



FACTORS AFFECTING CHRONIC KIDNEY DISEASE PATIENTS UNDERGOING HEMODIALYSIS AFTER INTRADIALYTIC EXERCISE AND COGNITIVE BEHAVIORAL THERAPY: A CFA

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ABSTRACT

Chronic kidney disease (CKD) patients undergoing continuous hemodialysis (HD) experience decreased daily physical activity, lower tolerance to exercise and poorer health-related quality of life. There are many factors that have not been identified that can affect CKD patients after undergoing hemodialysis. This study aims to determine the factors that influence CKD patients undergoing hemodialysis after intradialytic exercise and cognitive behavioral therapy. The research design uses confirmatory factor analysis (CFA) model. The research was conducted in the hemodialysis unit of the Surabaya Islamic Hospital, Indonesia. The sampling technique uses purposive sampling. The sample includes 180 patient respondents with the following criteria: patients undergoing hemodialysis, aged between 20-60 years, treated for CKD with hemodialysis for ≥ 3 months, and agreed to be respondents. The research instrument used the WHOQOL-BREF questionnaire. The validity of the internal factor domain and quality of life each showed good consistency, indicated by the loading factor (λ) values ranging from 0.700 to 0.841. All components of each domain were declared reliable, indicated by the indicator reliability (R²) values ranging from 0.48 to 0.71. Data analysis uses CFA with parameter data estimation using analysis of moment structures (AMOS) software. Acceptance of the CFA model by looking at the GoF. The respective p values for age factor, income factor, gender factor, educational factor, physical domain, psychological domain, social domain, and environmental domain are 0.000, while the religious factor is (0,789) which has no effect. Factors that can influence CKD patients undergoing hemodialysis after intradialytic exercise and cognitive behavioral therapy are: 1) internal factors include: age factor, income factor, gender factor, and education factor; 2) quality of life includes: physical domain, psychological domain, social domain and environmental domain.

Keywords: cognitive behavior therapy; deep breath relaxation; hemodialysis; intradialytic exercise; quality of life

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INTRODUCTION

Chronic kidney disease (CKD) is a public health problem throughout the world, with increasing prevalence and poor clinical outcomes and causing high medical costs (Apel et al., 2021). CKD is a chronic disease that receives the largest funding from the Indonesian social security administration body with a very high prevalence rate increase of 13.4%, which is one of the main causes of the national death rate (Belinda & Dewi, 2021). In initial hemodialysis, patients experience poor physical strength, muscle metabolism, and peak oxygen consumption and are at high risk of death resulting in decreased quality of life (Lagadec et al., 2018). Despite improvements in treatment, CKD patients undergoing maintenance hemodialysis often demonstrate decreased daily physical activity, low exercise tolerance, poor health-related quality of life, and functional impairment at similar ages (Gomes Neto et al., 2018). Quality of life scores in hemodialysis patients are lower and among the worst compared to other chronic diseases (Shdaifat, 2022). Quality of life is consistently associated with high phosphorus and potassium levels, as well as high interdialytic weight gain (Cohen & Kimmel, 2018). Inactivity is associated with lower quality of life scores (Shirazian et al., 2023). The depressive symptom factor, which is the main component of quality of life, is related to

non-adherence to treatment, restriction of diet and fluids, and dialysis sessions (Atawi & Alaamri, 2024).

The results showed that approximately 26 million adults in the United States and 4.6 million adults in Korea suffer from CKD, and the annual medical costs per person caused by CKD are \$1,700 for stage 2, \$3,500 for stage 3, and \$12,700 for stage 4 (Park et al., 2021). The results of a study of 7,378 hemodialysis patients in Europe, Japan and the United States showed that the physical component quality of life score and mental component quality of life score using the Kidney Disease Quality of Life Survey (KDQOL)-36 were significantly low (Shirazian et al., 2023).

The diagnosis and treatment of CKD can have a significant impact, many losses and limitations in the patient's daily life, causing various biopsychosocial changes (Hagemann et al., 2019), as well as the limitations of CKD itself, thus having a significant impact on the patient's quality of life. such as the physical component scale and mental component scale (Salhab et al., 2019). A low quality of life score causes a significant risk of hospitalization and death (Ravera et al., 2021), because it changes the way individuals view and evaluate their life and illness which can cause individuals to not adhere to treatment (Hagemann et al., 2019).

One way to reduce the impact of risk factors on CKD patients is to provide exercise for hemodialysis patients, provide counseling, and regularly encourage patients undergoing hemodialysis to increase their level of physical activity even though there are many obstacles (Rhee et al., 2019). Potential physical activities include intradialytic exercise (Kirkman et al., 2019). Hemodialysis patients require interventions that focus on patients' psychological characteristics to reduce medical noncompliance (Sohn et al., 2018). Cognitive behavioral therapy is a psychotherapy approach that manages emotional, behavioral and knowledge dysfunction through systematic procedures (Gerogianni et al., 2018). The therapy has also been shown to improve depressed mood and quality of life (Ng et al., 2019). This study aims to determine the factors that influence CKD patients undergoing hemodialysis after intradialytic exercise and cognitive behavioral therapy.

