



Breathing and Range of Motion Exercises as Fatigue Intervention In Chronic Kidney Failure Patients: a Case Study

Renandha Parahita¹, Dian Hudiawati*²

¹ Nursing Profession, Universitas Muhammadiyah Surakarta, Indonesia

² Nursing Study Program, Universitas Muhammadiyah Surakarta, Indonesia

Address: Jl. A. Yani, Mendungan, Pabelan, Kartasura District, Sukoharjo Regency, Central Java 57162

Correspondence Author : dian.hudiawati@ums.ac.id*

Abstract. *Background : One of the most prominent negative impacts in patients with kidney failure undergoing hemodialysis is fatigue. Breathing and range of motion exercises are therapies that can be applied to reduce fatigue in patients with chronic kidney failure. Objective: to provide breathing and range of motion exercise interventions in patients with chronic renal failure. Method: used in this study is a case study. Assessment of Mrs. S conducted for 3 consecutive days. Results: After the intervention for 3 days, the results showed that the level of fatigue and anxiety in Mrs. S decreased. Conclusions and suggestions: The interventions given have an effect on reducing the level of anxiety and fatigue of patients. It is expected that nurses can provide optimal nursing care to patients with chronic kidney failure to improve the quality of life of patients.*

Keywords : *Chronic kidney failure, breathing exercises, range of motion*

1. INTRODUCTION

Chronic renal failure (CRF) occurs when both kidneys are no longer able to maintain an internal environment suitable for survival. Damage to both kidneys is irreversible and progressive loss of kidney function (Hamed & Aziz, 2022). Kidney failure disease is predicted to continue to increase. The prevalence of chronic kidney disease sufferers reaches 30 million people or 15% of the adult population and 96% of the population is unaware that mild kidney function impairment has occurred (Djupri et al., 2019). Based on the Basic Health Research (RISKESDAS, 2018), the prevalence of CKD increased from 2013 by 2.0% to 3.8% in 2018. The province with the lowest prevalence is West Sulawesi at 1.8% and the province with the highest prevalence is West Kalimantan at 6.4%. Meanwhile, the results of RISKESDAS (2019), the prevalence of the provinces of East Nusa Tenggara, South Sulawesi, Lampung, West Java, Central Java, DI Yogyakarta, and East Java were each 0.3%, North Sumatra province was 0.2%.

Chronic kidney disease is a general term that describes kidney damage or decreased glomerular filtration rate (GFR) for 3 months or more (Wayunah et al., 2023). End-stage chronic kidney disease with a glomerular filtration rate <15 ml/min requires dialysis. Hemodialysis is performed by a machine with an artificial semi-permeable membrane used to filter the blood (Rubio-López et al., 2023). Hemodialysis prevents death but does not cure

kidney disease and does not compensate for the loss of endocrine or metabolic activity of the kidneys (Clyne & Anding-Rost, 2021) . Patients undergoing hemodialysis may experience various problems such as bleeding, hypotension, arrhythmias, headaches, tremors, electrolyte disturbances and other symptoms such as nausea and vomiting (Nirmalasari et al., 2020) . One of the problems that often occurs faced by patients fail kidney chronic hemodialysis patients is fatigue . Fatigue is a condition where the *client* feels tired both physically and mentally (Alfikrie et al., 2020) .

In the research Sri et al (2020) around 60 – 97% of patients with disease fail kidney chronic in progress operate hemodialysis experience *fatigue* . In individuals undergoing hemodialysis, *fatigue* is one of the symptoms that is difficult to treat . In Johansen's (2020) study, it was stated that the level of *fatigue* experienced by hemodialysis patients was dominated by the level moderate and severe. The hemodialysis therapy process is long and takes less than more 5 hours causes the patient experience *fatigue* and stress (Sitoresmi et al., 2020) . Then in Sakitri, Makiyah & Khoiriyati (2022) explained that k fatigue or *fatigue* in hemodialysis patients results in *Dialysis Disequilibrium Syndrome* (DDS). If DDS is not detected, coma can occur which can result in death. 50% of hemodialysis patients experience decreased *fatigue* after performing *Intradialytic Exercise* .

