Jurnal Info Kesehatan
Vol. 19, No. 2. December 2021, pp. 197-205
P-ISSN 0216-504X, E-ISSN 2620-536X
DOI: *10.31965/infokes.Vol19Iss2.523*
Journal homepage:*http://jurnal.poltekeskupang.ac.id/index.php/infokes*

R E S E A R C H **Open Access**

Hemodialysis Duration with Levels of Hemoglobin, Hematocrit, Serum Iron and Total Iron Binding Capacity on Chronic Kidney Disease

Supriati Wila Djami[1a*], Marni Tangkelangi[1b]

[1] Department of Medical Laboratory Technology, Polytechnic of Health Ministry of Health Kupang, Kupang, East Nusa Tenggara, Indonesia.

[a] Email address: riatiputri@gmail.com
[b] Email address: marni.tangkelangi@gmail.com

Received: 23 April 2021 Revised: 16 July 2021 Accepted: 31 December 2021

Abstract

The correlation of the length of time undergoing hemodialysis with the levels of hemoglobin, hematocrit, serum iron and total iron binding capacity in patients with chronic kidney disease at RSUD Prof. Dr. W. Z. Johannes Kupang. People with chronic kidney disease who are performing Hemodialysis suffer from anemia. Blood loss during the hemodialysis process is affected by frequent blood sampling for laboratory tests. To diagnose the occurrence of iron deficiency, anemia laboratory tests such as complete blood, serum iron (SI), TIBC, transferrin saturation, and serum ferritin can be conducted. The objective of this study is to determine the correlation between the length of undergoing Hemodialysis with the levels of Hemoglobin, Hematocrit, Serum Iron, and Total Iron Binding Capacity (TIBC) in patients with chronic kidney disease in RSUD Prof. Dr.W. Z Johannes Kupang. This study employed an anon-reactive research design or unobtrusive research based on secondary data derived from medical record records at RSUD Prof. Dr.W. Johannes in August - September 2019 on 92 hemodialysis patients who met the inclusion criteria. The collected data were calculated with the SPSS application, while the correlation analysis between variables was performed by administering a linear regression analysis test. Ninety-two (92) respondents were obtained by employing the purposive sampling technique. The majority of patients with chronic kidney disease undergoing Hemodialysis were men (57.6%) with ages 39 - 59 years (63.0%), and the majority of patients undergoing Hemodialysis in patients with chronic kidney failure (CKD) were <12 months (41.3%). It was discovered that there was no relationship between the length of Hemodialysis with hemoglobin, hematocrit, serum iron, and total iron-binding capacity levels in patients with chronic kidney disease (CKD).

Keywords: Hemodialysis, Anemia, Hemoglobin, Hematocrit Serum Iron, Chronic Kidney Disease.

Corresponding Author:

Supriati Wila Djami
Department of Medical Laboratory Technology, Polytechnic of Health Ministry of Health Kupang, Kupang, East Nusa Tenggara, Indonesia.
Email: riatiputri@gmail.com

1. INTRODUCTION

Kidneys are vital organs in humans that possess a tremendous essential role in the body's metabolism. If there is a disturbance in kidney function caused by chronic disease, it affects the function of other organs in the body. Chronic Kidney Failure (CKD) is a non-communicable disease (NCD) that has become a global public health issue due to increased prevalence and incidence of kidney failure, poor prognoses, and high expenses. According to the World Health Organization (WHO), chronic kidney disease, with an annual mortality rate of 850.000 individuals, contributes to the world's disease burden (World Health Organization, 2003). The prevalence of CKD rises in tandem with the aging population and the rise in the frequency of hypertension and diabetes mellitus (Kementerian Kesehatan Republik Indonesia, 2018). Chronic kidney disease (CKD) is a global health problem whose prevalence has increased. The state of fluid overload is often a systemic complication of CKD patients undergoing hemodialysis (HD) therapy. One of the clinical parameters of fluid overload in HD patients is ascites (Yusman, et al, 2020).

