Journal of World Future Medicine, Health and Nursing, 1(3) - Sep 2023 237-249

The Correlation Between Frequency of Protein Consuption and Incidence of Intradialysis Hypertension in Hemodialysis Unit of Ade M Jhon Hospital Sintang

Kafi Pangki Suwito [1], Asri Fitri Yati [2]
[1] *Sekolah Tinggi Ilmu Kesehatan Kapuas Raya Sintang, Indonesia*
[2] *Sekolah Tinggi Ilmu Kesehatan Kapuas Raya Sintang, Indonesia*

Corresponding Author: Kafi Pangki Suwito, E-mail; kafi.pangki@gmail.com

Article Information:
Received September 10, 2023
Revised September 19, 2023
Accepted September 27, 2023

ABSTRACT

Kidney disease is one of the primary causes of mortality and disability in many countries throughout the world. Protein consumption may worsen kidney damage because the most dangerous metabolism is the concentration of blood urea nitrogen. Currently, hemodialysis is one of the renal replacement therapies, but the most frequent complication in dialysis is hypertension, which may increase morbidity and mortality. Objective: To identify the correlation between frequency of protein consumption and incidence of intradialytic hypertension in the hemodialysis unit of Ade M Jhon Hospital Sintang. Methods: This research is quantitative with a cross-sectional design. The population in this research was 177 respondents based on medical records, while sampling employed purposive sampling which was taken in 66 respondents with chronic renal failure in the Hemodialysis Unit of Ade M Jhon Hospital Sintang. The statistical test in this study employed chi-square, with an error rate of α of 5% (0.05). Results: Most frequency of protein consumption with intradialytic hypertension categorized as rare was 12 respondents (18.18%) who did not suffer from hypertension and 3 respondents (4.55%) who suffered from hypertension, while categorized as frequent was 49 respondents (74.24%) who suffered from hypertension and 2 respondents (3.03%) who did not suffer from hypertension. The significant value of the variable of protein consumption frequency with intradialytic hypertension was P value of 0.000 <0.05 (α).

Keywords: *Consumption, Intradialysis Hypertension, Hemodialysis*

Journal Homepage https://journal.ypidathu.or.id/index.php/jnhl

How to cite: Suwito, P, K., Yati, F, A. (2023). The Correlation Between Frequency of Protein Consuption and Incidence of Intradialysis Hypertension in Hemodialysis Unit of Ade M Jhon Hospital Sintang. *Journal of World Future Medicine, Health and Nursing*, 1(3), 237-249. https://doi.org/10.55849/health.v2i1.421
Published by: Yayasan Pendidikan Islam Daarut Thufulah

INTRODUCTION

Chronic Kidney Disease (CKD) is an emerging public health problem worldwide (Global Burden of Disease, 2017). In 2015 around 1.2 million people worldwide died from CKD (Global Burden of Disease, 2017). In 2017 patients undergoing dialysis were 3.2 million and will continue to increase by around 4.9 million in 2025(Fresenius Medical Care, 2017). Worldwide CKD patients requiring dialysis treatment are increasing at a relatively constant rate of around 6% per year, but in Asia - Pacific it is higher than the global rate of 8% (Fresenius Medical Care, 2017) (Cervantes dkk., 2018; Giglio dkk., 2018; Xiong dkk., 2020). The number of CKD patients who have just undergone dialysis continues to increase in Indonesia, from 21,050 in 2015 to 30,831 in 2017 (PERNEFRI, 2017). Hemodialysis patients are at high risk for cardiovascular complications. This will continue as the cause of death (Alberici dkk., 2020; Bertrand dkk., 2021; Fishbane dkk., 2020). Hypertension is the most common risk factor, controlling hypertension is important to reduce morbidity and mortality (Imen dkk., 2015).

The prevalence of chronic kidney failure based on doctors' diagnoses in Indonesia is 713,783, while in West Kalimantan the number of patients with chronic kidney failure is reported to be 13,035 (Kementerian Kesehatan RI, 2018).

Intradialytic hypertension is a well-known complication with an incidence of 5-15% in patients with chronic kidney failure undergoing routine hemodialysis (Naysilla & Partiningrum, 2012).

Research conducted in 4 countries, namely Japan, China, England and the United States with a cross-sectional study found that consumption of vegetable protein is inversely related to a person's blood pressure (Armiyati, 2012) (Esgalhado dkk., 2018; Gallieni dkk., 2019; Wong dkk., 2018; Wu dkk., 2019).

