
Hemodialysis Duration and Symptom Burden in Patients with Chronic Kidney Disease

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ABSTRACT

Background: hemodialysis is the most common renal replacement therapy for patients with chronic kidney failure. While hemodialysis therapy can prolong the life expectancy of patients, this therapy can also cause side effects that become a symptom burden for patients. Symptom burden is the combination of physical and psychological symptoms felt by patient. The severity of symptom burden can be influenced by various factors, one of them is the length of the patient undergoing hemodialysis.

Purpose: the purpose of this study was to determine the relationship between the length of hemodialysis and symptom burden in patients with chronic kidney failure undergoing hemodialysis at Buleleng Regional General Hospital.

Methods: this study was a descriptive correlational study with a cross-sectional approach and involved 70 respondents with chronic kidney failure obtained through purposive sampling technique. The instrument in this research used the Chronic Kidney Disease Symptoms Burden Index (CKD-SBI) and data analysis used the Chi Square test.

Results: most respondents had undergone hemodialysis for ≥ 1 year (72.9%). Patients experienced an average of 14 symptoms with a mean symptom burden score of 21.07. The majority had mild symptom burden (84.3%). A significant relationship was found between the length of hemodialysis and symptom burden ($p = 0.000$)

Conclusion: the duration of hemodialysis is significantly associated with symptom burden in chronic kidney failure patients. These findings highlight the importance of monitoring symptom burden, particularly among long-term hemodialysis patients.

Keywords:

Chronic kidney disease; symptom burden; the length of hemodialysis

BACKGROUND

Chronic kidney failure is defined as a clinical condition characterized by damage to the structure or function of the kidneys that lasts more than three months (Himmelfarb & Ikizler, 2019). According on the United State Renal Data System (2022), the highest incidence of chronic kidney failure in 2020 was reported in Taiwan, with 525 cases per one million population. While Indonesia ranks seventh with an incidence rate of 303 cases per one million population. The increasing prevalence of chronic kidney failure has contributed to the increasing number of patients who require hemodialysis therapy. In general, this therapy is carried out 2-3 times a week and each session lasts 4-5 hours (Amelia et al., 2021). Bali has the second highest proportion of patients undergoing hemodialysis in Indonesia after DKI Jakarta, which is 37% (Indonesian Ministry of Health, 2019).

Hemodialysis therapy is carried out as an attempt to extend the life expectancy of patients (Mardhatillah et al., 2020). However, during hemodialysis, patients also experience side effects that can become a symptom burden for patients (Li et al., 2018). Symptom burden is a combination of several subjective symptoms, both physical and psychological, from the dimensions of prevalence, distress, severity, and frequency of symptoms experienced by patients (Limbong et al., 2020). There are several physical and psychological symptoms that can be experienced include fatigue, difficulty sleeping, headache, dry skin, itching, muscle cramps, sadness, and anxiety (Irawati et al., 2023).

The study by Abeywickrama et al. (2020) reported that 95% of patients experienced at least one symptom and experienced a high symptom burden which was closely related to their quality of life. The severity of symptom burden experienced by hemodialysis patients is influenced by various factors, including demographic characteristics such as age, gender, income, hemodialysis schedule, vascular access, psychological factors such as stress, depression, and lack of social support and clinical characteristics including dialysis inadequacy, comorbidities, and dialysis duration (Antari et al., 2019; Gunarathne et al., 2022; Karaaslan & Pembegul, 2023; Li et al., 2018). The previous study by Zhang (2016) found that patients who received hemodialysis for less than one year had a higher symptom burden, followed by patients with a dialysis duration of more than ten years. In addition, a study by Gunarathne et al. (2022), found that at the initiation of hemodialysis therapy, patients experienced 21 symptoms, which then decreased to 19 symptoms after six months of therapy.