METHOD

The research design uses model confirmatory factor analyze (CFA). The research aims to determine the factors that influence CKD patients undergoing hemodialysis after intradialytic exercise and cognitive behavioral therapy, by analyzing the estimated effect: 1) internal factors to age factors (FU), internal factors to income factors (FP), internal factors to gender factors (FJ), internal factors to religious factors (FA), internal factors to education factors (FE); 2) quality of life in the physical domain (DF), quality of life in the psychological domain (DP), quality of life in the social domain (DS), quality of life in the environmental domain (DL). The research was conducted in the hemodialysis unit of the Surabaya Islamic Hospital, Indonesia. The sampling technique uses purposive sampling. The sample includes 180 patient respondents with the following criteria: patients undergoing hemodialysis, aged between 20-60 years, treated for CKD with hemodialysis for ≥ 3 months, and agreed to be respondents. The research instrument used the WHOQOL-BREF questionnaire. The validity of the internal factor domain and quality of life each showed good consistency, indicated by the loading factor (λ) values ranging from 0.700 to 0.841. All components of each domain were declared reliable, indicated by the indicator reliability (R²) values ranging from 0.48 to 0.71. Data analysis used CFA with data parameter estimation using analysis of moment structures (AMOS version 21) software (Byrne, 2013) with parameters evaluated as follows: 1) factorial weight; 2) variance and covariance of each indicator reliability; 3) variance and covariance; 4) error correlation. Acceptance of the CFA model by observing: 1) interpretation, weighting and statistical significance of parameters; 2) modification index proposed by AMOS; 3) model adjustment indicators. The research has received ethical approval number 024/SGH/KEPK/VI/2024 from the STIKes Ganesha Husada Kediri Health Research Ethics Commission.

RESULT

Table 1.
Respondent characteristics (n=180)

No	Characteristics	f	%
1	Age:		
	20-30 years	44	24.4
	31-40 years	44	24.4
	41-50 years	47	26.1
	51-60 years	45	25
2	Education:		
	No formal education	40	22.2
	Elementary school (primary)	48	26.7
	High school (secondary school)	49	27.2
	Graduated (university and above)	43	23.9
3	Hemodialysis Frequency:		
	Two times	99	55.0
	Three times	81	45.0
4	Hemodialysis Duration:		
	> 3 Months	92	51.1
	< 3 Months	88	48.9

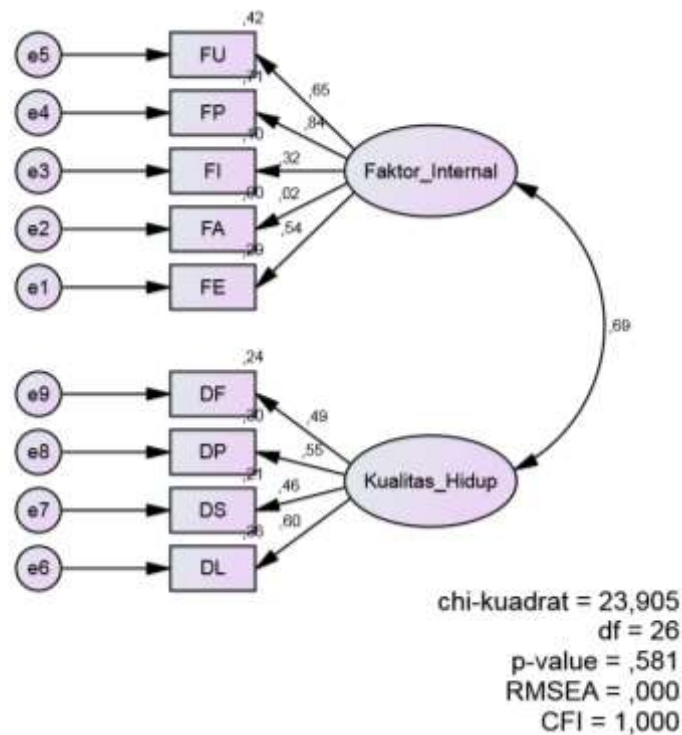


Figure 1. CFA Model of Internal Factors with Quality of Life

Table 2.
Regression Weights

			Estimate	P
FE	<---	Internal_Factors	1,000	0,000
FA	<---	Internal_Factors	0,031	0,789
FI	<---	Internal_Factors	0,410	0,000
FP	<---	Internal_Factors	1,663	0,000
FU	<---	Internal_Factors	1,348	0,000
DL	<---	Quality_of-Life	1,000	0,000
DS	<---	Quality_of-Life	0,777	0,000
DP	<---	Quality_of-Life	0,884	0,000
DF	<---	Quality_of-Life	0,816	0,000

Table 2 shows the factors that influence CKD patients undergoing hemodialysis after intradialytic training and cognitive behavioral therapy, namely: age factor (FU), income factor (FP), gender factor (FJ), education factor (FE), physical domain (DF), psychological domain (DP), social domain (DS), and environmental domain (DL). Only the religious factor (FA) has no effect.