There are 2 ways to prevent kidney deterioration, namely, the first way is to limit protein intake, which is started at GFR ≤ 60 ml/min. Protein is given 0.6 - 0.8/Kg.bb/day, of which 0.35 - 0.50 gr is a biological protein value high, for the number of calories given is 30-35 kcal/Kg.bb/day and regular monitoring of the patient's nutritional status is needed (Goicoechea dkk., 2020; Huang, 2019; Meadowcroft dkk., 2019). The second way is pharmacological therapy to reduce intraglomerular hypertension. Several studies have shown that controlling blood pressure has the same role as limiting protein intake, to reduce intraglomerular hypertension and glomerular hypertrophy. In addition, the target of pharmacological therapy is closely related to the degree of proteinuria (Suwita, 2014) (Ahmadmehrabi & Tang, 2018; Clarke dkk., 2020; Simon dkk., 2021).

The results of a preliminary study at the Hemodialysis Unit of Ade M Jhon Sintang Hospital on February 18 to 27 2023 obtained data on the number of HD patients as many as 177 patients (Chou dkk., 2018; Grupper dkk., 2021; Kuno dkk., 2020; Pisoni dkk., 2018), with a total of 104 male patients while 73 female patients. The total number of HD procedures for a month at Ade M Jhon Sintang Hospital was 1,474 times. From the results of interviews, the guard schedule was divided into three, namely the morning guard from 07.00-11.00 WIB with a total of 22 HD patients, while for the afternoon guard it started from 12.00-16.00 WIB with a total of 22 patients, and the night guard started from 17.00-

17.00 WIB. 21.00 WIB with a total of 15 patients (Akizawa dkk., 2020; De Vriese dkk., 2020; Kuno dkk., 2020; Thamer dkk., 2018).

The results of observations on Tuesday 24 February 2023 during the night watch with a total of 15 patients showed that monitoring of patient conditions such as vital signs, patient complaints and intradialysis complications had not been carried out every hour. Recording of intradialysis complications in the available documentation format only contains recording of blood pressure before and after hemodialysis (Coleman dkk., 2019; Lee dkk., 2018; Pisoni dkk., 2018; Roy-Chaudhury dkk., 2018). Observations on 15 patients during the hemodialysis process showed that 2 out of 15 patients experienced hypotension (Abbasi & Hajisalimi, 2018; Flythe dkk., 2018; Hull dkk., 2018; Raggi dkk., 2020). There were 8 patients who had intradialytic hypertension. The results of interviews with nurses on duty in the hemodialysis unit showed that the number of clients who experienced intradialysis complications in the form of dizziness, cramps, and increased blood pressure, ranged from 1-2 patients per shift. Based on the interview, the researchers did not find written data about complications when patients underwent hemodialysis from the first hour to the last hour. Researchers also have not found research data related to this matter (Basile dkk., 2020; Liakopoulos dkk., 2019; Ronco & Clark, 2018). Research on intradialysis complications experienced by CKD patients while undergoing hemodialysis is urgently needed. By identifying intradialysis complications during the hemodialysis process, nurses can anticipate and reduce complications that occur.

From the interview results for the frequency of protein consumption, the results showed that 15 patients continued to consume protein foods with the types of food, chicken, eggs, tilapia, satay, beef, meatballs, catfish, tofu and tempeh. For restricted foods are fruits, rice, and liquids.

RESEARCH METHODOLOGY

This research uses observational, which is a type of research that observes a relationship between the frequency of protein consumption and the incidence of intradialytic hypertension. The design used was cross-sectional, namely researchers only. conduct to find the relationship between the independent variable (independent variable) with the dependent variable (dependent variable) measured or collected simultaneously (at the same time).

The research was conducted at the Hemodialysis Unit of Ade M Jhon Sintang Hospital. The time of the research was carried out on March 26 - March 30 2023 with a total sample of 66 samples. The sampling technique used by researchers is non-probability sampling, namely purposive sampling, which is the selection of samples by determining subjects who meet the research criteria, are included in the study for a certain period of time, so that the required number of respondents is met.

Inclusion criteria:

Chronic kidney failure patients undergoing hemodialysis therapy for ≥ 3 months and registered as permanent patients in the Ade M Jhon Sintang Hemodialysis Room.

Patients who have a hemodialysis therapy schedule at least once a week.

Patients undergoing hemodialysis therapy on the afternoon schedule, on Monday, Tuesday and Wednesday.

1. Exclusion criteria :
2. Patients who cannot be responders for medical reasons.
3. inpatient.
4. Traveling patient.

Univariate analysis was performed on each variable from the research results. This analysis produces a frequency distribution table of each variable to determine the characteristics of the research subjects, namely, age, sex, frequency of protein consumption, the incidence of intradialytic hypertension. Bivariate analysis in this study was used to determine the relationship between the two variables, so that the statistical test used was the chi square test. The hypothesis uses a P value = 0.000, if p <0.05 (using a standard deviation of 0.05) then H0 is rejected so that Ha accepted, there is a relationship between the frequency of protein consumption and the incidence of intradialytic hypertension at Ade M Jhon Sintang Hospital.