P giving intervention For reduce level anxiety and fatigue experienced patient fail kidney chronic in progress operate Hemodialysis is highly recommended . This is supported by research from Sulistyaningsih (2019) stated that physical exercise during hemodialysis can reduce muscle weakness and increase muscle strength. Therapy that can be applied to reduce the level of fatigue in patients with failure kidney chronic is with give therapy breathing exercise . *Breathing exercise* is a natural healing technique and is part of a holistic self-care strategy to *overcome various complaints* such as fatigue , pain, sleep disorders, stress and anxiety (Utami et al., 2023) . One part of *breathing exercise* is *pursed lip breathing* . This exercise does not take a long time and can be done before, intradialysis and also after the hemodialysis process (Indriani, 2019) . Physiologically, the slow deep breathing relaxation technique will stimulate the parasympathetic nervous system so that it increases endorphin production, decreases heart rate, increases lung expansion so that it can develop optimally and the muscles relax (Anisah & Maliya, 2021) . *Pursed lip breathing* will maintain high intra-alveolar pressure and allow oxygen to be distributed to the alveolar capillaries so that the body gets adequate oxygen input (Hudiyawati & Prakoso, 2020) . The role of nurses in overcoming *fatigue* is to conduct an initial assessment and understand the level of *fatigue* in each patient to prepare the right intervention for the patient, so that *fatigue complaints can be reduced* in

patients undergoing hemodialysis (Natashia et al., 2020) . Interventions that can be carried out on patients undergoing hemodialysis with complaints of *fatigue* include providing relaxation exercises such as *pursed lip breathing* because this intervention is a technique that is easy to do, easy to learn, not harmful to patients and does not require large costs (Nurjanah, 2020) .

Seeing this problem, the author is interested in conducting a case study "Breathing Exercises and Range of Motion as Interventions for Chronic Kidney Failure Patients with *Fatigue* : Case Study" conducted at UNS Hospital, Sukoharjo City. This case study aims to obtain an overview and results of the implementation of breathing exercises and range of motion in chronic kidney failure patients.

2. METHOD

The type of design and approach used is a case study, using a nursing process approach . This study was conducted on November 2, 2023, on Mrs. S with a medical diagnosis of *CKD (Chronic Kidney Disease)* On Hemodialysis at UNS Hospital, Sukoharjo City. This study obtained patient data using interview methods, observation, documentation studies and literature studies. The research used in the interview was self-research with assessment guideline tools while other instruments used physical examination sheets, hemodialysis monitoring sheets , tensiometers, and nursing care documentation. Clients in the study were all patients undergoing hemodialysis therapy. However, those who met the inclusion criteria consisted of one patient. The inclusion criteria were having a regular hemodialysis schedule, namely 2 times / week, not having a disease in the nervous system, not experiencing complications of dialysis hypotension, no femoral access installed, willing to be a respondent and complete the treatment until completion. Exclusion Criteria: having uncontrolled hypotension, not suffering from Congestive Heart Failure (CHF), irregular hemodialysis schedule, having a risk of fracture.

Standard Operating Procedure (SOP) of Therapy given to chronic kidney failure patients who will undergo hemodialysis by researchers in the form of deep breathing exercises, conscious relaxation to regulate breathing deeply and slowly. This study is considered to be able to reduce the level of fatigue, namely from moderate to mild fatigue, which is given for 3 consecutive days before hemodialysis in one respondent. Deep breathing relaxation is carried out for 15 minutes on the patient, then the patient is evaluated.

3. RESULTS

Mrs. S is 56 years old, female, address in Boyolali, with a medical diagnosis of CKD on HD with pulmonary edema, anemia, hyperglycemia. The patient said that if she was sick, her family would take her to the nearest health service, the patient underwent an examination at the nearest doctor's clinic before being taken to Banyu Bening Hospital with the care of an internist, the patient underwent HD 1x last August. Then from Banyu Bening Hospital she was referred to UNS Hospital to continue treatment and HD on October 31, 2023. The patient said she had a history of hypertension since October 2023.