Chronic Kidney Disease is a non-communicable disease affecting the kidney organ, in which the kidney organ suffers from severe damage due to the decreased glomerular filtration rate (Permatasari, 2019). Basic Health Research data in 2018 reported that the prevalence of the Indonesian population suffering from kidney failure reaches 3.8%, and the province of East Nusa Tenggara attains 2% suffering from chronic kidney failure (Kementerian Kesehatan Republik Indonesia, 2018).

Chronic kidney failure or end-stage renal disease (ESRD) is a progressive and irreversible renal function disorder in which the ability of the body fails to maintain metabolism, fluid, and electrolyte balance, causing uremia (Simatupang, 2019). Chronic kidney disease can be caused by various conditions such as vascular disease, chronic glomerular disease, chronic infections, hypertension, diabetes, obstruction processes, and others. The kidneys can be translated for the treatment, or dialysis/hemodialysis can be used. Hemodialysis, frequently known as dialysis, is a kidney replacement therapy that cleans metabolic residue from the blood. It is most commonly used in patients with chronic kidney failure to extend and improve their quality of life. Low blood pressure, sepsis signs such as high fever and disorientation, muscular cramps, sleeplessness, and bone and joint pain are all side effects of hemodialysis (Permatasari, 2019).

Hemodialysis is a method of transferring dissolved compounds with products remaining in the body. Residual compounds collected in patients with CKD were obtained attractively by administering a semipermeable membrane passive diffusion method. The transfer of substances or compounds remaining in metabolic products works by following a decrease in the concentration gradient in the circulation into the dialysate (Aisara, et al., 2018). One method of managing chronic kidney disease is hemodialysis. Hemodialysis therapy takes a long time, has complications, and requires patient compliance. This will give the patient physiological and psychological stressors, affecting the patient's quality of life (Fitriani et al., 2020). Hemodialysis has developed as replacement therapy for renal function. Correctly understanding the patient's condition and providing the necessary care is at the core of patient care. Furthermore, optimal care of patients with the end-stage renal disease requires a thorough understanding of the different treatment options related to dialysis. In comparison, dialysis patterns may differ from country to country depending on national health policies (Kim & Kawanishi, 2018).

The highest increase in the number of patients with chronic kidney failure undergoing hemodialysis occurred in the 45–64-year age group, patients actively undergoing hemodialysis. Patients with chronic kidney failure who are performinghemodialysis suffer from anemia. Blood loss during the hemodialysis process is affected by frequent blood collection for laboratory and other examinations, characterized by a decrease in transferrin saturation and reduced ferritin levels. Laboratory tests such as Complete Blood, Serum Iron (SI), Total Iron Binding Capacity (TIBC), transferrin saturation, and serum ferritin are performed to diagnose iron-deficiency anemia. Chronic kidney failure, also understood as CKD or chronic kidney disease, is characterized by a significant decrease in kidney function, which is frequently up to less than 20% of the normal GFR value, over a long period, usually >3 months. Chronic kidney disease lasts without symptoms for years with increasing uremia and accompanying symptoms when the GFR has dropped to below 60 mL/min. The causes of chronic kidney failure are all in the form of long-term chronic disease (Indri, 2020).

According to Rachmanto, 2018, hemodialysis is a therapy that is performed to replace the work function of the kidneys by utilizing a tool specifically designed to treat symptoms and signs due to low levels of GFR patient's quality of life. In simple terms, hemodialysis is interpreted as a method of washing blood by removing excess waste or harmful compounds through a semipermeable membrane conducted to replace kidney function that is not functioning properly. Hemodialysis cleans and replaces the work that healthy kidneys are supposed to function. Hemodialysis should be conducted for the rest of the life of patients with decreased renal function until the patient receives a kidney transplant. If the transplant is not successful, hemodialysis can be performed again..

Wahyuni, et al., 's research 2018 study, there was a significant relationship between hemodialysis duration and quality of life in patients with chronic kidney disease, while Permatasari in 2019, study revealed no link between hemodialysis length and hemoglobin, hematocrit, or serum iron levels in patients with chronic kidney failure. The study on the length of hemodialysis with hemoglobin (Hb), hematocrit (Ht), serum iron (SI), and Total Iron Binding Capacity (TIBC) levels in kidney failure patients in Prof. Dr. WZ. Hospital Johannes Kupang, Indonesia, considers anemia's influence on kidney failure patients receiving hemodialysis.