RESULTS

Univariate analysis

Characteristics of Respondents

Table 1 Characteristics of Respondents

No.	Characteristics	Frequency (n)	Percentage (%)
1	**Gender**		
	a. Woman	33	50
	b. Man	33	50
	Total	**66**	**100**
2	**Age (years)**		
	Early adulthood (26-35)	7	10,6
	Late adulthood (36-45)	9	13,6
	Early elderly (46-55)	24	36,4
	Late elderly (56-65)	18	27,3
	Seniors > 65	8	12,1
	Total	**66**	**100**

Based on Table 1, it is known that the respondents in this study were balanced between 33 male respondents (50%) and 33 female respondents (50%). It is known that the most age of respondents is the early elderly at the age of 46-55 years totaling 24 respondents (36.4%) with an average age of respondents 52.21 years.

Protein Consumption Frequency

Table 2 Frequency of Protein Consumption

No.	Category of Protein Consumption Frequency	n	%
1	Seldom	15	22,7
2	Often	51	77,3
	Total	**66**	**100**

Based on Table 2, it can be seen that the frequency of protein consumption for the rare category is 15 respondents (22.7%) and the frequent category is 51 respondents (77.3%).

Intradialytic Hypertension

Table 3 Incidence of Intradialysis Hypertension

No.	Category of intradialysis hypertension	n	%
1	Not Hypertension	14	21,2
2	Hypertension	52	78.8
	Total	**66**	**100**

Based on Table 3, it can be seen that the incidence of intradialytic hypertension for the non-hypertensive category was 14 respondents (21.2%) and for the hypertension category there were 52 respondents (78.8%).

Bivariate Analysis

Cross-tabulation of respondents' characteristics with protein consumption frequency

Table 4 Cross tabulation of Respondents' Characteristics with Protein Consumption Frequency

Characteristics of Respondents	Total Protein Consumption Frequency					
	Seldom		Often			
	N	%	N	%	N	%
Gender						
Man	6	18,18	27	81,82	33	100
Woman	9	27,27	24	72,73	33	100
Total	**15**	**22,72**	**51**	**77,28**	**66**	**100**
Age (years)						
Early adulthood (26-35)	2	28.57	5	71,43	7	100
Late adulthood (36-45)	2	22,22	7	77,78	9	100
Early elderly (46-55)	5	20,83	19	79,17	24	100
Late elderly (56-65)	5	27,78	13	72,22	18	100
Seniors > 65	1	12.50	7	87.50	8	100
Total	**15**	**22,72**	**51**	**77,28**	**66**	**100**

Based on Table 4, it can be seen that the characteristics of respondents based on gender in the frequent category, the largest was male, with 27 respondents (81.82%). Characteristics of respondents based on age with frequency of protein consumption in the frequent category, namely early elderly at the age of 46-55 years totaling 19 respondents (79.17%).

Cross tabulation of the characteristics of respondents with intradialytic hypertension

Table 5 Cross tabulation of Respondents Characteristics with Intradialysis Hypertension

Characteristics of Respondents	Total intradialytic hypertension					
	Not Hypertension		Hypertension			
	N	%	N	%	N	%
Gender						
a. Man	5	15,15	28	84.85	33	100
b. Woman	9	27,27	24	72,73	33	100

Total	**14**	**21,21**	**52**	**78,79**	**66**	**100**
Age (years)						
Early adulthood (26-35)	3	42.86	4	57,14	7	100
Late adulthood (36-45)	1	11,11	8	88,89	9	100
Early elderly (46-55)	4	16,67	20	83,33	24	100
Late elderly (56-65)	5	27,78	13	72,22	18	100
Seniors > 65	1	12.50	7	87.50	8	100
Total	**14**	**21,21**	**52**	**78,79**	**66**	**100**

Based on Table 5, it can be seen that the characteristics of respondents based on gender with the incidence of intradialytic hypertension, the largest was male, with 28 respondents (84.85%). Characteristics of respondents based on age with frequency of protein consumption in the frequent category, namely early elderly at the age of 46-55 years totaling 20 respondents (83.33%).

Cross-tabulation of protein consumption frequency with the incidence of intradialytic hypertension

Table 6 Cross Tabulation of Frequency of Protein Consumption with Intradialysis Hypertension

Protein Consumption Frequency	Total intradialytic hypertension					
	Not Hypertension		Hypertension			
	N	%	N	%	n	%
Gender						
a. Seldom	12	80	3	20	15	100
b. Often	2	3.93	49	96.07	51	100
Total	**14**	**21,21**	**52**	**78,79**	**66**	**100**

Based on Table 6 it can be seen that the frequency of protein consumption based on the frequent category with the incidence of intradialytic hypertension, the majority of the number and percentage of frequency of protein consumption in the frequent category of respondents are in the hypertension category, in the frequent category of protein consumption experiencing intradialytic hypertension as many as 52 respondents (96.07%) and 3 respondents (20%) rarely experienced intradialysis hypertension category.