Table 3.
Goodness of Fit Model

Model	
Chi-quadrat	23,905
p-value	0,581
RMSEA	0,000
CFI	1,000
GFI	0,971
AGFI	0,950
TLI	1,013
NFI	0,908
PCFI	0,722
PNFI	0,656

Table 3 shows the goodness of fit model values. That whole the suitability index shows an adequate index (fit), except for the chi-square ratio ($\chi^2/df=23.905$). However, with the values of GFI, NFI, AGFI and CFI, the TLI is very close to 1 (respectively 0.971, 0.908, 0.950 and 1.000, 1.013) and with an RMSEA of 0.000.

DISCUSSION

Age Factor on Internal Factors

The age factor is related to the self-efficacy of patients undergoing hemodialysis in managing chronic diseases (Mousa et al., 2018). The results of the study show that the characteristics that influence the quality of life of patients undergoing hemodialysis are age over 55 years (Cepeda Marte et al., 2019). A regular quality of life for CKD patients can be achieved by patients aged 60 years and over (Pretto et al., 2020). Age greatly influences an individual's quality of life. Adult individuals experience higher well-being in middle adulthood (Matud et al., 2019).

Factor Income against Internal Factors

The burden of CKD has multiple dimensions and individuals living with this condition may experience stress from a variety of sources. Complex disease management protocols that include multiple medications and inconvenient food and fluid restrictions can be burdensome and have potential economic and social losses, as impaired kidney function is associated with reduced productivity and life expectancy (Bruce et al., 2009; Crews et al., 2019; Turin et al., 2012).

Gender Factor on Internal Factors

Male gender is associated with quality of life in CKD patients (Rehman et al., 2020). The quality of life of patients undergoing hemodialysis is influenced by male gender (Cepeda Marte et al., 2019).

Religious Factors versus Internal Factors

Religiosity involves behavior related to religious norms, traditions, and doctrines in an organized manner, while spirituality refers to a person's inner experiences, awareness, and relationship with greater powers or forces (Fetzer Institute, 2003; Underwood & Teresi, 2002). Religious institutions (churches, mosques, and temples) are places where individuals can participate in religious traditions and gain spiritual experiences, as well as receive social, emotional, and economic support (Krause, 1997; Levin et al., 2011; Taylor & Chatters, 1988). Attendance at places of worship has been associated with mortality in the general population (Bruce et al., 2017; Gillum et al., 2008; Koenig et al., 1999), however, the impact of attending religious services on clinical outcomes in individuals with chronic health conditions remains unclear. less clear (Bruce et al., 2021).

Educational Factors versus Internal Factors

There is a positive relationship between the level of education and the self-efficacy of patients undergoing hemodialysis in managing chronic diseases (Mousa et al., 2018). Educational factors can influence an individual's quality of life. That the quality of life will increase along with the higher level of education an individual obtains (Forde & Smyth, 2022). Education plays an important role in empowering hemodialysis patients to manage their condition more effectively. Educational interventions focus on educating patients about the disease, the importance of adherence to treatment regimens, and strategies for managing symptoms and complications. Additionally, a continuity of care approach ensures that patients receive consistent support throughout the treatment journey. This can include regular check-ups, tailored advice, and adjustments to the treatment plan based on individual needs (Liao et al., 2020). Simple behavioral educational interventions based on cognitive behavioral therapy can improve the quality of life and self-care of hemodialysis patients. This approach combines cognitive behavioral therapy components with educational components to provide practical strategies for managing the condition overall (Shirazian et al., 2023).

