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RELATIONSHIP BETWEEN HEMODIALYSIS FREQUENCY AND UREA REDUCTION RATIO (URR) RESULTS IN CKD PATIENTS

Nuniek Setyo Wardani*, Nyoto Heriyanto, Moch Robby Fajar Cahya, Sondang Tio Helena Manurung, Intan Parulian
Nursing Science Program, Universitas Binawan, Jalan Kalibata Raya No. 25-30, Kramat Jati, Jakarta Timur, Jakarta 13630, Indonesia
*nuniek@binawan.ac.id

ABSTRACT
Chronic Kidney Disease (CKD) is an irreversible condition characterized by structural and functional abnormalities of the kidneys. Patients in the early stages of CKD usually do not experience any complaints until a decline in kidney function necessitates hemodialysis. Patients undergoing hemodialysis gradually experience a reduction in urea levels. Daily dietary habits and patient compliance play a crucial role in regulating urea levels. The aim of this study is to determine the relationship between the frequency of hemodialysis and the URR (Urea Reduction Ratio) results in CKD patients at RSUD Tarakan.This research was carried out from August 2024 to January 2025. It is a descriptive correlational study employing a cross-sectional approach with total sampling, involving 93 respondents. The results showed that the majority of respondents (82.8%) regularly underwent hemodialysis twice a week, and their average URR increased by 79.6%. Cross-tabulation analysis yielded a p-value of 0.026 (< 0.05), indicating a significant relationship between hemodialysis frequency and URR values in patients at RSUD Tarakan. The strength of the association was determined to be r = 0.231, implying a low/weak correlation between the hemodialysis frequency and URR values.It is recommended that the hospital provide educational sessions or seminars on the importance of hemodialysis to enhance patient motivation for undergoing the procedure.

Keywords: hemodialysis; kidneys; URR

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INTRODUCTION

Chronic Kidney Disease (CKD) is an irreversible condition characterized by structural and functional abnormalities of the kidneys (Cahyani et al., 2022). The kidneys function as regulators of water and electrolyte balance, acid-base balance, excretion of metabolic waste and toxins, and the release of several hormones (renin, erythropoietin, prostaglandins). The kidneys also regulate the transport of salt, water, and electrolytes. Kidney damage can lead to a decline in kidney function, resulting in CKD (Putri et al., 2023).The prevalence of CKD, according to WHO in Syahputra et al. (2022), explains that chronic kidney failure is a health problem affecting 1 in 10 people worldwide, with an estimated 5 to 10 million deaths each year and approximately 1.7 million deaths annually due to acute kidney injury. The number of CKD patients in Asia is estimated to be 434.3 million adults. The largest numbers of adults living with CKD are in China, around 159.8 million, and India, around 140.2 million. Collectively, they account for 69.1% of adults with CKD in the region (Liyanage et al., 2022). According to the Centers for Disease Control and Prevention (CDC), CKD is more common in individuals aged 65 and older (38%) compared to those aged 45-64 (12%) or 18-44 (6%) (Wilson et al., 2021). Research conducted by Utami et al. (2020) indicates that the age range of CKD patients at Sanglah General Hospital, Denpasar, includes ages 20-40 years, 41-60 years, 61-80 years, and 81-100 years. Patients aged 61-80 years represent the age group with the

highest number and percentage.

The results of the Indonesian Renal Registry (IRR) in 2018 stated that Indonesia is one of the countries with a fairly high prevalence of CKD, with 14,771 new patients and 33,828 active patients. CKD patients in Central Java rank fourth with a rate of 0.3%, after North Kalimantan, North Maluku, and North Sulawesi. CKD patients who have undergone hemodialysis have increased rapidly in the age group 35-44 years (0.3%), followed by the age group 45-54 years (0.4%), and the age group 55-74 years (0.5%), with the highest rate in the age group 75 years and older (0.6%). The prevalence among males (0.3%) is higher than females (0.2%), with a higher prevalence in rural areas (0.3%), those without formal education (0.4%), self-employed individuals, farmers/fishermen/laborers (0.3%). Based on the results of the Indonesian Renal Registry (IRR) in 2018, the number of active hemodialysis patients in DKI Jakarta is 7,232 patients with a total of 1571 hemodialysis machines available (IRR, 2018).