Relationship between Frequency of Protein Consumption and Incidence of Intradialysis Hypertension

Table 7 Relationship between Frequency of Protein Consumption and Intradialytic Hypertension

Protein Consumption Frequency	Intradialytic Hypertension				Total		P-values
	Not Hypertension		Hypertension				
	F	%	F	%	F	%	
Seldom	12	80	3	20	15	100	
Often	2	3.93	49	96.07	51	100	0.000
Total	14	21,21	52	78,79	66	100	

To find out the relationship between the frequency of protein consumption and the incidence of intradialytic hypertension in the Hemodialysis Unit of Ade M Jhon Sintang

Hospital, a food frequency questionnaire containing 16 questions was carried out for the protein consumption frequency variable, and also measuring blood pressure using a digital tensimeter for intradialytic hypertension variables.

DISCUSSION

Characteristics of Respondents

Based on the results of the study, it was shown that there were 33 male respondents (50%) who were male and 33 female respondents (50%). In general, the incidence of hypertension in men is higher than in women, but in middle age and older, the incidence of hypertension in women begins to increase, so that at the age of 65 years and over, the incidence in women is higher (Corwin, 2009). The results also show that the age characteristics of the respondents are mostly in the range of 55 years (10.6%) and the average age of the respondents is 52.21 years, the youngest is 26 years old and the oldest is 83 years. Shows that age is very vulnerable to the occurrence of intradialytic hypertension.

The incidence of hypertension increases with increasing age (Corwin, 2009). Old age is a risk factor for intradialytic hypertension in CKD patients undergoing routine hemodialysis (Naysilla & Partiningrum, 2012). So it is not certain that intradialytic hypertension is caused by age or caused by chronic kidney failure.

The results of statistical analysis (chi-square test) of the relationship between the frequency of protein consumption (rarely and often) with the incidence of intradialytic hypertension (not hypertension and hypertension) with a 2x2 table shows that the variable This is significant which is statistically significant, namely P value 0.000 (α <0.05).

(Naysilla & Partiningrum, 2012)with the title "Risk Factors of Intradialytic Hypertension in Patients with Chronic Kidney Disease". The results of the research conducted by Naysilla showed that it could not be concluded whether age was a risk factor for intradialytic hypertension.

Protein Consumption Frequency

Based on the frequency distribution of protein consumption in table 2, it can be seen that the frequency of protein consumption in the rare category is 15 respondents (22.7%) and the frequent category is 51 respondents (77.3%). These results indicate that respondents with chronic renal failure often consume protein. So the need for education / counseling to increase knowledge of diet in patients with chronic kidney failure. Excessive protein does not benefit the body. Excess amino acids will cause aggravating work of the kidneys and liver which must metabolize and remove excess nitrogen. Excess protein will cause acidosis, dehydration, diarrhea, increased blood ammonia, increased blood urea, and fever(Almaitser, 2010). Protein restriction in patients who are not undergoing dialysis is 0.8 g/kg/day, while in patients undergoing dialysis it is 1.5 g/kg/day (Suwita, 2014).

One of the complications often experienced by patients with kidney failure undergoing hemodialysis therapy is anemia. Collaborative management of anemia includes minimizing blood loss, giving oral or IV iron supplements, giving vitamin

supplementation, treating infection aggressively, ensuring adequate nutrition, and giving erythropoietin, blood products, or both.

The goals of iron therapy and erythropoietin administration in the ESRD population are a transferrin saturation of greater than 20%, a serum ferritin level of more than 10 mg/ml, and a hemoglobin level of 11 to 12 mg/dl. ((Morton dkk., 2014).

Intradialytic Hypertension

Based on the results of the distribution of intradialytic hypertension in table 3, it can be seen that the incidence of intradialytic hypertension was in the category of non-hypertensive 14 respondents (21.2%) and the category of hypertension 52 respondents (78.8%).

The results of this study are in accordance with the title "Intradialysis Hypotension and Hypertension in Hemodialysis at PKU Muhammadiyah Yogyakarta Hospital". The results of research conducted by Amriyati showed that 70% of patients had intradialytic hypertension, 26% had intradialytic hypotension (Armiyati, 2012).