Based on a preliminary study through interviews with two patient companions at the Hemodialysis Unit of Buleleng Regional Hospital, with the duration of hemodialysis for each patient being four years and one year, showed that fatigue, decreased appetite, and difficulty sleeping were the most common symptoms experienced by patients during therapy. These symptoms were strongly felt by patients in the first few months of hemodialysis. However, after approximately six months of hemodialysis, the symptoms have decreased compared to the symptoms felt at the beginning of hemodialysis. Although the symptoms have decreased, they must still receive proper attention from health workers by providing appropriate symptom management to patients. Thus, it is

hoped that the symptoms felt by patients can be minimized so that patients can carry out their daily routines better and their quality of life can improve. Previous studies have mostly examined the relationship between hemodialysis duration and one of the symptoms, both physical and psychological symptoms, while research about the relationship between hemodialysis duration and symptom burden has not been widely studied.

OBJECTIVE

This study aims to determine the relationship between hemodialysis duration and symptom burden in patients with chronic kidney failure at Buleleng Regional General Hospital.

METHODS

This study was a quantitative study with a descriptive correlational design that used a cross-sectional approach. The population of this study was 224 people with a sample size of 70 chronic kidney failure patients undergoing hemodialysis, which was selected by purposive sampling technique. Inclusion criteria in this study include patients aged 18-60 years, have undergone routine hemodialysis twice a week for at least 4 weeks, and are agreed to participate as respondents. Exclusion criteria were patients with decreased consciousness or hearing loss.

The instrument to measure symptom burden was the Chronic Kidney Disease Symptoms Burden Index (CKD-SBI) developed by Almutary et al. (2015) and translated into Indonesian by Wasilah et al. (2023). The CKD-SBI questionnaire consists of 32 physical and psychological symptoms and there are four dimensions including prevalence, distress, severity, and frequency. The total symptom load is the sum of the scores of each dimension then multiplied by 0.1008 (a constant number), so the total CKD-SBI score ranges from 0-100. The reliability test results of the CKD-SBI questionnaire, based on the Cronbach Alpha coefficient for 32 items, obtained a result of 0.91 and the dimensions of distress, severity, and frequency were 0.90, 0.92, and 0.86, respectively.

This study was conducted at Buleleng General Hospital in January 2025. Data analysis in this study used Chi Square. This research has passed the ethical test with number 01/EC/KEPK-RSB/1/2025.

RESULTS

The results of the study obtained a sample of 70 respondents. Data tabulation based on the characteristics of respondents including gender, education, occupation, comorbidities, hemodialysis schedule, and vascular access can be seen in the following table:

Table 1. Characteristics of Respondents (n=70)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	37	52,9
Female	33	47,1
Education		
None	5	7,1
Primary Education	29	41,4
Secondary Education	24	34,3
Higher Education	12	17,1
Occupation		
None	34	48,6
Civil Servant	8	11,4
Private Employee	1	1,4
Farmer	12	17,1
Trader	5	7,1
Laborer	9	12,9
Breeder	1	1,4
Comorbidities		
None	27	38,6
1 Comorbidity	29	41,4
2 Comorbidities	13	18,6
3 Comorbidities	1	1,4
Hemodialysis Schedule		
Morning	32	45,7
Afternoon	38	54,3
Vascular Access		
AVF	52	74,3
CDL	10	14,3
Femoral	8	11,4

Table 1 shows that the majority of respondents were male (52.9%), had the last education up to primary education (41.4%), did not work (48.6%), had one comorbidity (41.4%), received hemodialysis in the afternoon shift (54.3%), and used AVF (74.3%).

Table 2. The Central Tendency of Age, Hemodialysis Duration, and Symptom Burden Score of Respondents (n=70)

Respondents' Characteristics	Mean $\pm$ SD	Min-Max
Age	46,16 $\pm$ 10,223	21-59
Hemodialysis Duration	37,64 $\pm$ 36,901	1-144
Symptom Burden Score	21,07 $\pm$ 7,392	10-39

Table 2 shows that the average age of respondents was 46.16 years with an average length of hemodialysis of 37.64 months, and the average symptom burden score experienced by respondents during hemodialysis was 21.07.

Table 3. Overview of Hemodialysis Duration and Symptom Burden of Respondents (n=70)

Variable	Frequency (n)	Percentage (%)
Hemodialysis Duration		
<1 year	19	27,1
≥1 year	51	72,9
Symptom Burden		
Mild	59	84,3
Moderate	11	15,7
High	0	0

Table 3 shows that the majority of respondents had undergone hemodialysis for ≥1 year as many as 51 people (72.9%) and experienced mild symptom burden as many as 59 people (84.3%) and no respondents experienced high symptom burden.