Patients with early-stage CKD usually do not feel any complaints until kidney function is only ≤ 15% (Anggraini, 2022). Although initially CKD patients do not show signs or symptoms, the condition can gradually worsen and lead to kidney failure (Gliselda, 2021). In the early stages, CKD patients may experience symptoms such as fatigue, lack of energy, difficulty concentrating, loss of appetite, insomnia, prolonged dry and itchy skin, and frequent urination, especially at night (Marni et al., 2022). CKD treatment can be done with kidney transplantation and hemodialysis. According to Amalia & Apriliani (2021), hemodialysis is a kidney replacement therapy for CKD patients by inserting blood into an artificial kidney or dialyzer. Hemodialysis aims to remove metabolic waste and address fluid and electrolyte balance problems (Ramadhan et al., 2023).According to Kustiyah (2021), hemodialysis is performed as a replacement therapy for kidney function in patients with kidney failure and to remove metabolic waste as well as excrete toxic substances in the body such as urea. Increased urea levels can cause uremic toxicity complications. Monitoring urea levels in hemodialysis patients helps determine how well the kidneys are working and detect any organ disturbances as well as the success of hemodialysis therapy. As stated in the National Guidelines for Health Services in the field of kidney replacement therapy in Indonesia, hemodialysis adequacy is assessed using Kt/V or URR calculations. The standard frequency for hemodialysis in Indonesia is twice a week with a target Kt/V of 1.8 and URR > 65 percent (IRR, 2018). Inadequate urea removal during hemodialysis causes CKD patients to quickly fall back into uremia, which can affect almost all organ systems (Hasanah et al., 2020). Hematologically, urea buildup can damage and shorten the lifespan of erythrocytes, leading to anemia, which in turn disrupts melatonin regulation (Al Falah Rifqi et al., 2024).

Previous studies have shown that there is a decrease in urea levels after HD therapy, but not all return to normal levels. The daily dietary habits and compliance of patients play an important role in regulating urea levels. Syuryani et al. (2021) mentioned that CKD patients' urea levels before undergoing HD were generally hyperuremic, but frequent HD therapy did not bring urea levels back within normal limits. The daily dietary habits and compliance of patients play an important role in regulating urea levels. Research conducted by Susilawati & Sudrajat (2024) mentioned that the average pre-dialysis and post-dialysis urea levels in CKD patients remained above normal, with urea above 52.25 mg/dl. Research conducted by Syuryani (2021) stated that the urea levels in CKD patients before hemodialysis, with a sample size of 44, had an average value of 109.7 and a standard deviation of 34.24, while the urea levels in CKD patients after hemodialysis, with a sample size of 44, had a mean value of 31.40 and a standard deviation of 13.18.

Research conducted by Khaerudin et al. (2019) titled "The Relationship Between Hemodialysis Adequacy Urea Reduction Ratio (URR) and Fatigue Levels in End-Stage Renal Disease (ESRD) Patients" found a significant relationship between the two. The next study conducted by Fatonah et al. (2021) titled "The Relationship Between Hemodialysis Effectiveness and Quality of Life in Chronic Kidney Disease Patients in Yogyakarta" found a significant impact of Quick of Blood (Qb) determination on the success of Urea Reduction Ratio (URR) and the Duration of Hemodialysis at Murni Teguh Memorial Hospital.