Relationship between Frequency of Protein Consumption and Incidence of Intradialysis Hypertension

Based on the frequency distribution table of protein consumption with the incidence of intradialytic hypertension in Table 7, the percentage of frequency of protein consumption in the category of frequent intradialytic hypertension was 52 respondents (96.07%), and those who did not experience intradialytic hypertension were 2 respondents (3.93%), while the frequency of protein consumption in the category of rarely experiencing intradialytic hypertension was 3 respondents (20%) and those who did not experience intradialytic hypertension were 12 respondents (80%). These results used the chi-square statistical test which showed that there was a relationship between the frequency of protein consumption and the incidence of intradialytic hypertension with a sig. P-value 0.000 <0.05 (α).

Protein obtained from animals can be a cholesterol-containing food for the body, cholesterol can cause hardening of the arteries thereby increasing the risk of heart disease. High cholesterol can cause hypertension (Dwijayanthi, 2011). Dietary cholesterol is found in foods of animal origin, including egg yolks, organ meats, high-fat dairy products (Dwijayanthi, 2011).

The results of this study are in accordance with research conducted by Yolanda (2015) with the title "Intake of Nutrients (Energy, Protein, Fat) and Nutritional Status on Hypertension in Adolescents in Semarang High School". The results of Yolanda's research (2015) showed a significant relationship with hypertension in adolescents p = 0.00 (OR = 4.22; 95% CI: 3.16-5.64).

The results of this study are in accordance with research conducted by Pusitasari (2009) with the title "Intake of Micro and Macro Nutrients in Adolescents with Hypertension". The results of Puspitasari's research (2009) showed a significant relationship between intake of folic acid, sodium, soluble fiber and protein with the incidence of hypertension. In this study found a relationship between protein intake and the incidence of hypertension (P value = 0.036).

CONCLUSION

Based on the results of the research and discussion that has been carried out, the following conclusions can be drawn:

1. Patients with chronic kidney failure at Ade M Jhon Sintang Hospital who were respondents in the frequent protein consumption category experienced intradialysis hypertension.
2. There were 52 respondents who had hypertension, and there were 14 respondents who did not have hypertension during dialysis. So it can be concluded that many respondents experienced hypertension during dialysis.
3. There is a significant relationship between the frequency of protein consumption and intradialytic hypertension in chronic kidney failure patients at Ade M Jhon Sintang Hospital with P value = 0.000 <0.05 (α).

REFERENCES

Abbasi, M., & Hajisalimi, B. (2018). The main determinants of intradialysis hypertension during dialysis in chronic hemodialysis patients; a single-center study. *Journal of Renal Injury Prevention*, *7*(3), 152–159. https://doi.org/10.15171/jrip.2018.38

Ahmadmehrabi, S., & Tang, W. H. W. (2018). Hemodialysis-induced cardiovascular disease. *Seminars in Dialysis*, *31*(3), 258–267. https://doi.org/10.1111/sdi.12694

Akizawa, T., Iwasaki, M., Yamaguchi, Y., Majikawa, Y., & Reusch, M. (2020). Phase 3, Randomized, Double-Blind, Active-Comparator (Darbepoetin Alfa) Study of Oral Roxadustat in CKD Patients with Anemia on Hemodialysis in Japan. *Journal of the American Society of Nephrology*, *31*(7), 1628–1639. https://doi.org/10.1681/ASN.2019060623

Alberici, F., Delbarba, E., Manenti, C., Econimo, L., Valerio, F., Pola, A., Maffei, C., Possenti, S., Lucca, B., Cortinovis, R., Terlizzi, V., Zappa, M., Saccà, C., Pezzini, E., Calcaterra, E., Piarulli, P., Guerini, A., Boni, F., Gallico, A., … Scolari, F. (2020). A report from the Brescia Renal COVID Task Force on the clinical characteristics and short-term outcome of hemodialysis patients with SARS-CoV-2 infection. *Kidney International*, *98*(1), 20–26. https://doi.org/10.1016/j.kint.2020.04.030

Almaitser, S. (2010). *Prinsip Dasar Ilmu Gizi*. PT Gramedia Pustaka Utama.

Armiyati, Y. (2012). Hipotensi dan Hipertensi Intradialisis Pada Hemodialisis di Yogyakarta. *Nasional Seminaf of Research Result at Semarang*.

Basile, C., Combe, C., Pizzarelli, F., Covic, A., Davenport, A., Kanbay, M., Kirmizis, D., Schneditz, D., Van Der Sande, F., & Mitra, S. (2020). Recommendations for the prevention, mitigation and containment of the emerging SARS-CoV-2 (COVID-19) pandemic in haemodialysis centres. *Nephrology Dialysis Transplantation*, *35*(5), 737–741. https://doi.org/10.1093/ndt/gfaa069