Table 4. Prevalence of Symptom Burden (n=70)

Symptom	Frequency (f)	Percentage (%)
Constipation	11	15,7
Nausea	37	52,9
Vomiting	24	34,3
Diarrhea	11	15,7
Decreased appetite	30	42,9
Muscle cramps	41	58,6
Swelling in legs	18	25,7
Shortness of breath	21	30
Light headedness or dizziness	44	62,9
Restless legs	11	15,7
Numbness or tingling in feet	24	34,3
Feeling tired or lack of energy	50	71,4
Cough	33	47,1
Dry mouth	33	47,1
Bone or joint pain	47	67,1
Chest pain	21	30
Headache	43	61,4
Muscle soreness	45	64,3
Difficulty concentrating	13	18,6
Dry skin	39	55,7
Itching	44	62,9
Worrying	28	40
Feeling nervous	32	45,7
Trouble falling asleep	42	60
Trouble staying asleep	40	57,1
Feelings irritable	38	54,3
Feelings sad	22	31,4
Feelings anxious	34	48,6
Depression	2	2,9
Decreased interest in sex	43	61,4
Difficulty becoming sexually aroused	22	31,4
Nocturia	42	60

Table 4 shows that the most common symptoms experienced by respondents during hemodialysis were fatigue or lack of energy (71.4%), bone or joint pain (67.1), muscle soreness (64.3%), light headedness (62.9%), and itching (62.9%). In this study, the average number of symptoms experienced by respondents was 14.

Table 5. Symptom Burden Overview based on Respondent Characteristics (n=70)

Respondent Characteristics		Symptom Burden				Total	%
		Mild	%	Moderate	%		
Age	<40 years	12	17,1	2	2,9	14	20
	≥40 years	47	67,1	9	12,9	56	80
Gender	Male	34	48,6	3	4,3	37	52,9
	Female	25	35,7	8	11,4	33	47,1
	None	2	2,9	3	4,3	5	7,1
Education	Primary Education	27	38,6	2	2,9	29	41,4
	Secondary Education	20	28,6	4	5,7	24	34,3
	Higher Education	10	14,3	2	2,9	12	17,1
	None	27	38,6	7	10	34	48,6
Occupation	Civil Servant	8	11,4	0	0	8	11,4
	Private Employee	1	1,4	0	0	1	1,4
	Farmer	11	15,7	1	1,4	12	17,1
	Trader	4	5,7	1	1,4	5	7,1
	Laborer	7	10	2	2,9	9	12,9
	Breeder	1	1,4	0	0	1	1,4
	None	24	34,3	3	4,3	27	38,6
Comorbidities	1 comorbidity	26	37,1	3	4,3	29	41,4
	2 comorbidities	8	11,4	5	7,1	13	18,6
	3 comorbidities	1	1,4	0	0	1	1,4
Hemodialysis Schedule	Morning	28	40	4	5,7	32	45,7
	Afternoon	31	44,3	7	10	38	54,3
	AVF	47	67,1	5	7,1	52	74,3
Vascular Access	CDL	4	5,7	6	8,6	10	14,3
	Femoral	8	11,4	0	0	8	11,4

Table 5 shows that the majority of respondents who experienced moderate symptom burden were ≥40 years old (12.9%), female (11.4%), had secondary education (5.7%), did not work (10%), had two comorbidities (7.1%), were undergoing hemodialysis in the afternoon (10%), and used CDL (8.6%).

Table 6. Analysis of the Relationship between Hemodialysis Duration and Symptom Burden (n=70)

Hemodialysis Duration	Symptom Burden				p-value
	Mild	%	Moderate	%	
<1 year	9	12,9	10	14,3	0,000
≥1 year	50	71,4	1	1,4	

Table 6 shows that there was a relationship between hemodialysis duration and symptom burden in chronic kidney failure patients undergoing hemodialysis at Buleleng Regional General Hospital.