To maintain kidney function, a device called a dialyzer is used by terminal chronic kidney failure patients undergoing hemodialysis as an artificial kidney replacement therapy. Hemodialysis is a procedure that alters the composition of blood solutes by passing it through a semi-permeable membrane with a different solution. It has proven to be highly beneficial and improves the quality of life for patients (Rasianti Puspita Sari & Sitti Rahma Soleman, 2024). The hemodialysis process can be performed two to three times a week for three to five hours each session to maintain urea, creatinine, uric acid, and phosphate levels within normal ranges, even though clinical abnormalities such as metabolic disturbances due to uremic toxins may still be present (Endro Haksara & Ainnur Rahmanti, 2021).The blood flow rate affects the procedure of fluid transfer from the patient's blood to the dialyzer. The amount of blood that can flow in one minute (mL/min) is known as the blood flow rate (Quick of Blood). More toxins and excess fluids can be removed from the patient's body by using a dialyzer that can process more blood per minute (Fardiansyah et al., 2024). According to the Indonesian Renal Registry (IRR), clinical indicators of hemodialysis include overall good health and nutritional status, controlled blood pressure, absence of anemia, balanced electrolytes with normal acid-base concentration, controlled calcium and phosphate metabolism, and planned Kt/V values twice a month in January and February 2017. Starting with pre, intra, and post-hemodialysis, nurses are crucial to the hemodialysis adoption process (Fardiansyah et al., 2024).

Urea clearance or Urea Reduction Ratio (URR) is influenced by blood flow rate (QB), dialysate flow rate, and dialyzer membrane permeability (Wayunah et al., 2023). The patient's varying conditions are essential for determining the appropriate blood flow rate (QB), as it will determine different Urea Reduction Ratio (URR) results. Researchers believe that adjusting the blood flow rate (QB) is very important for achieving the Urea Reduction Ratio (URR). According to PERNEFRI (2020), a good QB is four times the body weight, which aligns with the standard used at Hospital X that applies the same QB. Factors influencing blood flow rate (QB) include body weight, lumen/needle size, and vascular access. Preliminary research conducted in the Hemodialysis Unit of Semarang City Hospital showed that paired-samples T-test results indicated significant differences in urea levels before and after hemodialysis in each QB group. The average URR result for a QB of 150 mL/min is 52%.RSUD Tarakan Jakarta is one of the general regional hospitals in DKI Jakarta that has a hemodialysis unit with a capacity of 30 beds and two hemodialysis isolation rooms. The hemodialysis unit has 25 machines in the hemodialysis room and three machines in the ICU, ICCU, and CTCU units. The hemodialysis room is located in the same building as the ER and ICU, making it very efficient for emergency and intensive care handling. In 2022, there were 8,119 hemodialysis therapy visits, increasing to 9,710 patients in 2023. From this data, it can be concluded that CKD cases requiring hemodialysis therapy have increased significantly by 19.58%, while the number of patients currently undergoing hemodialysis therapy is 93, with 53 male patients and 40 female patients. This study uses patient medical record data, totaling 93 patient records,

from February to July 2024.

METHOD

This research is a quantitative study with a descriptive analytical correlation design. The study was conducted using a cross-sectional approach. In this study, researchers reviewed medical records for data on hemodialysis frequency and use URR measurements through laboratory examinations. In this case, the conducted study does not perform validity and reliability tests. This study aims to examine the relationship between hemodialysis frequency and Urea Reduction Ratio (URR) results in CKD patients at RSUD Tarakan, Jakarta.The population of this study comprises patient data from the past six months, from February to July 2024, involving 93 patients undergoing hemodialysis therapy at the Hemodialysis Unit of RSUD Tarakan. The sample consists of retrospective data from February to July 2024, totaling 93 patient records.The research was conducted at the Hemodialysis Unit of RSUD Tarakan. The study will take place from August to October 2024.

RESULT

Table 1.
Frequency Distribution of Respondent Demographic Characteristics Based on Age, Gender, Education, and Occupation (n=93)

Variable	f	%
Age		
Early Adulthood (26 - 35)	10	10.8
Late Adulthood (36 - 45)	19	20.4
Early Ederly (46 - 55)	30	32.3
Late Elderly (56 - 65)	25	26.9
Elderly (> 65)	9	9.7
Gender		
Male	53	57.0
Female	40	43.0
Education		
No Schooling	1	1.1
Elementary School	7	7.5
Middle School	10	10.8
High School	58	62.4
Higher Education	17	18.3
Occupation		
Unemployed	17	18.3
Employed	76	81.7

Based on Table 1 regarding demographic characteristics by age among 93 respondents, the majority of respondents are in the early elderly age group (46-55 years), accounting for 32.3%. The gender variable shows that the majority of respondents are male, with 57%. The education variable indicates that most respondents have a high school education, making up 62.4%. The employment variable shows that the majority of respondents are employed, with 81.7%.