Bertrand, D., Hamzaoui, M., Lemée, V., Lamulle, J., Hanoy, M., Laurent, C., Lebourg, L., Etienne, I., Lemoine, M., Le Roy, F., Nezam, D., Plantier, J.-C., Boyer, O., Guerrot, D., & Candon, S. (2021). Antibody and T Cell Response to SARS-CoV-2 Messenger RNA BNT162b2 Vaccine in Kidney Transplant Recipients and Hemodialysis Patients. *Journal of the American Society of Nephrology*, *32*(9), 2147–2152. https://doi.org/10.1681/ASN.2021040480

Cervantes, L., Tuot, D., Raghavan, R., Linas, S., Zoucha, J., Sweeney, L., Vangala, C., Hull, M., Camacho, M., Keniston, A., McCulloch, C. E., Grubbs, V., Kendrick, J., & Powe, N. R. (2018). Association of Emergency-Only vs Standard Hemodialysis With Mortality and Health Care Use Among Undocumented Immigrants With End-stage Renal Disease. *JAMA Internal Medicine*, *178*(2), 188. https://doi.org/10.1001/jamainternmed.2017.7039

Chou, J. A., Streja, E., Nguyen, D. V., Rhee, C. M., Obi, Y., Inrig, J. K., Amin, A., Kovesdy, C. P., Sim, J. J., & Kalantar-Zadeh, K. (2018). Intradialytic

hypotension, blood pressure changes and mortality risk in incident hemodialysis patients. *Nephrology Dialysis Transplantation*, *33*(1), 149–159. https://doi.org/10.1093/ndt/gfx037

Clarke, C., Prendecki, M., Dhutia, A., Ali, M. A., Sajjad, H., Shivakumar, O., Lightstone, L., Kelleher, P., Pickering, M. C., Thomas, D., Charif, R., Griffith, M., McAdoo, S. P., & Willicombe, M. (2020). High Prevalence of Asymptomatic COVID-19 Infection in Hemodialysis Patients Detected Using Serologic Screening. *Journal of the American Society of Nephrology*, *31*(9), 1969–1975. https://doi.org/10.1681/ASN.2020060827

Coleman, C. I., Kreutz, R., Sood, N. A., Bunz, T. J., Eriksson, D., Meinecke, A.-K., & Baker, W. L. (2019). Rivaroxaban Versus Warfarin in Patients With Nonvalvular Atrial Fibrillation and Severe Kidney Disease or Undergoing Hemodialysis. *The American Journal of Medicine*, *132*(9), 1078–1083. https://doi.org/10.1016/j.amjmed.2019.04.013

Corwin, E. J. (2009). *Buku Saku Patofisiologi* (Edisi 3). EGC.

De Vriese, A. S., Caluwé, R., Pyfferoen, L., De Bacquer, D., De Boeck, K., Delanote, J., De Surgeloose, D., Van Hoenacker, P., Van Vlem, B., & Verbeke, F. (2020). Multicenter Randomized Controlled Trial of Vitamin K Antagonist Replacement by Rivaroxaban with or without Vitamin K2 in Hemodialysis Patients with Atrial Fibrillation: The Valkyrie Study. *Journal of the American Society of Nephrology*, *31*(1), 186–196. https://doi.org/10.1681/ASN.2019060579

Dwijayanthi, L. (2011). *Ilmu Gizi Menjadi Sangat Mudah*. EGC.

Esgalhado, M., Kemp, J. A., Azevedo, R., Paiva, B. R., Stockler-Pinto, M. B., Dolenga, C. J., Borges, N. A., Nakao, L. S., & Mafra, D. (2018). Could resistant starch supplementation improve inflammatory and oxidative stress biomarkers and uremic toxins levels in hemodialysis patients? A pilot randomized controlled trial. *Food & Function*, *9*(12), 6508–6516. https://doi.org/10.1039/C8FO01876F

Fishbane, S., Jamal, A., Munera, C., Wen, W., & Menzaghi, F. (2020). A Phase 3 Trial of Difelikefalin in Hemodialysis Patients with Pruritus. *New England Journal of Medicine*, *382*(3), 222–232. https://doi.org/10.1056/NEJMoa1912770

Flythe, J. E., Hilliard, T., Castillo, G., Ikeler, K., Orazi, J., Abdel-Rahman, E., Pai, A. B., Rivara, M. B., St. Peter, W. L., Weisbord, S. D., Wilkie, C., & Mehrotra, R. (2018). Symptom Prioritization among Adults Receiving In-Center Hemodialysis: A Mixed Methods Study. *Clinical Journal of the American Society of Nephrology*, *13*(5), 735–745. https://doi.org/10.2215/CJN.10850917

Fresenius Medical Care. (2017). *Creating Added Value*. Fresenius Medical Care.