Physical Domain on Quality of Life

Combined intradialytic aerobic and resistance exercise is effective for improving physical function and quality of life in CKD patients undergoing hemodialysis (Gomes Neto et al., 2018). Research results show that intradialytic exercise has an effect on the quality of life of patients undergoing hemodialysis (Kim et al., 2022; Martins do Valle et al., 2020; Rochmawati et al., 2022; Salhab et al., 2019; Suhardjono et al., 2019). However, the results of other studies found that intradialytic exercise improved physical health but did not improve quality of life (Huang et al., 2020). Exercise training can improve ongoing decline in functional status. In patients undergoing hemodialysis, regular exercise improves aerobic capacity, muscle strength, and cardiovascular function (Rhee et al., 2019). Additionally, exercise shows a strong correlation with dialysis benefits, high-sensitivity C-reactive protein, blood pressure, arterial stiffness, Health-related quality of life (QoL), and depression (Mohamed et al., 2020; Rhee et al., 2019). Physical quality of life influences the quality of life of CKD patients undergoing hemodialysis (Al Salmi et al., 2021). Intradialytic exercise training modalities influence physical function and quality of life related to maintaining the health of hemodialysis patients. The combination of aerobic and resistance exercise resulted in improvements in VO₂, depressive symptoms, and the physical function and vitality domains of health-related quality of life. Endurance training significantly influences the increase in walking test distance, knee extensor strength and physical health component scores. Interventions that combine aerobic exercise and intradialytic resistance can improve physical function and quality of life in end-stage renal disease patients undergoing hemodialysis (Gomes Neto et al., 2018).

Psychological Domain of Quality of Life

Cognitive behavioral therapy can improve the quality of life of CKD patients. Cognitive behavioral therapy is a structured psychotherapy intervention to overcome and treat dysfunctional cognition, negative emotions, and maladaptive behavior (Shirazian et al., 2023). In CKD patients, cognitive behavioral techniques integrated into educational programs have successfully improved quality of life (Liao et al., 2020; Ng et al., 2019; Shirazian et al., 2023; Sohn et al., 2018; Solati et al., 2019; Zhianfar et al., 2020). The combination of intradialytic exercise and cognitive behavioral therapy can improve the quality of life of CKD patients during hemodialysis based on quantity and quality (Ling et al., 2020). For dialytic CKD patients, quality of life can be understood as an individual's perception of well-being, ranging from satisfaction to dissatisfaction related to areas of life that are important to the patient (Hagemann et al., 2019). Quality of life is a health outcome for evaluating the quality of health services, assessing the impact of disease, and cost-effectiveness analysis (Khatib et al., 2018). The research results show that emotional quality of life is the quality of healthy human life. Emotional quality of life shows higher than physical quality of life. Younger patients are also more likely to experience emotional problems than older patients. Patients with

serum creatinine levels of 5–8 mg/l had lower emotional well-being. People with low-income levels experience social difficulties (Al Salmi et al., 2021).

Social Domain on Quality of Life

Patients undergoing peritoneal dialysis rated quality of life in different dimensions much higher than patients receiving hemodialysis. Parameters that have a negative impact on the quality of life of patients undergoing hemodialysis are obstacles to continuing to work or study and changing life plans. The will to live is higher in patients undergoing peritoneal dialysis compared to patients receiving hemodialysis (Dąbrowska-Bender et al., 2018). Careful quality of life assessment helps guide and achieve medical management to optimize patient health experiences such as dialysis staff support or encouragement, social support, and quality of social interactions (Thenmozhi, 2018). Hemodialysis patients with kidney disease-specific quality of life, weakness, and active intradialytic activities (such as reading, playing games, playing puzzles, chatting, or others) and passive intradialytic activities (such as watching TV or sleeping) have a higher quality of life (Warsame et al., 2018). The characteristic that most influences the quality of life of diabetes patients undergoing hemodialysis is the quality of social interactions (such as dialysis equipment support and patient satisfaction) (Cepeda Marte et al., 2019).

Environmental Domain on Quality of Life

A positive family history of CKD is a socio-economic and environmental factor in the family (E. et al., 2019). Many environmental susceptibility factors, such as diet, lifestyle, exposure to toxins (e.g., secondhand smoke), or infectious diseases, can be transmitted within the same family and cause CKD (Carlassara et al., 2021). That environmental factors (assortative mating) have an important role in determining CKD family aggregation (Govindaraju et al., 2008). Elements that support genetic and environmental contributions influence CKD (Zhang et al., 2021).

CONCLUSION

Factors that can influence CKD patients undergoing hemodialysis after intradialytic training and cognitive behavioral therapy are: 1) internal factors including: age factors, income factors, gender factors, and educational factors; 2) quality of life includes: physical domain, psychological domain, social domain and environmental domain. Knowing early about the factors that influence CKD patients can be the basis for improving daily care through precision medicine approaches. Early identification of individuals at risk for CKD and its potential contributors guides healthcare teams in better assessment of potentially actionable risk factors for kidney disease and improves patient management and outcomes.