Table 2.
Frequency Distribution of Hemodialysis Patients (n=93)

Variables	f	%
Hemodialysis Frequency		
Reguler (2x/ week)	77	82.8
Reguler (3x/ week)	16	17.2

Based on Table 2, the frequency distribution of hemodialysis patients at RSUD Tarakan, Jakarta, in 2024 shows that the majority of respondents undergo hemodialysis regularly 2 times a week, amounting to 82.8%.

Table 3.
Frequency Distribution of URR Results (n=93)

Variables	f	%
URR Results		
Not Achieved (< 65%)	19	20.4
Achieved (> 65%)	74	79.6

Based on Table 3, the frequency distribution of URR results among 93 respondents shows that the majority of respondents achieved URR results greater than 65%, accounting for 79.6%.

Table 4: Relationship Between Hemodialysis Frequency and Urea Reduction Ratio (URR) Results in CKD Patients at RSUD Tarakan, Jakarta, 2024 (n=93)

Hemodialysis Frequency	URR				Total		*P value*	Nilai *r*
	Not Achieved		Achieved					
	f	%	f	%	f	%		
Reguler (2x/ week)	19	20.4	58	62.4	77	100	0,026	0.231
Reguler (3x/ week)	0	0	16	17.2	16	100		
Total	19	20.4	74	79.6	93	100		

Based on Table 4, the chi-square test result with a P-value of 0.026 (< alpha 0.05) indicates a significant relationship between the variable of hemodialysis frequency (independent) and the Urea Reduction Ratio (URR) result (dependent) in CKD patients at RSUD Tarakan in 2024 with a total of 93 respondents. The Spearman-rank test result with an r value of 0.231 indicates that the correlation between the variable of hemodialysis frequency (independent) and the variable of Urea Reduction Ratio (URR) result (dependent) is low/weak (0.20 – 0.39) in CKD patients at RSUD Tarakan in 2024 with a total of 93 respondents.

DISCUSSION

Age Characteristics

Based on Table 1, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority were in the early elderly age group (46-55 years) with a total of 32.3%. The results of this study are in line with Ani Indriastutik's research (2022), which stated that most respondents were aged 46-55 years, almost half of them being 18 (45%) respondents. This is due to the decline in kidney function that occurs after the age of 40, which is a form of the degenerative process experienced by humans (Maya Febrianasari, Endrat Kartiko Utomo, 2025).According to Nurhamibah & Slametiningsih (2022), each kidney has around 1 million nephrons at birth. When someone reaches the age of 40, a gradual decline in kidney function and the number of nephrons begins. This can lead to a decrease in kidney function, so it can be said that people over 40 years old are at risk of CKD.The researcher assumes that those above the age of 40 are more at risk of experiencing a decline in organ function, such as the kidneys. This is due to the degenerative process in the human body.

Gender Characteristics

Based on Table 1, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority of respondents are male, accounting for 57%, while female respondents make up 43%.The results of this study are consistent with the findings of Euphora & Samira (2023), which state that the majority of CKD respondents were male, accounting for 51.3% of the 80 respondents. Data from the Indonesian Renal Registry (IRR) (2018) shows that 57% of hemodialysis patients were male (Mentari & Nugraha, 2023). This is attributed to insufficient water intake according to the body's needs. Water is essential for human survival; inadequate water consumption negatively impacts health.Insufficient fluid intake disrupts the movement of water within the body. Proper water consumption is 8 glasses per day; insufficient intake leads to dehydration. Water significantly affects the kidneys, as the human body primarily consists of fluids. Therefore, inadequate water intake can cause kidney problems. Knowledge of the importance of daily water intake is crucial to meet the body's fluid needs. Understanding the importance of drinking water daily is essential to prevent various diseases (Pratikaning Sari et al., 2023).The researchers assume that male respondents fail to meet their daily water intake needs of 8 glasses, leading to long-term kidney problems.

