemodialysis durations to be relatively higher and inconsistent (Vartia, 2013).

As the duration of hemodialysis increases, urea levels generally become more stable due to optimization of dialysis parameters and systemic adaptation to chronic uremic conditions. However, this stabilization is not always accompanied by a decrease in urea levels, as other factors such as decreased residual kidney function and increased dependence on dialysis also play a role (Lim et al., 2021; Malfica et al., 2023). Furthermore, chronic catabolic and inflammatory conditions in long-term hemodialysis patients can increase protein breakdown and endogenous urea production, resulting in high urea levels despite prolonged dialysis. Conversely, low urea levels in long-term patients may reflect low protein intake or protein-energy malnutrition and therefore do not always indicate successful dialysis (Zha & Qian, 2017; Wahyuni, 2018). Patient behavior and compliance also contribute to the dynamics of urea levels.

Patients with longer hemodialysis duration generally have a better understanding and adherence to diet and dialysis schedules, resulting in more stable urea levels compared to patients who have recently undergone therapy (Safitri et al., 2023). As patients undergo hemodialysis for longer, urea levels tend to decrease, reflecting the process of therapy adaptation and metabolic stabilization (Rees, 2019). However, varying results from other studies suggest that this relationship is strongly influenced by confounding factors such as nutritional status, inflammation, and comorbidities. Therefore, urea levels should be interpreted contextually and not used as the sole indicator of hemodialysis therapy success (Lee & Kwon, 2022; Wang et al., 2018).

Furthermore, based on the results of the Pearson correlation test above, the correlation coefficient value of creatinine levels with the duration of hemodialysis was also obtained, namely $r = -0.176$ with a significance value of $p = 0.013$ ($p < 0.05$). Thus, it can be concluded that there is a statistically significant relationship between creatinine levels and the duration of conventional hemodialysis. However, based on Pearson's degree of relationship guidelines, the correlation coefficient value is included in the very weak correlation category (0.00–0.20). The negative direction of the relationship indicates that the longer the patient undergoes conventional hemodialysis, the creatinine levels tend to decrease, but the closeness of the relationship is very weak. The relationship between creatinine levels and the duration of conventional hemodialysis is multifactorial and reflects the interaction between endogenous creatinine production, elimination through dialysis, changes in muscle mass, and metabolic conditions and chronic inflammation. Therefore, creatinine in hemodialysis patients reflects not only kidney function but also the overall condition of the body (Avila et al., 2025). Early in hemodialysis, creatinine levels are generally high and fluctuate due to creatinine accumulation prior to dialysis and an unstable therapeutic regimen. Over time, physiological adaptation and dialysis optimization can result in more stable creatinine levels, although they do not always decrease significantly (Sudrajat & Fetriyana, 2023; Wang et al., 2018). Decreased muscle mass due to malnutrition, limited physical activity, and chronic catabolic processes in long-term hemodialysis patients play a significant role in reducing endogenous creatinine production. Chronic inflammation also accelerates muscle tissue degradation, so lower creatinine levels do not always reflect better clinical conditions (Patel et al., 2012; Murfat et al., 2024). The above findings align with previous studies reporting a weak to moderately significant association between creatinine and duration of hemodialysis, and confirm that the relationship is non-linear and highly contextual (Ningsih et al., 2021; Erdiansyah, 2025; Kong et al., 2018). In addition to biological factors, patient adherence to the dialysis schedule and dietary management also influence creatinine stability. Patients with longer hemodialysis experience generally exhibit smaller creatinine fluctuations than new patients (Setiawati & Azim, 2024; Fauzi et al., 2021). Overall, creatinine levels should be understood as an integrative indicator reflecting disease progression, metabolic adaptation, and the body's response to long-term therapy, rather than as a single parameter determining clinical condition (Sakao et al., 2016; Tsai et al., 2021).

