

## **Relationship Of Hemodialysis Frequency With Hemoglobin Levels In Patients With Chronic Renal Failure Or Chronic Kidney Disease (Ckd) At Hospital in Jember Regency**

**Anita Fatarona<sup>1\*</sup>, Nindi Nur Kholifah<sup>1</sup>.**

<sup>1</sup>Faculty of Health Sciences, Universitas dr. Soebandi, Jember, Indonesia

\*Correspondence:

Author Name: Anita Fatarona

Email: [anitafatarona4@gmail.com](mailto:anitafatarona4@gmail.com)

**Received: 2023-09-13**

**Accepted: 2024-01-10**

**Published:2024-01-15**

### **Abstract**

**Introduction:** Chronic kidney disease is one of the most important global health problems today related to mortality, with its prevalence significantly increasing every year worldwide. Chronic kidney failure occurs because the kidneys cannot maintain balance in the body. Decreased kidney function results in the kidneys not producing the hormone erythropoietin, which can cause a decrease in hemoglobin levels. Low hemoglobin levels can cause anemia in patients with chronic kidney failure. This study aimed to analyze the relationship between hemodialysis frequency and hemoglobin levels in chronic renal failure patients at hospital in Jember. **Method:** The study used analytical observational research with a cross-sectional design. The sample of this study amounted to 30 respondents using consecutive sampling. Data collection using observation sheets. **Results:** Chronic renal failure patients undergoing hemodialysis 2 times a week (73.3%) in the always category and hemoglobin levels in the low category (76.7%). With a percentage of p-value results of 0.002 where  $p < \alpha$  ( $0.002 < 0.005$ ). **Conclusion:** There is a relationship between hemodialysis frequency and hemoglobin levels in chronic renal failure patients at hospital in Jember.

**Keywords:** Hemodialysis frequency, hemoglobin levels, chronic renal failure

### **Introduction**

Chronic kidney disease is one of the most important global health problems today related to mortality, and its prevalence is increasing yearly worldwide (Rosdewi, Tol'ba, Syahrul, & Tika, 2023). Chronic Kidney Disease (CKD) is a rapidly growing health problem. The Center For Disease Control and Prevention in Atlanta recently created the Chronic Kidney Disease Program to improve federal and state CKD surveillance and prevention programs. The increased incidence of CKD partly indicates an increase in obesity, hypertension, and diabetes in well-nourished and sedentary populations. Because cardiovascular disease and diabetes mellitus are common comorbidities of CKD, aggressive disease management and risk factors

can reduce morbidity and mortality (Sugiyarto, 2022).

Chronic kidney failure is a health problem in a world that continues to increase. According to World Health Organization (WHO) data, chronic kidney disease kills 850,000 people annually.

According to the Pan American Health Organization (PAHO), in 2021 in America, chronic kidney disease ranked 8th in 2019, with the number of deaths in all regions of America at 254,028 deaths. In Indonesia, the prevalence of chronic kidney failure based on a doctor's diagnosis is highest in North Maluku at 0.56%. The prevalence of kidney failure in East Java itself is 0.29%, while the prevalence based on the highest age aged 65-74 years is 0.82%, where the prevalence of men is 0.42% higher than women at 0.35% (Laporan Nasional RISKESDAS, 2018). Based on a preliminary study conducted at hospital in Jember, 70 chronic kidney failure patients are undergoing hemodialysis in February 2023. Chronic kidney failure occurs due to a decrease in the ability of the kidneys to maintain balance in the body. Kidney disease is a non-communicable disease, so the course of the disease takes a long time, so there is a decrease in its function, and it cannot return to its original condition. Kidney damage occurs in nephrons, including the glomerulus and renal tubules; damaged nephrons cannot return to normal function. The kidneys filter and remove the waste from the body's metabolism (Siregar, 2020). One of the most widely practiced therapies in some countries is hemodialysis.