2. RESEARCH METHOD

This study employeddescriptive analysis with frequency distribution tables of the patients' characteristics with chronic kidney failure undergoing hemodialysis in the form of age, sex, level of education and employment. This research is non-reactive research based on secondary data, in which the secondary data comes from medical records in RSUD Prof. Dr. W. Z. Johannes Kupang. This study was conducted on 92 patients undergoing hemodialysis in the hemodialysis unit of RSUD Prof. Dr. W. Z. Johannes Kupang General Hospital in August-September 2019. Moreover, this study was performed in patients with chronic kidney failure who underwent hemodialysis by looking at the results of their medical records which objective is to identify the correlation between length of time undergoing hemodialysis with hemoglobin, hematocrit, serum iron, and total iron-binding capacity in patients with chronic kidney failure.

The research data obtained were assessed by the SPSS application, while the correlation analysis between variables and data analysis results are presented in narration and frequency distribution tables. Results revealed significant when $p<0.05$. This research has also received research ethics permit from the Faculty of Medicine, University of Nusa Cendana with no. 45/UN15.16/KEPK/2019.

3. RESULTS AND DISCUSSION

Table 1. Characteristics of Respondents by Age.

Age	Frequency	Percent
18 – 38 Year	9	9.8
39 – 59 Year	58	63.0
60 – 80 Year	25	27.2
Total	92	100.0

Based on Table 1, it is displayed that the age of chronic kidney failure patients undergoing hemodialysis is mainly in the age group 39-59 years as many as 58 respondents (63.0%). Chronic kidney failure is a non-communicable disease affecting the kidney organ, in which the kidney organ suffers from severe damage due to a decreased glomerular filtration rate.

Based on research by Dharmawan, et al. in 2018, it was stated that patients undergoing hemodialysis were more common in the elderly or older than 40 years who often took hypertension drugs. Djami, et al.'s research in 2018 also stated that hypertension complications can affect various organs such as the heart (ischemic heart disease, left ventricular hypertrophy, heart failure), brain (stroke), kidneys (kidney failure), eyes (retinopathy) as well as peripheral arteries (intermittent claudication). The damage to these organs depends on the patient's high blood pressure and how long the high blood pressure is uncontrolled and untreated.

Table 2. Characteristics of Respondents by Gender.

Gender	Frequency	Percent
Male	53	57.6
Female	39	42.4
Total	92	100.0

Based on Table 2, the sex of chronic renal failure patients undergoing hemodialysis is the most male sex with 53 respondents (57.6%), and the least is the female sex with the number of 39 respondents (42.4%). Basic Health Research data in 2013 which shows that CKD patients are more common in men than women (Kementerian Kesehatan Republik Indonesia, 2013). These results were the same as Winalda's research in 2018 showed that the most extensive distribution of respondents according to gender was male by 52 people (52.0%).

Table 3. Characteristics of Respondents by Education Level.

Education Level	Frequency	Percent
Primary School	9	9.8
Junior High School	15	16.3
Senior High School	41	44.6
Diploma	4	4.3
Bachelor	23	25.0
Total	92	100.0

Based on Table 3, it is presented that the level of education of chronic kidney failure patients undergoing hemodialysis is mostly the level of high school education with a number of 41 respondents (44.6%), and for the least educational level is Diploma and 4 respondents (4.3%).

Table 4. Characteristics of Respondents Based on Employment Status.

Employment	Frequency	Percent
An Worker	38	41.3
Entrepreneur	26	28.3
Civil Servant	27	29.3
Army	1	1.1
Total	92	100.0

Based on Table 4, the occupational status of chronic kidney failure patients undergoing hemodialysis is largely not working with 38 respondents (41.3%). The occupational status of chronic kidney failure patients undergoing hemodialysis is the least with Indonesian Armies with only 1 respondent (1.1%).

Table 5. Duration of Hemodialysis.

Duration of Hemodialisis	Frequency	Percent
< 12 Month	38	41.3
12 – 24 Month	34	37.0
≥ 24 Month	20	21.7
Total	92	100.0

Based on Table 5 the length of time to undergo hemodialysis in patients with chronic kidney failure is the most <12 months with 38 respondents (41.3%).