For hemoglobin, the Pearson correlation test results showed a correlation coefficient value of $r = 0.354$ with a significance value of $p = 0.000$ ($p < 0.05$). This value indicates a statistically significant relationship between hemoglobin levels and the duration of conventional hemodialysis. Based on Pearson's degree of correlation guidelines, the correlation coefficient value is included in the weak correlation category (0.21–0.40). The positive direction of the relationship indicates that the longer a patient undergoes conventional hemodialysis, the hemoglobin level tends to increase. The relationship between hemoglobin levels and the duration of hemodialysis reflects the complex dynamics between impaired erythropoiesis, chronic inflammation, recurrent blood loss, and the effectiveness of anemia management. Anemia in hemodialysis patients is multifactorial and is not solely caused by decreased kidney function (Prapaiwong et al., 2025). In the early phase of hemodialysis, hemoglobin levels are generally low and unstable due to erythropoietin deficiency, impaired iron metabolism, systemic inflammation, and suboptimal nutritional conditions. As the duration of hemodialysis increases, optimizing anemia therapy can contribute to improving or stabilizing hemoglobin levels (Karaboyas et al., 2019; Mohtar et al., 2022). However, chronic inflammation and repeated blood loss during dialysis can hinder hemoglobin level improvement, especially in long-term hemodialysis patients. Decreased residual kidney function also leads to complete dependence on exogenous erythropoietin, resulting in variable therapy responses (Karaboyas et al., 2020; Tsukamoto et al., 2019; Tsuruya et al., 2017). These findings align with previous studies showing a weak but significant correlation between hemoglobin and duration of hemodialysis, with variations in the direction of the relationship influenced by clinical context and patient characteristics (Ardinata et al., 2022). Nutritional status, adherence to therapy, and psychological factors also play a role in hemoglobin level dynamics. Therefore, hemoglobin interpretation should be done carefully and associated with a comprehensive clinical evaluation, especially in long-term hemodialysis patients (Alshogran et al., 2022; Zhao et al., 2024; Brahmantya et al., 2025). Overall, hemoglobin levels are an integrative indicator that reflects the course of the disease, the quality of anemia management, and chronic exposure to various clinical factors in patients with chronic kidney disease undergoing conventional hemodialysis (Bila et al., 2025).

3.3. Multivariate Analysis

Table 3 Results of the F-Test Analysis of the Simultaneous Effect of Urea, Creatinine, and Hemoglobin Levels on the Duration of Conventional Hemodialysis

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	12497942	3	4165.981	23.557	.000[b]
	Residual	34132.109	193	176.850		
	Total	46630.051	196			

Source: Processed Primary Data, 2025

Table 3 on the results of multiple linear regression analysis presented in Table 5.5, obtained a calculated F value of 23.557 with a significance value of p = 0.000 (p < 0.05), which indicates that simultaneously the variables of urea, creatinine, and hemoglobin levels have a statistically significant influence on the length of conventional hemodialysis in chronic kidney failure patients at Bahteramas Regional Hospital. A significance value smaller than 0.05 indicates that the regression model formed is fit to be used in explaining the relationship between the independent variables and the dependent variable, so it can be concluded that urea, creatinine, and hemoglobin levels together have a significant effect on the length of conventional hemodialysis in chronic kidney failure patients at Bahteramas Regional Hospital.

Table 4 Results of the T-Test Analysis of the Partial Influence of Urea, Creatinine, and Hemoglobin Levels on the Duration of Conventional Hemodialysis

Model	B	Std. Error	Beta	t	Sig.
(Constant)	15.964	9.038		1.766	0.079
urea	-0.171	0.028	-0.399	-6,050	0.000
Creatinine	0.477	0.479	0.069	0.997	0.320
Hemoglobin	3.618	0.749	0.315	4.831	0.000

Source: Processed Primary Data, 2025

Table 4 of the partial t-test results in this study shows that urea levels have a partial significant effect on the duration of conventional hemodialysis in chronic kidney failure (CKF) patients at Bahteramas Regional Hospital with a significance value of p = 0.000 (p < 0.05), which means that urea levels have a significant effect on the duration of conventional hemodialysis. The standard beta coefficient value of the urea variable of β = −0.399 indicates that urea has the strongest negative effect on the duration of conventional hemodialysis compared to other independent variables in the model. The direction of this negative effect indicates that higher urea levels are associated with longer duration of conventional hemodialysis, with a statistically significant effect.

Furthermore, the creatinine level variable showed a significance value of p = 0.320 (p > 0.05), which indicates that creatinine levels do not significantly affect the duration of conventional hemodialysis. The standard beta coefficient value of β = 0.069 is the smallest beta value among the independent variables, which indicates that the contribution of creatinine levels in explaining variations in the duration of conventional hemodialysis is very low and is in line with the results of the t-test which is not statistically significant.

Meanwhile, the hemoglobin level variable has a significance value of p = 0.000 (p < 0.05), indicating that hemoglobin levels significantly influence the duration of conventional hemodialysis. The standardized beta coefficient value of β = 0.315 indicates that hemoglobin has a fairly strong positive influence on the duration of conventional hemodialysis. This indicates that increasing hemoglobin levels is associated with an increase in the duration of conventional hemodialysis. Based on the standardized beta value, hemoglobin ranks as the variable with the second largest influence after urea in the regression model.