Education Characteristics

Based on Table 1, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority of respondents have a high school education, accounting for 62.4%.The results of this study are consistent with Samosir et al. (2024), which states that most CKD stage V patients undergoing hemodialysis therapy are high school graduates, with a total of 61 respondents (83.6%). Knowledge is something known related to the learning process. Knowledge is one of the factors influencing attitudes and actions, leading to attitude changes to support individuals in taking positive actions and demonstrating psychosocial adjustment abilities in response to health status changes. There are levels of knowledge that include knowing, experience, understanding, analysis, synthesis, and evaluation. Increasing respondents' knowledge affects attitude and behavior changes in making decisions to undergo hemodialysis therapy and medical treatment (R. Dwi & Aminah, 2023).The researchers assume that the lack of health knowledge among individuals is very important. This can influence individuals' awareness of their health, thereby improving their quality of life.

Occupation Characteristics

Based on Table 1, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority of respondents are employed, accounting for 81.7%, while 18.3% are unemployed.The results of this study are consistent with Saragih et al. (2024), which states that most CKD patients undergoing hemodialysis are employed, with 40 patients (55.6%) working and 32 patients (44.4%) not working. According to Rembune et al. (2022), work is a social activity where individuals or groups put effort over certain times and spaces, sometimes expecting rewards or not expecting rewards, but feeling a sense of duty to others. The employment status of most respondents as active workers influences their compliance with hemodialysis. This is due to the lack of time to carry out all the prescribed therapies, impacting the respondents' adherence to all given therapies (Saragih et al., 2024).The researchers assume that employment supports quality of life. Work not only provides income but also gives structure to daily life, boosts self-confidence, and offers social interactions that can affect the quality of life of hemodialysis patients.

Hemodialysis Frequency Characteristics

Based on Table 2, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority of respondents undergo hemodialysis regularly twice a week, accounting for 82.8%.The results of this study are consistent with Suciana et al. (2020), which states that most patients undergoing hemodialysis therapy do so twice a week, accounting for 61.1%. According to Ashar et al. (2023), hemodialysis is a procedure where blood is removed from the body and circulated through a machine outside the body called a dialyzer. Hemodialysis frequency refers to how often a patient visits the hemodialysis unit for blood cleansing therapy. The frequency of hemodialysis varies depending on the remaining kidney function, with an average of twice a week. Each hemodialysis session typically lasts at least three to four hours.The researchers assume that the frequency of hemodialysis performed by patients is regularly carried out two to three times a week. This is done to reduce symptoms arising from CKD, such as nausea, vomiting, fluid overload that can cause edema, and shortness of breath.

URR Results Characteristics

Based on Table 3, it shows that out of 93 hemodialysis patients at RSUD Tarakan, Jakarta, in 2024, the majority achieved URR results greater than 65%, accounting for 79.6%, while 20.4% did not achieve URR results less than 65%.The results of this study are consistent with Novinka et al. (2022), which states that 19 hemodialysis patients (76.0%) had adequate hemodialysis adequacy, while 6 respondents (24.0%) had inadequate hemodialysis adequacy. According to Aufa et al. (2024), hemodialysis adequacy is an indicator of the success of the dosage adequacy in hemodialysis patients. Adequacy is achieved and can be seen in patients' good condition, absence of malnutrition, absence of uremic disorders, and patients being able to comfortably engage in activities as they did before getting sick. Adequacy is measured using the Urea Reduction Rate (URR) or Kt/V value and is assessed monthly or every six months at most. Adequacy is considered ideal if the Kt/V value is 1.2 (URR 65%) for hemodialysis 3 times a week with a duration of 3-4 hours per session and Kt/V 1.8 (URR 80%) for hemodialysis 2 times a week for 4-5 hours per session.The researchers assume that the study results indicate that most hemodialysis patients in this study achieved hemodialysis adequacy. This is crucial for patients undergoing hemodialysis to ensure the therapy is as effective as possible and to prevent complications due to CKD experienced by the patients.