Table 6. Hemoglobin levels.

Hemoglobin	Frequency	Percent
Low	92	100.0
Normal	0	0.0
High	0	0.0
Total	92	100.0

Based on Table 6, it can be concluded that the overall hemoglobin level in patients with chronic kidney failure is decreased by a total of 92 respondents (100%). The 92 respondents who suffered from chronic kidney failure and were undergoing hemodialysis as a whole had a hemoglobin level <13 g / dl (100.0%).

The research results by Agustina, et al. (2019) showed a significant difference between pre and post hemodialysis Hb levels in chronic kidney disease patients, where post hemodialysis Hb levels were lower than pre hemodialysis Hb levels. This is because a small amount of blood is usually left in the dialyzer. This can be a source of iron deficiency over time, leading to anemia.

Table 7. Hematocrit levels.

Hematocrit	Frequency	Percent
Low	91	98.9
Normal	1	1.1
High	0	0.0
Total	92	100.0

Based on Table 7, it can be concluded that overall hematocrit levels in patients with chronic kidney failure are decreased by 91 respondents (98.9%). It was found that the incidence of anemia in patients with chronic kidney disease was 98.5%, with an average Hb level of 7.3 g/dl and an average glomerular filtration rate of 8.81 ml/minute/1.73 m^2. From the Pearson correlation test results, it was found that there was a relationship between the incidence of anemia and chronic kidney disease (Hidayat, et al., 2016).

Table 8. Serum Iron levels.

Serum Iron	Frequency	Percent
Low	25	27.2
Normal	56	60.8
High	11	12.0
Total	92	100.0

Based on Table 8, it can be concluded that most Serum Iron (SI) levels in chronic kidney raga sufferers are normal, with 56 respondents (60.8%). Of the 92 respondents who suffered from chronic kidney failure and were undergoing hemodialysis, as many as 25 respondents (27.2%) had serum iron <65 ug / dL. Absolute Iron Deficiency Anemia (IDA) is one of the complications in patients undergoing hemodialysis, with an incidence of 76.4%. If this condition is not treated properly, it can impair heart function and increase mortality. The incidence of this case is between 30−45%. Determining iron status in hemodialysis patients using serum ferritin and transferrin saturation did not significantly change the value of the initial state of iron deficiency (Rachmiwatie, et al., 2018).

Table 9. Total Iron Binding Capacity (TIBC).

Total Iron Binding Capacity (TIBC)	Frequency	Percent
Low	14	15.2
Normal	62	67.4
High	16	17.4
Total	92	100.0

Based on Table 9, it can be concluded that the majority of the Total Iron Binding Capacity (TIBC) in chronic renal disease sufferers is normal, with 62 respondents (67.4%). This study found levels of Total Iron Binding Capacity (TIBC) decreased by 14 respondents (15.2%), and as many as 16 respondents (17.4%) had high SI levels/increased. Serum transferrin estimated by measurement of total iron-binding capacity is one of the energy and protein malnutrition markers. On chronic kidney disease, anemia often occurs due to anemia deficiency. TIBC is indirectly from iron stores from transferrin (Pradipta, et al., 2018).

Table 10. Correlation of the Duration of Hemodialysis with the Levels of Hemoglobin, Hematocrit, Serum Iron and Total Iron Binding Capacity (TIBC) in Chronic Kidney Disease Patients (CKD).

Levels	*p-value*
Hemoglobin	0.682
Hematocrit	0.147
Serum Iron (SI)	0.561
Total Iron Binding Capacity (TIBC)	0.606

Based on table 10, it can be identified the results of the correlation spearmen test of the relationship between the length of undergoing hemodialysis with hemoglobin and hematocrit levels in patients with chronic kidney failure undergoing hemodialysis obtained Sig. in hemoglobin of 0.682 (>0.05) and Sig. in hematocrit of 0.147 (>0.05). Thus, it is identified that there is no relationship between the length of undergoing hemodialysis with hemoglobin and hematocrit levels in patients with chronic kidney failure. Sig value in Serum Iron value is 0.561 (>0.05), and Sig value in Total Iron Binding Capacity is 0.606 (>0.05). It can be indicated that there is no relationship between the length of undergoing hemodialysis with Serum Iron levels and Total Iron Binding Capacity levels in patients with chronic kidney failure.