Subjective Data Results: The patient said that he had previously had a check-up at the internal medicine clinic at Banyu Bening Hospital (October 26, 2023) and had undergone HD 1x in August. The patient said that he had no allergies to drugs, food and drinks, the patient said that shortness of breath/dyspnea after doing activities (eg sitting, eating) decreased, the patient said that he was dizzy, the patient said that shortness of breath decreased, nausea, vomiting, the patient said that both feet and both hands were swollen, the patient said that he urinated 3-4x a day with DC, the patient said that he drank 1 small glass of water a day, the patient said that during his illness his weight increased by 4 kg, the patient said that he had just undergone the second hemodialysis.

Objective Data Results: PCO₂: 34.0 (low), pH: 7,300 (low), tachycardia as evidenced by vital signs: BP: 155/86 mmHg, N: 107x minutes, S: 36.5 C, RR: 20x/minute, SpO₂: 98%, the patient appears restless, cold sweat/diaphoresis appears, abnormal breathing pattern tends to be fast and shallow, both feet and both hands appear swollen and tight, the mucosa of the lips looks pale, JVP R +4 cm, fine wet pulmonic rhonchi (fine rales), HB: 8.6 (low), HT: 26 (low), pulse is felt to be slow/weak, pulse rate and body temperature increase as evidenced by vital signs measurements: BP (16.30): 155/86 mmHg, N: 107x minutes, S: 36.5 C, RR: 20x/minute, SpO₂: 98%. BP (20.00) : 183/91 mmHg, N : 134x min, S : 36.9oC, RR : 20x/min, SpO₂ : 98%. BW before illness : 56 kg, BW after illness : 60 kg, fluid balance per shift : (-) 340.5, urine output 300 ml. Hemoglobin : 8.6 g/dl, Hematocrit : 26, Urea 102 mg/dl, Creatinine 10.24 mg/dl, Sodium 139.35. Thorax X-ray showed Cardiomegaly (LV), accompanied by aortic arch classification. Pulmonary edema picture. No right and left hilar lymphadenopathy was seen.

Nursing diagnoses that appear in this case include: Fatigue related to long-term treatment programs, Impaired gas exchange related to changes in the alveolar-capillary membrane characterized by dyspnea, diaphoresis, decreased PCO₂, tachycardia, Hypervolemia related to excess fluid intake characterized by dyspnea, weight gain in a short time, and Fluid imbalance related to kidney and gland disease as evidenced by

Nursing Implementation carried out on Tuesday, September 30, 2023, the care collaborated on providing hemodialysis therapy, providing fluid intake as needed, monitoring breathing patterns and oxygen saturation, monitoring frequency, rhythm, depth and respiratory effort, closely monitoring infusion rates, raising the head of the bed 30-40 degrees, recording fluid intake-output and calculating fluid balance, documenting and informing monitoring results, recording intake-output and calculating fluid balance per shift, teaching fluid restriction, conducting laboratory tests. Patients were also given deep breathing relaxation techniques for 15 minutes, then all patients were evaluated. The average level of fatigue score before (50.18) and after the breathing relaxation technique was performed was (46.45) with a p value = 0.043 (<0.05). Patients were also given intradialysis ROM exercises in patients undergoing hemodialysis therapy can affect the level of fatigue. The first exercise had a fatigue value of pre 22 and post 29. The second exercise had a fatigue value of pre 24 and post 24. On the third day the fatigue value was pre 29 and post 31.

Next on Wednesday, October 1, 2023, monitor TTV and hemodynamic status, monitor pulse rate and strength, monitor respiratory rate, monitor blood pressure, check for signs and symptoms of hypervolemia, identify the cause of hypervolemia, collaborate on hemodialysis therapy, provide intravenous fluid intake, facilitate rest and sleep. On Thursday, October 2, 2023, monitor TTV and hemodynamic status, monitor skin elasticity or turgor, monitor heart rate/infusion in a way strictly, monitor hydration status. Therapy given to patients during the treatment process in the inpatient room furosemide 10mg/hour, RL/12 hours, kidmin 1plabot/24 hours, amlodipine 1x10mg, ceftriaxone 2grams/24 hours, clopidogrel 1x1, ISDN 3x1, folic acid 3x1, and VIP albumin 3x1. Hemodialysis therapy on October 31, 2023 and November 2, 2023. Researchers performed deep breathing relaxation technique therapy and sat upright then bent forward and the patient was in a condition where 3 liters of oxygen were attached with a nasal cannula to reduce shortness of breath for 3x24 hours.