Relationship Between Hemodialysis Frequency and URR Results

Based on Table 4, data shows that respondents undergoing hemodialysis regularly (twice a week) achieved URR results greater than 65% in the majority of cases, accounting for 75.3%. Respondents undergoing hemodialysis regularly (three times a week) achieved URR results greater than 65% in 21.6% of cases. The chi-square test result with a p-value of 0.026 (< alpha 0.05) indicates a significant relationship between the independent variable of hemodialysis frequency and the dependent variable of Urea Reduction Ratio (URR) results in CKD patients at RSUD Tarakan in 2024, involving 93 respondents. The Spearman-rank test result with an r value of 0.231 shows that the correlation between the independent variable of hemodialysis frequency and the dependent variable of URR results is low/weak (0.20 – 0.39) among CKD patients at RSUD Tarakan in 2024, involving 93 respondents.According to Ashar et al. (2023), hemodialysis is a procedure where blood is removed from the body and circulated through a machine outside the body called a dialyzer. Hemodialysis frequency refers to how often a patient visits the hemodialysis unit for blood cleansing therapy. The frequency of hemodialysis varies depending on the remaining kidney function, with an average of twice a week. Each hemodialysis session typically lasts at least three to four hours.
Hemodialysis frequency is the number of therapy sessions conducted based on patient needs and conditions. Patients undergo hemodialysis two to three times a week for four to five hours

each session, or 10-15 hours per week. In Indonesia, hemodialysis is conducted twice a week for four to five hours, tailored to individual needs and prescribed doses. Adequacy is an indicator of the success of dosage adequacy in hemodialysis patients. Adequacy is achieved and can be seen in patients' good condition, absence of malnutrition, absence of uremic disorders, and patients being able to comfortably engage in activities as they did before getting sick (Aufa et al., 2024). Adequacy is measured using the Urea Reduction Rate (URR) or Kt/V value and is assessed monthly or every six months at most. Adequacy is considered ideal if the Kt/V value is 1.2 (URR 65%) for hemodialysis three times a week with a duration of 3-4 hours per session, and Kt/V 1.8 (URR 80%) for hemodialysis twice a week for 4-5 hours per session (Naryati, Widakdo, et al., 2023).

According to Novinka et al. (2022), hemodialysis adequacy can be measured in two ways: by measuring the amount of urea reduction (Urea Reduction Rate, URR), or by calculating the urea reduction rate from the body fluid volume of each patient during hemodialysis (Kt/V). When the targeted URR goal is achieved, namely URR 65% and Kt/V 1.2 for patients receiving hemodialysis three times a week for four hours each session, and URR 80% and Kt/V 1.8 for patients receiving hemodialysis twice a week for five hours each session, hemodialysis is considered appropriate.

CONCLUSION

Based on the data processing and discussion, the author concluded that the demographic characteristics of the age variable among 93 respondents show that the majority of respondents are in the early elderly age group (46-55 years), accounting for 32.3%. The gender variable indicates that most respondents are male, accounting for 57%. The education variable shows that most respondents have a high school education, accounting for 62.4%. The occupation variable indicates that most respondents are employed, accounting for 81.7%. The majority of respondents who regularly (twice a week) undergo hemodialysis amount to 82.8%. The majority of respondents undergoing hemodialysis achieve URR results greater than 65%, accounting for 79.6%.The frequency of hemodialysis among 93 respondents shows that the majority regularly undergo hemodialysis twice a week, amounting to 82.8%.URR results among 93 respondents show that the majority achieve URR results greater than 65%, accounting for 79.6%.The chi-square test result with a p-value of 0.026 (< alpha 0.05) indicates a significant relationship between the independent variable of hemodialysis frequency and the dependent variable of Urea Reduction Ratio (URR) results in CKD patients at RSUD Tarakan in 2024, involving 93 respondents. The Spearman-rank test result with an r value of 0.231 shows that the correlation between the independent variable of hemodialysis frequency and the dependent variable of URR results is low/weak (0.20 – 0.39) among CKD patients at RSUD Tarakan in 2024, involving 93 respondents.

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