DISCUSSION

The findings of this study showed that the average duration of hemodialysis among respondents was 37.64 months, and most participants had undergone hemodialysis for ≥ 1 year. This is consistent with previous evidence stating that hemodialysis is a long-term, lifelong therapy requiring sustained patient adherence (Agustani et al., 2022). The prolonged nature of therapy contributes to patients' gradual adaptation to treatment procedures and physical responses.

In this study, respondents experienced an average of 14 symptoms listed in the CKD-SBI with a mean symptom burden score of 21.07, and the majority reported mild symptom burden. Although comparable to Limbong et al. (2020), differences across studies may reflect variations in hemodialysis adequacy, sociocultural perceptions of symptoms, and individual resilience (Almutary et al., 2016). These findings align with the Symptom Management Theory, which explains that symptom experience is influenced by physiological, psychological, and situational factors interacting simultaneously.

The most common symptoms identified were fatigue, musculoskeletal pain, itching, and light-headedness, which are widely reported among hemodialysis patients (Almutary et al., 2016). Fatigue may result from decreased erythropoietin production, chronic inflammation, toxin accumulation, and repeated fluid shifts during dialysis. Patients in the early phase of treatment may also experience stress and anxiety, which can heighten symptom perception (Pratiwi et al., 2024). These mechanisms may explain why fatigue occurred across both < 1 year and ≥ 1 year groups.

Age showed a notable relationship with symptom burden, with respondents aged ≥ 40 years experiencing more moderate symptoms. Physiological decline, decreased metabolic reserve, and higher prevalence of chronic diseases at older ages contribute to the amplification of symptoms during hemodialysis (Rooij et al., 2022). Older adults may also have reduced tolerance to fluid removal and hemodynamic changes, leading to more intense symptom experiences. Female respondents exhibited greater symptom burden, which may be attributed to hormonal variations, higher prevalence of anemia, and differences in emotional coping and symptom reporting (Chauhan et al., 2022). Women often report symptoms more sensitively and consistently, partly influenced by biological vulnerability and sociocultural expectations related to health expression.

Education level did not show meaningful differences in symptom burden, consistent with Georges et al. (2022). Although education is often linked with health literacy, symptom burden among hemodialysis patients is more strongly influenced by clinical conditions rather than educational background. Respondents who were unemployed demonstrated higher symptom burden. Engagement in employment is associated with structured activities, a sense of purpose, and social interaction. Lack of such engagement may heighten anxiety, reduce coping capacity, and contribute to poorer quality of life, which can amplify symptom perception (Simorangkir et al., 2021).

Comorbidity was also associated with symptom burden, where respondents with two comorbidities experienced the highest burden. Comorbidities such as hypertension and diabetes mellitus accelerate metabolic dysregulation, vascular complications, and inflammatory processes, all of which intensify physical and psychological symptoms (Susanto et al., 2024). Hemodialysis schedule influenced symptom burden, with afternoon schedules associated with more moderate symptoms. Afternoon dialysis may disrupt circadian rhythms and recovery patterns, causing difficulty sleeping, prolonged fatigue, and reduced daily functioning (Lopes et al., 2014; Antari et al., 2019). Sleep disturbance further worsens symptom burden and quality of life (Alshammari et al., 2023).

Patients using central double-lumen catheters (CDL) experienced higher symptom burden. CDL is associated with higher risks of infection, inflammation, and vascular complications compared with AVF (Karaaslan & Pembegul, 2023). These complications can contribute to physical discomfort and psychological stress experienced during treatment. A key finding of this study is that the duration of hemodialysis was significantly associated with symptom burden. Patients who had undergone hemodialysis <1 year experienced a higher symptom burden than those with longer treatment duration. The early phase of hemodialysis is characterized by physiological instability, fluid and metabolic shifts, and limited patient adaptation (Gunarathne et al., 2022). Patients may also enter hemodialysis with a high pre-existing symptom burden due to the progression of chronic kidney failure (Zhang, 2016). Over time, patients develop physiological tolerance and psychological adjustment, which may reduce symptom intensity. These findings reinforce adaptation-based theories suggesting that symptom burden decreases as patients become more accustomed to treatment routines and physiological responses.

This study has potential confounding factors that may influence the association between hemodialysis duration and symptom burden, including variations in dialysis adequacy, nutritional status, inflammatory markers, and adherence to treatment. Additionally, selection bias may occur because patients with severe symptoms or complications might be underrepresented if they were unable to participate.