4. CONCLUSION

In general, patients with chronic kidney failure on hemodialysis are 39-59 years old, male, high school educated, and unemployed. Patients with chronic kidney failure who receive hemodialysis at the RSUD Prof. W. Z Johannes Kupang General Hospital have a maximum of one-year stay. The majority of chronic kidney failure patients on hemodialysis have low hematocrit and low hemoglobin levels. Most hemodialysis patients with chronic kidney failure possess normal Serum Iron and Total Iron Binding Capacity levels. In patients with chronic kidney disease, there is no link between the length of time spent on hemodialysis and hemoglobin, hematocrit, serum iron, or total iron-binding capacity in patients with chronic kidney failure.

Further research needs to be conducted by comparing the levels of hemoglobin, hematocrit, serum iron, and total iron-binding capacity before and after hemodialysis in patients with chronic kidney failure. Moreover, caution must be considered to ensure the length of data undergoing hemodialysis to eliminate bias..

REFERENCES

Agustina, W., & Wardani, E. K. (2019). Penurunan Hemoglobin pada Penyakit Ginjal Kronik Setelah Hemodialisis di RSU "KH" Batu. *Jurnal Ners dan Kebidanan (Journal of Ners and Midwifery)*, *6*(2), 141-146.

Aisara, S., Azmi, S., & Yanni, M. (2018). Gambaran klinis penderita penyakit ginjal kronik yang menjalani hemodialisis di RSUP Dr. M. Djamil Padang. *Jurnal Kesehatan Andalas*, *7*(1), 42-50.doi: https://doi.org/10.25077/jka.v7i1.778

Dharmawan, E., Widiana, I. G. R., Suwitra, K., Sudhana, W., Loekman, J. S., Kandarini, Y., & Ayu, N. P. (2018). Faktor-faktor yang berhubungan dengan hipertensi intradialitik pada populasi hemodialisis di rumah sakit sanglah denpasar. *MEDICINA*, *49*(2), 266-270. doi:http://doi.org/10.15562/medicina.v49i2.194

Djami, S. W., Arif, M., & Bahrun, U. (2019). N Terminal–Pro Brain Natriuretic Peptide (Nt-ProBNP) in Patients Hypertension Stage 1 And Stage 2. *JURNAL INFO KESEHATAN*, *17*(1), 64-74. doi:https://doi.org/10.31965/infokes.Vol17.Iss1.232

Fitriani, D., Pratiwi, R. D., Saputra, R., & Haningrum, K. S. (2020). Hubungan Lama Menjalani Terapi Hemodialisis Dengan Kualitas Hidup Pasien Penyakit Ginjal Kronik Di Ruang Hemodialisa Rumah Sakit Dr Sitanala Tangerang. *Edu Dharma Journal: Jurnal penelitian dan pengabdian masyarakat*, *4*(1), 70-78. doi:http://dx.doi.org/10.52031/edj.v4i1.44

Hidayat, R., Azmi, S., & Pertiwi, D. (2016). Hubungan Kejadian Anemia dengan

Penyakit Ginjal Kronik pada Pasien yang Dirawat di Bagian Ilmu Penyakit Dalam RSUP dr M Djamil Padang Tahun 2010. *Jurnal Kesehatan Andalas, 5*(3). doi:https://doi.org/10.25077/jka.v5i3.574

Indri, J.(2020). Asuhan Keperawatan pada Pasien dengan Gagal Ginjal Kronis yang di Rawat Di Rumah Sakit.*Karya Tulis Ilmiah.* Prodi DiplomaTiga Keperawatan Samarinda, JurusanKeperawatan, PoliteknikKesehatanKementerianKesehatan Kalimantan Timur.