The negative effect of urea levels on the duration of conventional hemodialysis shows that the higher the urea level, the shorter the patient's survival time on hemodialysis. Clinically, elevated urea levels reflect the accumulation of nitrogen metabolic waste products due to increasingly severe decline in renal excretory function. Prolonged uremia can trigger various systemic complications, such as cardiovascular disorders, neurological disorders, malnutrition, and chronic inflammation, which can ultimately worsen the patient's condition and reduce tolerance to long-term hemodialysis

therapy. Therefore, high urea levels are often an indicator of faster disease progression and a poorer prognosis, thus being associated with shorter hemodialysis duration (Syuryani et al, 2021). Conversely, hemoglobin levels have a positive and significant effect on the duration of conventional hemodialysis. This means that the higher the hemoglobin level, the longer the patient can undergo hemodialysis therapy. These findings align with the concept that anemia is a major complication in CKD patients, contributing to reduced quality of life and functional capacity, as well as increased morbidity and mortality. Better hemoglobin reflects better controlled anemia, whether through erythropoietin therapy, iron supplementation, or adequate nutritional management. This allows patients to better tolerate hemodialysis procedures physiologically, reduces fatigue and cardiovascular complications, and thus supports longer-term therapy continuity (Hashmi et al., 2024).

Unlike urea and hemoglobin, creatinine levels in this study did not show a significant partial effect on the duration of conventional hemodialysis. This can be explained because in patients with chronic kidney disease (CKD) undergoing hemodialysis, creatinine levels no longer fully reflect the severity of kidney damage. Creatinine levels in hemodialysis patients are influenced by various other factors, such as muscle mass, nutritional status, dialysis frequency and adequacy, and long-term metabolic adaptation. Therefore, variations in creatinine levels are less sensitive in explaining differences in hemodialysis duration than other parameters more directly related to the patient's clinical condition and complications (Patel et al., 2013).

Based on the standardized beta coefficient value, urea levels were the most dominant variable influencing the duration of conventional hemodialysis, followed by hemoglobin levels, while creatinine levels had the lowest contribution. The dominance of urea levels confirms that the degree of uremia plays a central role in determining the clinical course of CKD patients undergoing hemodialysis. Meanwhile, the role of hemoglobin as a protective factor demonstrates the importance of optimal anemia management to improve patient resilience to long-term hemodialysis therapy. Overall, the results of this study confirm that controlling urea levels and improving hemoglobin levels are crucial aspects in the management of chronic kidney disease patients undergoing conventional hemodialysis. Efforts to optimize dialysis adequacy, regulate diet, and appropriate anemia therapy are expected to prolong the duration of hemodialysis and improve patient quality of life.

4. Conclusion

There is a statistically significant relationship between urea levels and the duration of conventional hemodialysis with a moderate correlation strength and a negative direction ($r = -0.423$; $p = 0.000$), indicating that the longer the patient undergoes hemodialysis, the urea levels tend to decrease. Creatinine levels also show a statistically significant relationship with the duration of hemodialysis, but with a very weak correlation strength and a negative direction ($r = -0.176$; $p = 0.013$), so its role in explaining the duration of hemodialysis is relatively small. Meanwhile, hemoglobin levels have a significant relationship with the duration of hemodialysis with a weak correlation strength and a positive direction ($r = 0.354$; $p = 0.000$), indicating a tendency for hemoglobin levels to increase as the duration of hemodialysis increases. The results of multiple linear regression analysis show that urea and hemoglobin levels have a partial significant effect on the duration of conventional hemodialysis, with urea as the most dominant variable and hemoglobin as the second dominant factor, while creatinine levels do not show a significant effect.

Compliance with ethical standards

Disclosure of Conflict of Interest

There is no conflict of interest in this research.

Statement of ethical approval

The author would like to express his sincere gratitude to the Postgraduate Program, Faculty of Public Health, Halu Oleo University, as well as to all individuals and institutions who have contributed to the completion of this research.

Statement of informed Consent

As a researcher, I confirm that prospective participants have received complete, clear, and understandable information regarding the research objectives, procedures, potential benefits and risks, data confidentiality provisions, and the right to refuse or discontinue participation at any time without consequences. I ensure that the informed consent process is ethical, voluntary, free from duress, and in accordance with research ethics standards. This ensures that participants have sufficient information to make informed and responsible decisions regarding their participation in this research.

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