Overall, the findings highlight the importance of early symptom assessment and comprehensive support for patients in the first year of hemodialysis, emphasizing the role of healthcare professionals in monitoring physiological changes, managing symptoms, and facilitating patient adaptation to long-term treatment.

CONCLUSION

Most respondents experienced a mild symptom burden (84.3%), with the five most common symptoms being fatigue, bone or joint pain, muscle soreness, light-headedness, and itching. This study also found a significant relationship between the duration of hemodialysis and symptom burden among chronic kidney failure patients. Future studies are recommended to explore additional contributing factors such as psychological status and clinical conditions and to evaluate interventions aimed at reducing symptom burden, particularly fatigue in hemodialysis patients.

REFERENCES

- Abeywickrama, H. M., Wimalasiri, S., Koyama, Y., Uchiyama, M., Shimizu, U., Kakihara, N., Chandrajith, R., & Nanayakkara, N. (2020). Quality of Life and Symptom Burden Among Chronic Kidney Disease of Uncertain Etiology (CKDU) Patients in Girandurukotte, Sri Lanka. *International Journal of Environmental Research and Public Health*, 17(11), 1–16. <https://doi.org/10.3390/ijerph17114041>
- Agustani, S., Suparman, R., Setianingsih, T., & Mamlukah. (2022). Analisis Faktor-Faktor yang Berhubungan dengan Kepatuhan Pasien Gagal Ginjal Kronik dalam Menjalani Hemodialisa di Unit Hemodialisa RSUD 45 Kuningan 2021. *Journal of Public Health Innovation*, 2(02), 113–122. <https://doi.org/10.34305/jphi.v2i2.411>
- Almutary, H., Bonner, A., & Douglas, C. (2015). Arabic Translation, Adaptation and Modification of The Dialysis Symptom Index for Chronic Kidney Disease Stages Four and Five. *BMC Nephrology*, 16(1), 1–8. <https://doi.org/10.1186/s12882-015-0036-2>
- Almutary, H., Bonner, A., & Douglas Clint. (2016). *Which Patients with Chronic Kidney Disease Have the Greatest Symptom Burden? A Comparative Study of Advanced CKD Stage and Dialysis Modality*. 42(2), 73. <https://doi.org/https://doi.org/10.1111/jorc.12152>
- Alshammari, B., Alkubati, S. A., Pasay-an, E., Alrasheeday, A., Alshammari, H. B., Asiri, S. M., Alshammari, S. B., Sayed, F., Madkhali, N., Laput, V., & Alshammari, F. (2023). Sleep Quality and Its Affecting Factors among Hemodialysis Patients: A Multicenter Cross-Sectional Study. *Healthcare (Switzerland)*, 11(18). <https://doi.org/10.3390/healthcare11182536>
- Amelia, F., Safitri, K. H., & Suwanto, S. (2021). Determinant Fatigue pada Pasien ESRD yang Menjalani Hemodialisis. *Jurnal Keperawatan Wiyata*, 2(1), 41–50. <https://jurnal.itkeswhs.ac.id/index.php/keperawatan/article/view/495>
- Antari, G. A. A., Sukmarini, L., & Adam, M. (2019). Associated Factors of Post-hemodialysis Recovery Time in Kidney Failure Patients. *Enfermeria Clinica*, 29, 247–251. <https://doi.org/10.1016/j.enfcli.2019.04.139>
- Chauhan, K., Wen, H. H., Gupta, N., Nadkarni, G., Coca, S., & Chan, L. (2022). Higher Symptom Frequency and Severity After the Long Interdialytic Interval in Patients on Maintenance Intermittent Hemodialysis. *Kidney International Reports*, 7(12), 2630–2638. <https://doi.org/10.1016/j.ekir.2022.09.032>
- Fathy, B., Salama, A. M. S. E., Khalil, M. A. E. H., & Ibraheim, N. A. E. R. (2022). Role of Time of Hemodialysis Shifts on Quality of Life: A Comparative Study between Morning versus Evening Conventional Hemodialysis at Nephrology & Urology Unit, Minia University Hospital. *The Egyptian Journal of Hospital Medicine*, 88, 3284–3292. <https://doi.org/10.21608/ejhm.2022.247140>
- Georges, T. D., Mbeng, A. C.-S., Mahamat, M., Bandolo, V. N., Acha, M. K., Francois, K., & Gloria, A. (2022). Symptom Burden in Patients on Maintenance Haemodialysis: Magnitude, Associated Factors, Patients' attitude and Practice. *The Open Urology & Nephrology Journal*, 15(1), 1–10. <https://doi.org/10.2174/1874303x-v15-e2207050>
- Gunarathne, T. G. N. S., Tang, L. Y., Lim, S. K., Nanayakkara, N., Damayanthi, H. D. W. T., & Abdullah, K. L. (2022). Factors Associated with Symptom Burden in