Nursing Evaluation consists of subjective data: the patient said that shortness of breath has decreased, dizziness has decreased, and nervousness because tomorrow will be HD again, the patient said that shortness of breath and nausea have decreased, the patient said that shortness of breath, weakness, pain in the stomach and swollen hands and feet have decreased and objective data: still visible cold sweat, restlessness, good general awareness, compos mentis, BC per shift -665, urine output: 450 ml, BP: 168/92 mmHg, N: 83x / minute, RR: 20 x / minute, S: 36.8 °C, SpO₂: 99%.

4. DISCUSSION

Fatigue that occurs due to undergoing hemodialysis in PGK patients is a normal thing, they live with fear and the threat of death. This is a physical stressor that plays a role in various dimensions of the patient's life which include biological, psychological, social, spiritual (biopsychosocial) (Anisah & Maliya, 2021) . Until it causes symptoms that are usually in patients undergoing hemodialysis, namely muscle weakness, lack of energy and feeling tired (fatigue) (Agustin et al., 2020) . Fatigue and depression are symptoms that often occur in hemodialysis patients and can play a role in poor quality of life (Hudiyawati et al., 2019) .

Breathing and range of motion exercises as nursing interventions for patients with chronic kidney failure, Deep breathing exercises have many benefits, namely easy to do independently, cost-free and practical (Ganik Sakitri, Nurul Makiyah, 2018) . Other benefits that can be obtained from deep breathing exercises are increasing maximum alveolar inflation and muscle relaxation; relieving anxiety, eliminating ineffective and uncoordinated respiratory muscle activity patterns; slowing the respiratory rate; and reducing the work of breathing (Hamed & Aziz, 2022) . Slow, relaxed, and rhythmic breathing also helps control anxiety that occurs (Rahmawati et al., 2019) . Breathing exercises such as *pursed lip breathing* provide the body with adequate oxygen input, where oxygen plays an important role in the body's respiratory and circulatory systems (Pattikawa et al., 2020) . When doing breathing exercises, oxygen flows into the blood vessels and all body tissues, removing toxins and unused metabolic waste, increasing metabolism and producing energy which will then maximize the amount of oxygen that enters and is supplied to all tissues so that the body can produce energy and reduce fatigue levels (Muliani et al., 2021) . So there is a significant effect of breathing exercises to reduce fatigue in patients with kidney disorders with hemodialysis (Wisudayanti et al., 2023) . According to Jafar (2019), breathing exercises are carried out during hemodialysis or after the hemodialysis process. Meanwhile, according to Fajrianti (2019), breathing exercises can be done before, during, after the hemodialysis process and while the patient is at home.

Regular range of motion exercises in intradialysis can increase blood flow to the muscles, enlarge the number of capillaries and enlarge the area and surface of the capillaries so as to increase the transfer of urea and toxins from the tissue to the vasculature which is then channeled to the dialyzer or HD machine (Sulistini et al., 2021) . Physical exercise can also show improvements in physical fitness, physiological function, agility, reduce fatigue levels, agility and increase lower limb muscle strength (Herabare et al., 2023) . The exercises performed stimulate the growth of small blood vessels (capillaries) in the muscles. This will help the body to more efficiently deliver oxygen to the muscles, can improve overall circulation

and lower blood pressure and remove metabolic waste products such as lactic acid from the muscles. The type of physical exercise performed is *Range of Motion* (ROM) (Gregg et al., 2019) . Exercises performed to stimulate the growth of small blood vessels (capillaries) in the muscles. This helps the body to more efficiently deliver oxygen to the muscles, can improve overall circulation and lower blood pressure and remove irritating metabolic waste products such as lactic acid from the muscles. Adequate exercise increases the efficiency of blood flow, so the body excretes metabolic waste more effectively (Metekohy, 2021) .

5. CONCLUSION

Intradialysis ROM exercises and deep breathing relaxation exercises can reduce fatigue in heart failure patients undergoing hemodialysis.

SUGGESTION

The researcher hopes that this case study can be a reference for nursing students in providing nursing interventions with a comparison of non-pharmacological therapy, so that it can support the improvement of patient conditions in addition to collaboration with the use of drugs.