REFERENCES

- Al Salmi, I., Kamble, P., Lazarus, E. R., D'Souza, M. S., Al Maimani, Y., & Hannawi, S. (2021). Kidney Disease-Specific Quality of Life among Patients on Hemodialysis. *International Journal of Nephrology*, 2021, 8876559. <https://doi.org/10.1155/2021/8876559>
- Apel, C., Hornig, C., Maddux, F. W., Ketchersid, T., Yeung, J., & Guinsburg, A. (2021). Informed decision-making in delivery of dialysis: combining clinical outcomes with sustainability. *Clinical Kidney Journal*, 14(Suppl 4), i98–i113. <https://doi.org/10.1093/ckj/sfab193>
- Atawi, A. A. Al, & Alaamri, M. M. (2024). The Relationship between Perceived Social Support and Adherence to Treatment Regimens among Patients Undergoing Hemodialysis: A Scoping Review. *Evidence-Based Nursing Research*, 4(1), 17. <https://doi.org/10.47104/ebnrojs3.v4i1.231>
- Belinda, B., & Dewi, Z. L. (2021). Exploring Self-Regulation of Patients with Chronic Kidney Disease Undergoing Hemodialysis. *Jurnal Psikologi*, 48(2), 118–132. <https://doi.org/10.22146/jpsi.61144>
- Bruce, M. A., Beech, B. M., Sims, M., Brown, T. N., Wyatt, S. B., Taylor, H. A., Williams, D. R., & Crook, E. (2009). Social environmental stressors, psychological factors, and kidney disease.

- Journal of Investigative Medicine : The Official Publication of the American Federation for Clinical Research, 57(4), 583–589. <https://doi.org/10.2310/JIM.0b013e31819dbb91>
- Bruce, M. A., Martins, D., Duru, K., Beech, B. M., Sims, M., Harawa, N., Vargas, R., Kermah, D., Nicholas, S. B., Brown, A., & Norris, K. C. (2017). Church attendance, allostatic load and mortality in middle aged adults. *PloS One*, 12(5), e0177618. <https://doi.org/10.1371/journal.pone.0177618>
- Bruce, M. A., Thorpe, R. J. J., Kermah, D., Shen, J., Nicholas, S. B., Beech, B. M., Tuot, D. S., Ku, E., Waterman, A. D., Duru, K., Brown, A., & Norris, K. C. (2021). Religious Service Attendance and Mortality among Adults in the United States with Chronic Kidney Disease. *International Journal of Environmental Research and Public Health*, 18(24), 13179. <https://doi.org/10.3390/ijerph182413179>
- Byrne, B. M. (2013). Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd ed.). Routledge.
- Carlassara, L., Zaroni, F., & Gharavi, A. G. (2021). Familial Aggregation of CKD: Gene or Environment? *American Journal of Kidney Diseases*, 77(6), 861–862. <https://doi.org/10.1053/j.ajkd.2020.12.010>
- Cepeda Marte, J. L., Javier, A., Ruiz-Matuk, C., & Paulino-Ramirez, R. (2019). Quality of Life and Nutritional Status in diabetic patients on hemodialysis. *Diabetes & Metabolic Syndrome*, 13(1), 576–580. <https://doi.org/10.1016/j.dsx.2018.11.020>
- Cohen, S. D., & Kimmel, P. L. (2018). Management of Nonadherence in ESKD Patients. *Clinical Journal of the American Society of Nephrology : CJASN*, 13(7), 1080–1082. <https://doi.org/10.2215/CJN.13331117>
- Crews, D. C., Bello, A. K., & Saadi, G. (2019). 2019 World Kidney Day Editorial - burden, access, and disparities in kidney disease. In *Jornal brasileiro de nefrologia* (Vol. 41, Issue 1, pp. 1–9). <https://doi.org/10.1590/2175-8239-JBN-2018-0224>
- Dąbrowska-Bender, M., Dykowska, G., Żuk, W., Milewska, M., & Staniszevska, A. (2018). The impact on quality of life of dialysis patients with renal insufficiency. *Patient Preference and Adherence*, 12, 577–583. <https://doi.org/10.2147/PPA.S156356>
- E., G. E., Maddalena, M., Sophia, C.-C., Slavé, P., S., A. V., Hila, M.-R., Yifu, L., Junying, Z., Jordan, N., Priya, K., Yee, L. W., Adele, M., Stacy, P., H., K. B., Debanjana, C., Rachel, R., Drew, B., Michael, D., Holly, S., ... G., G. A. (2019). Diagnostic Utility of Exome Sequencing for Kidney Disease. *New England Journal of Medicine*, 380(2), 142–151. <https://doi.org/10.1056/NEJMoa1806891>
- Fetzer Institute. (2003). Multidimensional Measurement of Religiousness Spirituality for Use in Health Research: A Report of the Fetzer Institute/National Institute on Aging Working Group. Fetzer Institute.
- Forde, J. J., & Smyth, S. (2022). Avoidance Behavior in Adults with Developmental Coordination Disorder is Related to Quality of Life. *Journal of Developmental and Physical Disabilities*, 34(4), 571–589. <https://doi.org/10.1007/s10882-021-09815-8>
- Gerogianni, G., Kouzoupis, A., & Grapsa, E. (2018). A holistic approach to factors affecting depression in haemodialysis patients. *International Urology and Nephrology*, 50(8), 1467–1476. <https://doi.org/10.1007/s11255-018-1891-0>
- Gillum, R. F., King, D. E., Obisesan, T. O., & Koenig, H. G. (2008). Frequency of attendance at religious services and mortality in a U.S. national cohort. *Annals of Epidemiology*, 18(2), 124–129. <https://doi.org/10.1016/j.annepidem.2007.10.015>
- Gomes Neto, M., de Lacerda, F. F. R., Lopes, A. A., Martinez, B. P., & Saquetto, M. B. (2018). Intradialytic exercise training modalities on physical functioning and health-related quality of life in patients undergoing maintenance hemodialysis: systematic review and meta-analysis. *Clinical Rehabilitation*, 32(9), 1189–1202. <https://doi.org/10.1177/0269215518760380>
- Govindaraju, D. R., Adrienne Cupples, L., Kannel, W. B., O'Donnell, C. J., Atwood, L. D., D'Agostino, R. B. S., Fox, C. S., Larson, M., Levy, D., Murabito, J., Vasan, R. S., Lee Splansky, G., Wolf, P. A., & Benjamin, E. J. (2008). Genetics of the Framingham Heart Study