- Adults with Chronic Kidney Disease Undergoing Hemodialysis: A Prospective Study. *International Journal of Environmental Research and Public Health*, 19(9). <https://doi.org/10.3390/ijerph19095540>
- Himmelfarb, J., & Ikizler, T. A. (2019). Chronic Kidney Disease, Dialysis, and Transplantation. In *Chronic Kidney Disease, Dialysis, and Transplantation* (pp. 754–779). Elsevier. <https://doi.org/10.1016/B978-0-323-52978-5.18001-2>
- Irawati, D., Agung, R. N., Natashia, D., Narawangsa, A., Purwati, N. H., & Handayani, R. (2023). Perubahan Fisik dan Psikososial Mempengaruhi Kualitas Hidup Pasien Hemodialisis. *Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing)*, 9(1), 96–104. <https://doi.org/10.33023/jikep.v9i1.1426>
- Karaaslan, T., & Pembegul, I. (2023). Relationship between Symptom Burden and Dialysis Adequacy in Patients with Chronic Kidney Disease undergoing Hemodialysis. *Northern Clinics of Istanbul*, 10(4), 435–443. <https://doi.org/10.14744/NCI.2023.01799>
- Kementerian Kesehatan RI. (2019). *Riset Kesehatan Dasar (Riskesdas)*. https://kesmas.kemkes.go.id/assets/upload/dir_519d41d8cd98f00/files/Hasil-riskesdas-2018_1274.pdf
- Li, H., Xie, L., Yang, J., & Pang, X. (2018). Symptom Burden Amongst Patients Suffering from End-Stage Renal Disease and Receiving Dialysis: A literature review. In *International Journal of Nursing Sciences* (Vol. 5, Issue 4, pp. 427–431). Chinese Nursing Association. <https://doi.org/10.1016/j.ijnss.2018.09.010>
- Limbong, E. O., Pahria, T., & Pratiwi, S. H. (2020). Symptom Burden's Associated Factors among Hemodialysis Patients. *Jurnal Keperawatan Padjadjaran*, 8(3), 208–220. <https://doi.org/10.24198/jkp>
- Lopes, G. B., Silva, L. F., Pinto, G. B., Catto, L. F., Martins, M. T. S., Dutra, M. M. D., & Lopes, A. A. (2014). Patient's Response to A Simple Question on Recovery After Hemodialysis Session Strongly Associated with Scores of Comprehensive Tools for Quality of Life and Depression Symptoms. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 23(8), 2247–2256. <https://doi.org/10.1007/s11136-014-0666-z>
- Lu, Y., Zhai, S., Liu, Q., Dai, C., Liu, S., Shang, Y., & Chen, C. (2024). Correlates of Symptom Burden in Renal Dialysis Patients: A Systematic Review and Meta-analysis. *Renal Failure*, 46(2). <https://doi.org/10.1080/0886022X.2024.2382314>
- Mardhatillah, Arsin, A., Syafar, M., & Hardianti, A. (2020). Ketahanan Hidup Pasien Penyakit Ginjal Kronik yang Menjalani Hemodialisis di RSUP Dr. Wahidin Sudirohusodo Makassar. *Jurnal Kesehatan Masyarakat Maritim*, 3(1), 21–33. <https://doi.org/10.30597/jkmm.v3i1.10282>
- Parsons, G., Liu, S., & Chang, T. I. (2024). In-Center Hemodialysis Symptom Burden: Differences Between Men and Women. *Kidney Medicine*, 6(10). <https://doi.org/10.1016/j.xkme.2024.100881>
- Pratiwi, S. D., Hamzah, A., Herlina, L., & Setiawan, A. (2024). Hubungan Lama Menjalani Hemodialisa dengan Kelelahan Pasien Chronic Kidney Disease. *Jurnal Keperawatan Indonesia Florence Nightingale*, 4(2), 1–7. <https://doi.org/10.34011/jkifn.v4i2.2632>
- Rooij, E. N. de, Meuleman, Y., Fijter, J. W. de, Jager, K. J., Chesnaye, N. C., Evans, M., Caskey, F. J., Torino, C., Porto, G., Szymczak, M., Drechsler, C., Wanner, C., Dekker, F. W., & Hoogeveen, E. K. (2022). Symptom Burden Before and After