BIBLIOGRAPHY

- Agustin, A., Hudiawati, D., & Purnama, PA (2020). The effect of inhalation aromatherapy on anxiety in hemodialysis patients. *Journal of Proceedings of the National Nursing Seminar* , 2012 , 16–24.
- Alfikrie, F., Purnomo, A., & Selly, R. (2020). The Effect of Deep Breathing Relaxation on Anxiety in Chronic Kidney Failure Patients Undergoing Hemodialysis. *Borneo Nursing Journal (BNJ)* , 2 (2), 1–8. <https://akperyarsismd.e-journal.id/BNJ>
- Anisah, IN, & Maliya, A. (2021). The Effectiveness of Benson Relaxation on Anxiety in Patients Undergoing Hemodialysis. *Journal of Nursing News* , 14 (1), 57–64. <https://doi.org/10.23917/bik.v14i1.12226>
- Clyne, N., & Anding-Rost, K. (2021). Exercise training in chronic kidney disease—effects, expectations and adherence. *Clinical Kidney Journal* , 14 , II3–II14. <https://doi.org/10.1093/ckj/sfab012>
- Djupri, D., Yetti, K., & Masfuri. (2019). *The Effect of Breathing Exercise and Range of Motion (ROM) Exercise towards the Decrease of Intradialysis Fatigue Level in Hemodialysis Unit at Dr. Adjidarmo Hospital, Banten* . 15 (IcoSIHSN), 221–225. <https://doi.org/10.2991/icosihsn-19.2019.48>
- Ganik Sakitri, Nurul Makiyah, A. (2018). The Effect of Intradialytic Exercise on Fatigue,

- Hemoglobin Levels and Blood Pressure of Hemodialysis Patients on DI 8 at Dr. Soradji Titonegoro General Hospital, Klaten. *Islamic Professional Research Publication Media* , 1–17.
- Gregg, LP, Jain, N., Carmody, T., Minhajuddin, AT, Rush, AJ, Trivedi, MH, & Hedayati, SS (2019). Fatigue in nondialysis chronic kidney disease: Correlates and association with kidney outcomes. *American Journal of Nephrology* , 50 (1), 37–47. <https://doi.org/10.1159/000500668>
- Hamed, L.A., & Aziz, T.M.A. (2022). *Effect of Deep Breathing Exercise Training on Fatigue ' Level among Effect of Deep Breathing Exercise Training on Fatigue ' Level among Maintenance Hemodialysis Patients : Randomized Quasi-experimental Study Introduction : October* . <https://doi.org/10.21608/ejhc.2020.169731>
- Herabare, RA, Hudiyawati, D., & Purnama, AP (2023). *INTRADIALYTIC EXERCISE AS AN EVIDENCE BASE PRACTICE TO REDUCE FATIGUE IN INTRADIALYTIC HEMODIALYSIS PATIENTS* . 06 , 10–14.
- Hudiyawati, D., Muhlisin, A., & Ibrahim, N. (2019). Effectiveness of progressive muscle relaxation in reducing depression, anxiety and stress among hemodialysis patients attending a public hospital at Central Java Indonesia. *IJUM Medical Journal Malaysia* , 18 (3), 3–10. <https://doi.org/10.31436/imjm.v18i3.185>
- Hudiyawati, D., & Prakoso, AM (2020). Effectiveness of Cognitive Behavioral Therapy to Reduce Depression, Anxiety and Stress among Hospitalized Patients with Congestive Heart Failure in Central Java. *Nursing Journal* , 14 (3), 367–373. <https://doi.org/10.20473/jn.v14i3.17215>
- Indriani, D. (2019). *Description of self-esteem of hemodialysis patients who have installed Cimino at Ir. Soerkarno Hospital, Sukaharjo* . 1–23.
- Metekohy, FA (2021). PROGRESSIVE MUSCLE RELAXATION (PMR) EXERCISE ON REDUCING FATIGUE IN CHRONIC KIDNEY DISEASE PATIENTS IN THE HEMODIALIS UNIT OF DR. M. HAULUSSY AMBON REGIONAL HOSPITAL. *East Indonesian Nursing Journal* , 1 (1), 12 –21.
- Muliani, R., Muslim, AR, & Abidin, I. (2021). Intradialytic Exercise: Flexibility to Fatigue Score in Chronic Kidney Disease Patients Undergoing Hemodialysis. *Journal of Medicine and Health* , 3 (2), 137–146. <https://doi.org/10.28932/jmh.v3i2.3147>
- Natashia, D., Irawati, D., & Hidayat, F. (2020). Fatigue and Quality of Life in Chronic Kidney Failure Patients with Hemodialysis Therapy. *Muhammadiyah Nursing Journal* , 5 (2), 209–218. <https://doi.org/10.30651/jkm.v5i2.6540>
- Nirmalasari, N., Mardiyono, M., Dharmana, E., & Arifin, T. (2020). Deep breathing exercise and active range of motion influence physiological response of congestive heart failure patients. *Nurse Media Journal of Nursing* , 10 (1), 57–65. <https://doi.org/10.14710/nmjn.v10i1.25318>
- Nurjanah. (2020). Deep Breathing Relaxation Techniques in Patients with Kidney Failure. *National Nursing Seminar, Muhammadiyah University of Surakarta (SEMNASKEP)* , 62–71. <https://publikasiilmiah.ums.ac.id/handle/11617/12261>