- population. *Advances in Genetics*, 62, 33–65. [https://doi.org/10.1016/S0065-2660\(08\)00602-0](https://doi.org/10.1016/S0065-2660(08)00602-0)
- Hagemann, P. de M. S., Martin, L. C., & Neme, C. M. B. (2019). The effect of music therapy on hemodialysis patients' quality of life and depression symptoms. *Jornal Brasileiro de Nefrologia*, 41(1), 74–82. <https://doi.org/10.1590/2175-8239-jbn-2018-0023>
- Huang, M., Lv, A., Wang, J., Zhang, B., Xu, N., Zhai, Z., Gao, J., Wang, Y., Li, T., & Ni, C. (2020). The effect of intradialytic combined exercise on hemodialysis efficiency in end-stage renal disease patients: a randomized-controlled trial. *International Urology and Nephrology*, 52(5), 969–976. <https://doi.org/10.1007/s11255-020-02459-1>
- Khatib, S. T., Hemadneh, M. K., Hasan, S. A., Khazneh, E., & Zyoud, S. H. (2018). Quality of life in hemodialysis diabetic patients: a multicenter cross-sectional study from Palestine. *BMC Nephrology*, 19(1), 49. <https://doi.org/10.1186/s12882-018-0849-x>
- Kim, S., Park, H.-J., & Yang, D.-H. (2022). An intradialytic aerobic exercise program ameliorates frailty and improves dialysis adequacy and quality of life among hemodialysis patients: a randomized controlled trial. *Kidney Research and Clinical Practice*, 41(4), 462–472. <https://doi.org/10.23876/j.krcp.21.284>
- Kirkman, D. L., Scott, M., Kidd, J., & Macdonald, J. H. (2019). The effects of intradialytic exercise on hemodialysis adequacy: A systematic review. *Seminars in Dialysis*, 32(4), 368–378. <https://doi.org/10.1111/sdi.12785>
- Koenig, H. G., Hays, J. C., Larson, D. B., George, L. K., Cohen, H. J., McCullough, M. E., Meador, K. G., & Blazer, D. G. (1999). Does religious attendance prolong survival? A six-year follow-up study of 3,968 older adults. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 54(7), M370-6. <https://doi.org/10.1093/gerona/54.7.m370>
- Krause, N. (1997). Religion, aging, and health: current status and future prospects. In *The journals of gerontology. Series B, Psychological sciences and social sciences* (Vol. 52, Issue 6, pp. S291-3). <https://doi.org/10.1093/geronb/52b.6.s291>
- Lagadec, N., Steinecker, M., Kapassi, A., Magnier, A. M., Chastang, J., Robert, S., Gaouaou, N., & Ibanez, G. (2018). Factors influencing the quality of life of pregnant women: a systematic review. *BMC Pregnancy and Childbirth*, 18(1), 455. <https://doi.org/10.1186/s12884-018-2087-4>
- Levin, J., Chatters, L. M., & Taylor, R. J. (2011). Theory in religion, aging, and health: an overview. *Journal of Religion and Health*, 50(2), 389–406. <https://doi.org/10.1007/s10943-009-9319-x>
- Liao, B., Zhao, L., Peng, Y., Chen, J., Chen, W., & Wang, X. (2020). Effect of comprehensive nursing intervention on negative emotion, quality of life and renal function of hemodialysis patients. *International Journal of Clinical and Experimental Medicine*, 13(2), 949-957. <https://www.cochranelibrary.com/central/doi/10.1002/central/CN-02099406/full>
- Ling, C., Evans, D., Zhang, Y., Luo, J., Hu, Y., Ouyang, Y., Tang, J., & Kuang, Z. (2020). The effects of cognitive behavioural therapy on depression and quality of life in patients with maintenance haemodialysis: a systematic review. *BMC Psychiatry*, 20(1), 369. <https://doi.org/10.1186/s12888-020-02754-2>
- Martins do Valle, F., Valle Pinheiro, B., Almeida Barros, A. A., Ferreira Mendonça, W., de Oliveira, A. C., de Oliveira Werneck, G., de Paula, R. B., & Moura Reboredo, M. (2020). Effects of intradialytic resistance training on physical activity in daily life, muscle strength, physical capacity and quality of life in hemodialysis patients: a randomized clinical trial. *Disability and Rehabilitation*, 42(25), 3638–3644. <https://doi.org/10.1080/09638288.2019.1606857>
- Matud, M. P., López-Curbelo, M., & Fortes, D. (2019). Gender and Psychological Well-Being. *International Journal of Environmental Research and Public Health*, 16(19). <https://doi.org/10.3390/ijerph16193531>
- Mohamed, S., Kanona, A., & El-Gahsh, N. (2020). Effect of intradialytic range of motion exercises on dialysis efficacy and blood pressure among patients undergoing hemodialysis. *Menoufia Nursing Journal*, 5(2), 39–54. <https://doi.org/10.21608/menj.2020.151588>