- Dialysis Initiation in Older Patients. *Clinical Journal of American Society of Nephrology*, 17, 1719–1729. <https://doi.org/10.2215/CJN.09190822>
- Sari, S. P., Rasyidah, A. Z., & Maulani. (2022). Hubungan Lama Hemodialisis dengan Kualitas Hidup Pasien Penyakit Ginjal Kronik di Ruang Hemodialisa Rumah Sakit Bhayangkara Kota Jambi. *Jurnal Ilmiah Ners Indonesia*, 3(2), 54. <https://www.onlinejournal.unja.ac.id/JINI>
- Simorangkir, R., Andayani, T. M., & Wiedyaningsih, C. (2021). Faktor-Faktor yang Berhubungan dengan Kualitas Hidup Pasien Penyakit Ginjal Kronis yang Menjalani Hemodialisis. *Jurnal Farmasi Dan Ilmu Kefarmasian Indonesia*, 8(1), 83–90. <https://doi.org/https://doi.org/10.20473/jfiki.v8i12021.83-90>
- Susanto, G., Wahyudi, D. A., & Wulandari, R. Y. (2024). Penyakit Komorbid dan Survival Rate pada Pasien Gagal Ginjal Kronik di Ruang Hemodialisa RSUD Dr Abdul Moeloek Provinsi Lampung. *Jurnal Rekam Medis Dan Infromasi Kesehatan*, 1(1), 1–8. <https://journal.aisyahuniversity.ac.id/index.php/Jremik/article/download/1546/704/>
- Triesnwati, F. D., Nuryani, R., & Lindasari, W. (2023). Resilience Berhubungan dengan Stres pada Pasien Chronic Kidney Disease dengan Hemodialisis. *Jurnal Keperawatan*, 15(2), 801–814. <http://journal.stikeskendal.ac.id/index.php/Keperawatan>
- United State Renal Data System. (2022). *End Stage Renal Disease: Chapter 11*. <https://usrds-adr.niddk.nih.gov/2022/end-stage-renal-disease/11-international-comparisons>
- Wahyudi, F. F. N., & Rantung, J. (2024). Hubungan Fatigue dengan Kualitas Hidup Pasien Gagal Ginjal Kronik yang Menjalani Terapi Hemodialisa di Rumah Sakit Swasta Bandar Lampung. *Klabat Journal of Nursing*, 6(1), 50–59. <http://ejournal.unklab.ac.id/index.php/kjn>
- Wasilah, H., Natasha, D., Huang, C. H., Chen, H. M., & Yen, M. (2023). Translation and Psychometric Testing of Indonesian Version of Chronic Kidney Disease–Symptom Burden Index. *Jurnal Ners*, 18(3), 235–242. <https://doi.org/10.20473/jn.v18i3.47539>
- Wiradana, AA. G. A. A. A., Wibawa, I. G. A. B. K., & Budiarta, I. B. (2021). Bloodstream Infection of Double Lumen Catheter among Hemodialysis Patient. *Journal of Indonesian Society for Vascular and Endovascular Surgery*, 2(1), 30–33. <https://doi.org/10.36864/jinasvs.2021.1.009>
- Zhang, X. (2016). Symptom Burden and Its Influence Factors among Patients Receiving Maintenance Hemodialysis: A Cross-sectional Study. *Hangzhou: Zhejiang Chinese Medical University*.