Hemodialysis is a therapy to remove metabolic waste from the body. Hemodialysis undertaken by patients can maintain survival. The rest of this metabolism is urea and creatinine. Excess urea and creatinine in the body due to decreased kidney function and high creatinine and urea levels can interfere with erythropoietin function. Erythropoietin (EPO) stimulates the spinal cord to form red blood cells. Due to impaired kidney function, the kidney cannot produce enough erythropoietin, which can affect the formation of red blood cells. Thus, the kidneys can not produce erythropoietin, which can cause a decrease in erythrocyte levels (Rosini, Aini, & Ramadanti, 2020). Hemoglobin (Hb) has two important tasks for transportation in the body: transporting oxygen into the tissues and as a carrier of carbon dioxide and protons from peripheral tissues to the respiratory organs, then excreted out of the body. Decreased hemoglobin levels in patients with chronic renal failure occur due to excess fluid in all extracellular parts, decreasing fluid and sodium excretory function. An increased amount of fluid can cause dilution and low hemoglobin levels, and anemia can even occur (Aristin, 2022). Anemia can also increase the risk of significant morbidity and mortality from chronic kidney failure. Anemia in patients with chronic renal failure will increase the risk of cardiovascular events and the prognosis of kidney failure itself (Lombu, 2019).

Based on the explanation above, researchers are interested in researching the "Relationship of Hemodialysis Frequency with Hemoglobin Levels in Chronic Kidney Disease (CKD) Patients at Hospital in Jember".

## METHOD

This study used analytical observational research with a *cross-sectional* research design. The population used in this study was all chronic kidney failure patients undergoing hemodialysis in the hemodialysis hospital in Jember. The sample in this study was 28 respondents obtained from the calculation results of the Slovin formula. The sampling technique in this study used *consecutive sampling*. Data collection in the study using observation sheets. The data analysis technique used is Spearman's *rho test*.

## RESULTS

### 1. Univariate Analysis

**Table 1** Distribution of Hemodialysis Patients at Hospital in Jember Period (July 2023)

Respondents' characteristic	Frequency	Presentase%
<b>Gender</b>		
Man	16	55,2
Woman	12	41,4
<b>Age</b>		
26-35 years	4	13,8
36-45 years	11	37,9
46-55 years old	13	44,8
<b>HD Frequency</b>		
Sometimes	7	24,1
Always	21	72,4
<b>Hemoglobin Level</b>		
Low	21	72,4
Normal	5	17,2
Tall	2	6,9
<b>Total</b>	<b>28</b>	<b>100,0</b>

Based on table 1, it can be seen that most of the respondents were men, namely 16 respondents (55.2%). And based on aged 45-55 years, namely 13 respondents (44.8%). The most respondents underwent hemodialysis  $\geq 2x/week$ , namely 21 respondents (72.4%). The number of HD patients who was undergoing hemodialysis had low hemoglobin levels, namely 21 respondents (72.4%).

### 2. Bivariate Analysis

Based on the results of statistical tests using Spearman's *rho*, a significant value of  $p$ -value = 0.001 was obtained where  $p < \alpha$  ( $0.001 < 0.05$ ) so that  $H_0$  was rejected and  $H_a$

was accepted, which means there is a relationship between the frequency of hemodialysis and hemoglobin levels in undergoing hemodialysis at hospital in Jember. The r value of -0.594 indicates a strong or significant correlation strength, but a negative pattern means that the greater the frequency of hemodialysis, the lower the hemoglobin level.

**Table 2** Spearman's rho *Test Results* between Hemodialysis Frequency and Hemoglobin Levels in Chronic Renal Failure Patients Undergoing Hemodialysis at hospital in Jember.

Variable	R-value	P value
Frequency of hemodialysis	-0,594	0,001
Hemoglobin levels		

*Source: Secondary Data, 2023*

## Discussion

The study results show that most of the respondents who routinely do hemodialysis, with as many as 21 respondents (72.4%) in the category always. This shows that most chronic kidney failure patients routinely undergo hemodialysis a hospital in Jember.