Gallieni, M., Hollenbeck, M., Inston, N., Kumwenda, M., Powell, S., Tordoir, J., Al Shakarchi, J., Berger, P., Bolignano, D., Cassidy, D., Chan, T. Y., Dhondt, A., Drechsler, C., Ecder, T., Finocchiaro, P., Haller, M., Hanko, J., Heye, S., Ibeas, J., … Nagler, E. (2019). Clinical practice guideline on peri- and postoperative care of arteriovenous fistulas and grafts for haemodialysis in adults. *Nephrology Dialysis Transplantation*, *34*(Supplement_2), ii1–ii42. https://doi.org/10.1093/ndt/gfz072

Giglio, J., Kamimura, M. A., Lamarca, F., Rodrigues, J., Santin, F., & Avesani, C. M. (2018). Association of Sarcopenia With Nutritional Parameters, Quality of Life, Hospitalization, and Mortality Rates of Elderly Patients on Hemodialysis. *Journal of Renal Nutrition*, *28*(3), 197–207. https://doi.org/10.1053/j.jrn.2017.12.003

Global Burden of Disease. (2017). *Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980 –*

2015: A systematic analysis for the Global Burden of Disease Study 2015. *388*, 1459–1544.

Goicoechea, M., Sánchez Cámara, L. A., Macías, N., Muñoz De Morales, A., Rojas, Á. G., Bascuñana, A., Arroyo, D., Vega, A., Abad, S., Verde, E., García Prieto, A. M., Verdalles, Ú., Barbieri, D., Delgado, A. F., Carbayo, J., Mijaylova, A., Acosta, A., Melero, R., Tejedor, A., … Aragoncillo, I. (2020). COVID-19: Clinical course and outcomes of 36 hemodialysis patients in Spain. *Kidney International*, *98*(1), 27–34. https://doi.org/10.1016/j.kint.2020.04.031

Grupper, A., Sharon, N., Finn, T., Cohen, R., Israel, M., Agbaria, A., Rechavi, Y., Schwartz, I. F., Schwartz, D., Lellouch, Y., & Shashar, M. (2021). Humoral Response to the Pfizer BNT162b2 Vaccine in Patients Undergoing Maintenance Hemodialysis. *Clinical Journal of the American Society of Nephrology*, *16*(7), 1037–1042. https://doi.org/10.2215/CJN.03500321

Huang, W.-L. (2019). The Impact of Extrinsic Rewards and Public Service Motivation on Public Employees' Work Performance: Does Seniority Matter? *Chinese Public Administration Review*, *10*(1), 12–27. https://doi.org/10.22140/cpar.v10i1.190

Hull, J. E., Jennings, W. C., Cooper, R. I., Waheed, U., Schaefer, M. E., & Narayan, R. (2018). The Pivotal Multicenter Trial of Ultrasound-Guided Percutaneous Arteriovenous Fistula Creation for Hemodialysis Access. *Journal of Vascular and Interventional Radiology*, *29*(2), 149-158.e5. https://doi.org/10.1016/j.jvir.2017.10.015

Imen, G., Madina, M., Fathi, Y., Imed, H., & Taieb, A. Ben. (2015). Prevalence and risk factors of hypertension in Hemodialysis. *Open Journal of Nephrology*, *June*, 217–229.

Kementerian Kesehatan RI. (2018). Riset Kesehatan Dasar. *Kementerian Kesehatan Republik Indonesia*, 1–200.

Kuno, T., Takagi, H., Ando, T., Sugiyama, T., Miyashita, S., Valentin, N., Shimada, Y. J., Kodaira, M., Numasawa, Y., Briasoulis, A., Burger, A., & Bangalore, S. (2020). Oral Anticoagulation for Patients With Atrial Fibrillation on Long-Term Dialysis. *Journal of the American College of Cardiology*, *75*(3), 273–285. https://doi.org/10.1016/j.jacc.2019.10.059

Lee, S. M., Kang, W. S., Cho, A.-R., Kim, T., & Park, J. K. (2018). Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Comprehensive Psychiatry*, *87*, 123–127. https://doi.org/10.1016/j.comppsych.2018.10.003

Liakopoulos, V., Roumeliotis, S., Zarogiannis, S., Eleftheriadis, T., & Mertens, P. R. (2019). Oxidative stress in hemodialysis: Causative mechanisms, clinical implications, and possible therapeutic interventions. *Seminars in Dialysis*, *32*(1), 58–71. https://doi.org/10.1111/sdi.12745

Meadowcroft, A. M., Cizman, B., Holdstock, L., Biswas, N., Johnson, B. M., Jones, D., Nossuli, A. K., Lepore, J. J., Aarup, M., & Cobitz, A. R. (2019). Daprodustat for anemia: A 24-week, open-label, randomized controlled trial in participants on hemodialysis. *Clinical Kidney Journal*, *12*(1), 139–148. https://doi.org/10.1093/ckj/sfy014

Morton, P. G., Fontaine, D., Hudak, C. M., & Gallo, B. M. (2014). *Keperawatan Kritis Pendekatan Asuhan Holistik* (Edisi 8). EGC.