Kementerian Kesehatan Republik Indonesia. (2013). Riset Kesehatan Dasar (RISKESDAS) 2013. Badan Penelitian dan Pengembangan Kesehatan, Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan Republik Indonesia. (2018). *Cegah dan kendalikan penyakit ginjal dengan cerdik dan patuh. Jakarta:* Kementerian Kesehatan Republik Indonesia. Available on:*https://sehatnegeriku.kemkes.go.id/baca/umum/20180307/1425164/cegah-dan-kendalikan-penyakit-ginjal-cerdik-dan-patuh/*

Kementerian Kesehatan Republik Indonesia. (2018). Laporan Nasional RISKESDAS 2018. Jakarta: *Badan Penelitian dan Pengembangan Kesehatan*, Kementerian Kesehatan Republik Indonesia.

Kim, Y. L., & Kawanishi, H. (2018). *The Essentials of Clinical Dialsis*. Singapore: Springer.

Permatasari, L. F., & Maliya, A. (2019). Hubungan Lamanya Menjalani Hemodialisis dengan Status Zat Besi pada Penderita Gagal Ginjal Kronik. *Skripsi*.Program Studi S1 Keperawatan, FakultasIlmuKesehatan, Universitas Muhammadiyah Surakarta.

Pradipta, P. N., Suwitra, K. & Widiana, R. (2018). Status Nutrisi Pasien Penyakit Ginjal Kronik Yang Menjalani Hemodialisis Reguler Lebih Dari 5 Tahun Di Rumah Sakit Umum Pusat Sanglah Denpasar. *Medicina*, 49(2), 206-211. doi:http://doi.org/10.15562/medicina.v49i2.228.

Rachmanto, B. (2018). Teknik dan Prosedur Hemodialisa. Surakarta: RSUD Dr.Moewardi.

Rachmiwatie, A., Noormartany, N., Gondodiputro, R. S., & Prihatni, D. (2018). Kadar Hemoglobin Retikulosit Di Anemia Dan Nonanemia Akibat Defisiensi Besi Absolut Di Gagal Ginjal Terminal Terkait Hemodialisis (Reticulocyte Hemoglobin Level of Absolute Iron Deficiency Anemia and NonAbsolute Iron Deficiency Anemia In End State Renal Disease Undergoing Maintenance Hemodialysis). *Indonesian Journal Of Clinical Pathology And Medical Laboratory*, *21*(1), 32-39. doi:http://doi.org/10.24293/ijcpml.v21i1.1256.

Simatupang, D. S. (2019). Gambaran Pengetahuan Pasien Gagal Ginjal Kronik Tentang Kepatuhan Menjalani Hemodialisis Di Ruang Hemodialisa RSUP H. Adam Malik Medan Tahun 2019. *Jurnal Ilmiah PANNMED (Pharmacist, Analyst, Nurse, Nutrition, Midwivery, Environment, Dentist)*, *14*(2), 84-94. doi:https://doi.org/10.36911/pannmed.v14i2.609.

Wahyuni, P., Miro, S., & Kurniawan, E. (2018). Hubungan Lama Menjalani Hemodialisis dengan Kualitas Hidup Pasien Penyakit Ginjal Kronik dengan Diabetes Melitus di RSUP Dr. M Djamil Padang. *Jurnal Kesehatan Andalas, 7*(4), 480-485. doi:https://doi.org/10.25077/jka.v7i4.905.

Winalda, I. (2018). Hubungan Lama Menjalani Hemodialisis Dengan Kualitas Hidup Pasien Ginjal Kronik Di Instalasi Hemodialisis RSUP Dr. Mohammad Hoesin

Palembang. *Skripsi*. Palembang: Universitas Sriwijaya.

World Health Organization. (2003). *Global burden of disease study*. World Health Organization.

Yusman, F. A., Dewi, R. T. K., Mashuri, Y. A., Nurhayatun, E., & Giani, M. T. (2020). Faktor yang Berkaitan dengan Kejadian Asites pada Pasien Penyakit Ginjal Kronik yang Menjalani Hemodialisis di RSUD Dr Moewardi Surakarta: Sebuah Studi Potong Lintang. *Jurnal Penyakit Dalam Indonesia*, *7*(3), 154-160.doi:http://dx.doi.org/10.7454/jpdi.v7i3.420