Hemodialysis is a dialysis method to remove metabolic waste from the body when the kidneys can no longer carry out the process (Suciana, Hidayati, & Kartini, 2020). Frequency can be interpreted as hemodialysis dose every week, hemodialysis once every week in conditions of early renal failure, and at least 2 times a week in conditions of end-stage renal failure, according to Smeltzer, et al., 2008 (Primastuti, 2017). Ideally, hemodialysis is done 3 times/week with a duration of 4-5 hours 21 per session, but in Indonesia, it is done 2 times/week with a duration of 4-5 hours, according to Septiwi (2011) (Wong, 2017). The frequency of hemodialysis varies depending on how much kidney function remains. The frequency of hemodialysis is intended so the patient does not experience uremia, excess fluid disorders, and complications caused by kidney damage (Puspita, Setianingrum, & Lidia, 2018).

The study results show that most respondents have low hemoglobin levels, as many as 21 respondents (72.4%). This shows that most chronic kidney failure patients on hemodialysis at Hospital in Jember have low hemoglobin levels. One of the complications that often occurs in chronic kidney failure patients undergoing hemodialysis is anemia. The main cause of anemia in chronic renal failure patients is reduced erythropoietin, according to Lewis, 2017 (Pandiangnan F. , 2021). Erythropoietin is a hormone produced by the kidneys to stimulate the formation of hemoglobin. In patients with chronic renal failure, the amount of erythropoietin production in the kidneys becomes reduced because the kidneys are damaged to inhibit the formation of red blood cells, according to Lankhorst and Wish, 2010 (Pandiangnan F. , 2021).

This aligns with research conducted by (Akhdiyati, 2019), which states that hemoglobin levels in patients with chronic renal failure range from 3-12 g / dl. The decrease in hemoglobin levels in patients with chronic kidney failure is below normal. The decrease in hemoglobin levels is due to erythropoietin hormone deficiency. Chronic kidney damage causes less than optimal kidney performance, especially in producing the hormone erythropoietin. This leads to disruption of the formation of red blood cells, which directly leads to a decrease in hemoglobin levels in the blood.

Table 2. Based on the statistic analysis there were 10 of the Spearman rho statistical test results shows a significant relationship between the frequency of hemodialysis and hemoglobin levels in chronic renal failure patients at Hospital in Jember with *p-value results of 0.001 where  $p < \alpha$  ( $0.001 < 0.05$ )*. The hemodialysis process can result in impaired kidney function and blood loss, decreasing hemoglobin levels. The longer you undergo hemodialysis, the more hemoglobin levels will decrease. Therefore, it can be said that the incidence of anemia in patients with chronic renal failure is not only caused by a decrease in erythropoietin levels but can also be caused by the presence of injury mechanism on red blood cells during the hemodialysis process (Sunarto, 2019).

Patients undergoing hemodialysis may also develop anemia due to the blood loss accompanying their treatment. In chronic renal failure patients receiving routine dialysis therapy, blood loss results from several factors, such as sampling for routine biochemical examination and bleeding from the fistula site. Blood loss in dialyzer may be due to several causes, such as clotting episodes during hemodialysis and blood left behind in hemodialysis. At the end of each hemodialysis treatment, a small amount of blood is usually left in the dialysis. This can be a source of iron deficiency over time. So it can cause anemia, according to NKF-KDOQI, 2015 in (Wong, 2017).

This is in line with research (Rantepadang, 2022), which states that in hemodialysis patients, hemoglobin levels will decrease due to reduced erythropoietin production, blood collection for laboratory tests, and blood trapped or left in hemodialysis devices, as the results of the study stated that patients who have abnormal hemoglobin levels as much as 39 (90.7%).

The results of this study are in line with research conducted by (lombu, 2019), which states that there is a significant relationship between the frequency of hemodialysis and hemoglobin levels with a value of  $p = 0.036$ , which means a  $p$  value of  $<0.05$  but a negative pattern which means the greater the frequency of hemodialysis, the lower the hemoglobin level.