- Mousa, I., Ataba, R., Al-ali, K., Alkaiyat, A., & Zyoud, S. H. (2018). Dialysis-related factors affecting self-efficacy and quality of life in patients on haemodialysis: a cross-sectional study from Palestine. *Renal Replacement Therapy*, 4(1), 21. <https://doi.org/10.1186/s41100-018-0162-y>
- Ng, C. Z., Tang, S. C., Chan, M., Tran, B. X., Ho, C. S., Tam, W. W., & Ho, R. C. (2019). A systematic review and meta-analysis of randomized controlled trials of cognitive behavioral therapy for hemodialysis patients with depression. *Journal of Psychosomatic Research*, 126, 109834. <https://doi.org/10.1016/j.jpsychores.2019.109834>
- Park, J. Y., Jung, J., Kim, Y. C., Lee, H., Kim, E., Kim, Y. S., Kim, H., & Lee, J. P. (2021). Effects of residential greenness on clinical outcomes of patients with chronic kidney disease: a large-scale observation study. *Kidney Research and Clinical Practice*, 40(2), 272–281. <https://doi.org/10.23876/j.krcp.20.224>
- Pretto, C. R., Winkelmann, E. R., Hildebrandt, L. M., Barbosa, D. A., Colet, C. de F., & Stumm, E. M. F. (2020). Quality of life of chronic kidney patients on hemodialysis and related factors. *Revista latino-americana de enfermagem*, 28, e3327. <https://doi.org/10.1590/1518-8345.3641.3327>
- Ravera, A., Santema, B. T., Sama, I. E., Meyer, S., Lombardi, C. M., Carubelli, V., Ferreira, J. P., Lang, C. C., Dickstein, K., Anker, S. D., Samani, N. J., Zannad, F., van Veldhuisen, D. J., Teerlink, J. R., Metra, M., & Voors, A. A. (2021). Quality of life in men and women with heart failure: association with outcome, and comparison between the Kansas City Cardiomyopathy Questionnaire and the EuroQol 5 dimensions questionnaire. *European Journal of Heart Failure*, 23(4), 567–577. <https://doi.org/10.1002/ejhf.2154>
- Rehman, I. U., Lai, P. S., Kun, L. S., Lee, L. H., Chan, K. G., & Khan, T. M. (2020). Chronic Kidney Disease-Associated Pruritus and Quality of Life in Malaysian Patients Undergoing Hemodialysis. *Therapeutic Apheresis and Dialysis: Official Peer-Reviewed Journal of the International Society for Apheresis, the Japanese Society for Apheresis, the Japanese Society for Dialysis Therapy*, 24(1), 17–25. <https://doi.org/10.1111/1744-9987.12862>
- Rhee, S. Y., Song, J. K., Hong, S. C., Choi, J. W., Jeon, H. J., Shin, D. H., Ji, E. H., Choi, E.-H., Lee, J., Kim, A., Choi, S. W., & Oh, J. (2019). Intradialytic exercise improves physical function and reduces intradialytic hypotension and depression in hemodialysis patients. *The Korean Journal of Internal Medicine*, 34(3), 588–598. <https://doi.org/10.3904/kjim.2017.020>
- Rochmawati, E., Utomo, E. K., & Makiyah, S. N. N. (2022). Improving dialysis adequacy and quality of life in patients undergoing hemodialysis with twice a week range of motion exercise. *Therapeutic Apheresis and Dialysis: Official Peer-Reviewed Journal of the International Society for Apheresis, the Japanese Society for Apheresis, the Japanese Society for Dialysis Therapy*, 26(1), 140–146. <https://doi.org/10.1111/1744-9987.13701>
- Salhab, N., Karavetian, M., Kooman, J., Fiaccadori, E., & El Khoury, C. F. (2019). Effects of intradialytic aerobic exercise on hemodialysis patients: a systematic review and meta-analysis. *Journal of Nephrology*, 32(4), 549–566. <https://doi.org/10.1007/s40620-018-00565-z>
- Shdaifat, E. A. (2022). Quality of Life, Depression, and Anxiety in Patients Undergoing Renal Replacement Therapies in Saudi Arabia. *The Scientific World Journal*, 2022, 7756586. <https://doi.org/10.1155/2022/7756586>
- Shirazian, S., Smaldone, A. M., Jacobson, A. M., Fazzari, M. J., & Weinger, K. (2023). Improving quality of life and self-care for patients on hemodialysis using cognitive behavioral strategies: A randomized controlled pilot trial. *PloS One*, 18(5), e0285156. <https://doi.org/10.1371/journal.pone.0285156>
- Sohn, B. K., Oh, Y. K., Choi, J.-S., Song, J., Lim, A., Lee, J. P., An, J. N., Choi, H.-J., Hwang, J. Y., Jung, H.-Y., Lee, J.-Y., & Lim, C. S. (2018). Effectiveness of group cognitive behavioral therapy with mindfulness in end-stage renal disease hemodialysis patients. *Kidney Research and Clinical Practice*, 37(1), 77–84. <https://doi.org/10.23876/j.krcp.2018.37.1.77>