Naysilla, A. M., & Partiningrum, D. L. (2012). Faktor Risiko Hipertensi Intradialitik Pasien Penyakit Ginjal Kronik. *Jurnal Media Medika Muda*.

PERNEFRI. (2017). *10 th Report Of Indonesian Renal Registry*.

Pisoni, R. L., Zepel, L., Fluck, R., Lok, C. E., Kawanishi, H., Süleymanlar, G., Wasse, H., Tentori, F., Zee, J., Li, Y., Schaubel, D., Burke, S., & Robinson, B. (2018). International Differences in the Location and Use of Arteriovenous Accesses Created for Hemodialysis: Results From the Dialysis Outcomes and Practice Patterns Study (DOPPS). *American Journal of Kidney Diseases*, *71*(4), 469–478. https://doi.org/10.1053/j.ajkd.2017.09.012

Raggi, P., Bellasi, A., Bushinsky, D., Bover, J., Rodriguez, M., Ketteler, M., Sinha, S., Salcedo, C., Gillotti, K., Padgett, C., Garg, R., Gold, A., Perelló, J., & Chertow, G. M. (2020). Slowing Progression of Cardiovascular Calcification With SNF472 in Patients on Hemodialysis: Results of a Randomized Phase 2b Study. *Circulation*, *141*(9), 728–739. https://doi.org/10.1161/CIRCULATIONAHA.119.044195

Ronco, C., & Clark, W. R. (2018). Haemodialysis membranes. *Nature Reviews Nephrology*, *14*(6), 394–410. https://doi.org/10.1038/s41581-018-0002-x

Roy-Chaudhury, P., Tumlin, J. A., Koplan, B. A., Costea, A. I., Kher, V., Williamson, D., Pokhariyal, S., Charytan, D. M., Williamson, D., Roy-Chaudhury, P., Tumlin, J., Kher, V., Reddy, V., Prakash, K. C., Charytan, D., Tiwari, S. C., Pokhariyal, S., Podoll, A., Jasuja, S., … Winkelmayer, W. C. (2018). Primary outcomes of the Monitoring in Dialysis Study indicate that clinically significant arrhythmias are common in hemodialysis patients and related to dialytic cycle. *Kidney International*, *93*(4), 941–951. https://doi.org/10.1016/j.kint.2017.11.019

Simon, B., Rubey, H., Treipl, A., Gromann, M., Hemedi, B., Zehetmayer, S., & Kirsch, B. (2021). Haemodialysis patients show a highly diminished antibody response after COVID-19 mRNA vaccination compared with healthy controls. *Nephrology Dialysis Transplantation*, *36*(9), 1709–1716. https://doi.org/10.1093/ndt/gfab179

Suwita, K. (2014). *Buku Ajar Ilmu Penyakit Dalam* (S. Setiati, A. Alwi, A. W. Sudoyo, K. M. Simadibrata, B. Setiyohadi, & A. F. Syam, Ed.; VI). Interna Publising.

Thamer, M., Lee, T. C., Wasse, H., Glickman, M. H., Qian, J., Gottlieb, D., Toner, S., & Pflederer, T. A. (2018). Medicare Costs Associated With Arteriovenous Fistulas Among US Hemodialysis Patients. *American Journal of Kidney Diseases*, *72*(1), 10–18. https://doi.org/10.1053/j.ajkd.2018.01.034

Wong, B., Ravani, P., Oliver, M. J., Holroyd-Leduc, J., Venturato, L., Garg, A. X., & Quinn, R. R. (2018). Comparison of Patient Survival Between Hemodialysis and Peritoneal Dialysis Among Patients Eligible for Both Modalities. *American Journal of Kidney Diseases*, *71*(3), 344–351. https://doi.org/10.1053/j.ajkd.2017.08.028

Wu, K., Gao, R., Tian, F., Mao, Y., Wang, B., Zhou, L., Shen, L., Guan, Y., & Cai, M. (2019). Fatty acid positional distribution (*sn* -2 fatty acids) and phospholipid composition in Chinese breast milk from colostrum to mature stage. *British Journal of Nutrition*, *121*(1), 65–73. https://doi.org/10.1017/S0007114518002994

Xiong, F., Tang, H., Liu, L., Tu, C., Tian, J.-B., Lei, C.-T., Liu, J., Dong, J.-W., Chen, W.-L., Wang, X.-H., Luo, D., Shi, M., Miao, X.-P., & Zhang, C. (2020). Clinical Characteristics of and Medical Interventions for COVID-19 in Hemodialysis Patients in Wuhan, China. *Journal of the American Society of Nephrology*, *31*(7), 1387–1397. https://doi.org/10.1681/ASN.2020030354