## **Conclusion**

Based on the results of research and discussion about the relationship between hemodialysis frequency and hemoglobin levels in patients with chronic kidney disease (CKD) at hospital in Jember it can be concluded. Most chronic kidney failure patients at hospital in Jember does hemodialysis therapy 2 times a week. Chronic kidney failure patients undergoing hemodialysis mostly have low Hb levels. Meanwhile, the frequency of hemodialysis with a low hemoglobin content of 54%, the side of which is other factors influence 41%. The result of p-value 0.001 ( $p < 0.05$ ) is that there is a relationship between the frequency of hemodialysis and hemoglobin levels. The r value is calculated as -0.549, indicating the magnitude with the direction of the negative relationship. So, it can be concluded that the greater the frequency of hemodialysis, the lower the hemoglobin level.

### Acknowledgement

We sincerely thank to Head of the hospital for facilitating and giving permission to the researcher to conduct this research.

### Author Contribution

First author: designing the whole concept of the study, collecting and analyzing the data, and writing the manuscript

Second and third author: giving a guidance for the researcher during the process of research preparation and implementation, supervising and ensuring that research project is carried out in accordance with the methodology research.

### References

- Laporan nasional riskesdas* .(2018) . Badan penelitian dan pengembangan kesehatan 2019.
- Akhdiyati, H. (2019). Analisis Kadar Hemoglobin Pada Pasien Penderita Gagal Ginjal Kronik. *International Journal of Applied Chemistry Research*, 1 No. 1, 3-4.
- Aristin, r. P. (2022). Gambaran kadar hemoglobin pada pasien gagal ginjal kronik yang menjalani hemodialisa di rumah sakit umum bahtheramas provinsi sulawesi tenggara
- Lombu, s. (2019). Hubungan frekuensi terapi hemodialisa dengan hemoglobin pada pasien gagal ginjal kronik di rsud dr. Loekmono hadi kodus tahun 2019. 6-7.
- Pandiangan, F. D. (2021). Gambaran Kadar Hemoglobin Pasien Gagal Ginjal Kronik Sesudah Melakukan Hemodialis. *Jurnal Medika Hutama*, 02 No, 04, 1042-1043.
- Primastuti, N. (2017). Gambaran Kualitas Hidup Pasien Chronic Kidney Disease Yang Menjalani Hemodialisis Di Rumah Sakit Mitra Huasa Makasar Tahun 2017. *Skripsi*. Program Studi Pendidikan Dokter Fakultas Kedokteran
- Puspita, a. A., setianingrum, e. L., & lidia, k. (2018). Pengaruh frekuensi hemodialisis terhadap perbedaan kadar hemoglobin dan indeks eritrosit pasien gagal ginjal kronik pre dan post hemodialisis di rsud prof. Dr. W. Z. Johannes tahun 2018 . 105-108.

- Rantepadang, a. (2022). Kadar hemoglobin dan lama hemodialisa terhadap kualitas hidup pasien gagal ginjal kronis yang menjalani hemodialisa. *Klabat jotnal of nursing*.
- Rosdewi, tol'ba, y., syahrul, m., & tika, d. (2023). Pengaruh hemodialisa terhadap nilai hemoglobin pada pasien end stage renal disease di rs. Stella maris makasar. *Jurnal ners*, 7, no. 1, 68-73.
- Rosini, d. D., aini, & ramadanti , e. (2020). Efektivitas hemodialisa berdasarkan parameter hemoglobin, eristrosit, dan hematokrit pada penderita gagal ginjal kronik. *Jurnal analis medika biosains*, 7, no. 2, 146-152.
- Siregar, c. T. (2020). *Buku ajar manajemen komplikasi pasien hemodialisa*. (r. A. Aruga, ed.) Yogyakarta: deepublish.
- Sugiyarto. (2022). *Keperawatan medikal bedah ii (pemenuhan kebutuhan klien dengan gangguan kebutuhan sistem endokrin, pencernaan dan perkemihan)*. Rizmedia pustaka indonesia.
- Wong, O. W. (2017). Analisis Perubahan Hemoglobin Pada Pasien Gangguan Ginjal Keonik (GGK) Yang Menjalani Hemodialisis Selama 3 Bulan Di Rumah Sakit Perguruan Tinggi Negeri (RSPTN) Universitas Hasanudin (UNHAS) Makasar . *Skripsi*. Program Studi Pendidikan Dokter Fakultas Kedokteran