- Solati, K., Mardani, S., Ahmadi, A., & Danaei, S. (2019). Effect of mindfulness-based cognitive therapy on quality of life and self-efficacy in dialysis patients. *Journal of Renal Injury Prevention*, 8(1), 28–33. <https://doi.org/10.15171/jrip.2019.06>
- Suhardjono, S., Umami, V., Tedjasukmana, D., & Setiati, S. (2019). The effect of intradialytic exercise twice a week on the physical capacity, inflammation, and nutritional status of dialysis patients: A randomized controlled trial. *Hemodialysis International. International Symposium on Home Hemodialysis*, 23(4), 486–493. <https://doi.org/10.1111/hdi.12764>
- Taylor, R. J., & Chatters, L. M. (1988). Church Members as a Source of Informal Social Support. *Review of Religious Research*, 30(2), 193–203. <https://doi.org/10.2307/3511355>
- Thenmozhi, P. (2018). Quality of life of patients undergoing hemodialysis. *Asian Journal of Pharmaceutical and Clinical Research*, 11(4), 219. <https://doi.org/10.22159/ajpcr.2018.v11i4.24007>
- Turin, T. C., Tonelli, M., Manns, B. J., Ravani, P., Ahmed, S. B., & Hemmelgarn, B. R. (2012). Chronic kidney disease and life expectancy. *Nephrology, Dialysis, Transplantation: Official Publication of the European Dialysis and Transplant Association - European Renal Association*, 27(8), 3182–3186. <https://doi.org/10.1093/ndt/gfs052>
- Underwood, L. G., & Teresi, J. A. (2002). The daily spiritual experience scale: development, theoretical description, reliability, exploratory factor analysis, and preliminary construct validity using health-related data. *Annals of Behavioral Medicine: A Publication of the Society of Behavioral Medicine*, 24(1), 22–33. https://doi.org/10.1207/S15324796ABM2401_04
- Warsame, F., Ying, H., Haugen, C. E., Thomas, A. G., Crews, D. C., Shafi, T., Jaar, B., Chu, N. M., Segev, D. L., & McAdams-DeMarco, M. A. (2018). Intradialytic Activities and Health-Related Quality of Life Among Hemodialysis Patients. *American Journal of Nephrology*, 48(3), 181–189. <https://doi.org/10.1159/000492623>
- Zhang, J., Thio, C. H. L., Gansevoort, R. T., & Snieder, H. (2021). Familial Aggregation of CKD and Heritability of Kidney Biomarkers in the General Population: The Lifelines Cohort Study. *American Journal of Kidney Diseases: The Official Journal of the National Kidney Foundation*, 77(6), 869–878. <https://doi.org/10.1053/j.ajkd.2020.11.012>
- Zhianfar, L., Nadrian, H., Asghari Jafarabadi, M., Espahbodi, F., & Shaghaghi, A. (2020). Effectiveness of a Multifaceted Educational Intervention to Enhance Therapeutic Regimen Adherence and Quality of Life Amongst Iranian Hemodialysis Patients: A Randomized Controlled Trial (MEITRA Study). *Journal of Multidisciplinary Healthcare*, 13, 361–372. <https://doi.org/10.2147/JMDH.S247128>