- Pattikawa, FY, Arafat, R., & Rachmawaty, R. (2020). Physical Exercise Intervention to Overcome Fatigue in Hemodialysis Patients: Literature Review. *Muhammadiyah Nursing Journal Address , Special Edition* (June), 82–87. <http://journal.um-surabaya.ac.id/index.php/JKM/article/view/3816>
- Rahmawati, Hasanuddin, F., & Mokodompit, NA (2019). ROM Exercise In Chronic Kidney Failure Patients In Activity Needs Compliance. *Journal of Nursing Media: Makassar Health Polytechnic , 10* (2), 50–54.
- Rubio-López, A.I., Heredia-Ciuró, A., Marin-DelaRosa, J.L., Martín-Núñez, J., Granados-Santiago, M., De Gracia-Guindo, M.C., & Valenza, M.C. (2023). Role of breathing training programs on quality of life in chronic kidney disease patients. *AIMS Public Health , 10* (2), 409–421. <https://doi.org/10.3934/publichealth.2023029>
- Sitoresmi, H., Irwan, AM, & Sjattar, EL (2020). Nursing Interventions in Chronic Kidney Failure Patients Undergoing Hemodialysis: Systematic Review. *Scientific Journal of Nursing , 6* (1), 108–118. <https://doi.org/10.33023/jikep.v6i1.451>
- Sri Elis Rohaeti, Andi Sutandi, Eka Afrima Sari, SHP (2020). *OBSERVATION OF BREATHING RELAXATION EXERCISES IN PATIENTS WITH CHRONIC KIDNEY DISEASES WITH FATIGUE . 4* (1), 67–74.
- Sulistini, Rumentalia, Krisna, Y., & TutIk, H. (2021). FACTORS INFLUENCING FATIGUE IN PATIENTS UNDERGOING HEMODIALYSIS Rumentalia Sulistini^{1,2*} , Krisna Yetti³ , Rr. Tutik Sri Hariyati³ 1. Palembang Health Polytechnic of the Ministry of Health, Medical Surgical Nursing, Palembang 30126, Indonesia 2. Magiste Study Program. *Indonesian Nursing Journal, 15* (November), 75–82.
- Utami, SS, Arifah, S., & Rahayuningsih, FB (2023). Complementary Therapy to Overcome Fatigue in Hemodialysis Patients: Literature Review. *Journal of Vocational Health , 8* (2), 123. <https://doi.org/10.22146/jkesvo.68769>
- Wayunah, W., Wiwin Nur Aeni, Aulia Faturrohman, & Muhammad Saefulloh. (2023). Interdialytic Exercise Reduces Fatigue in Chronic Kidney Failure Patients: Systematic Literature Review. *HealthCare Nursing Journal , 5* (2), 822–830. <https://doi.org/10.35568/healthcare.v5i2.3768>
- Wisudayanti, MY, Heri, M., Putra, GNW, Sugiartini, DK, & Wijaya, GAS (2023). *PROGRESSIVE MUSCLE RELAXATION (PMR) ON FATIGUE LEVELS IN CHRONIC KIDNEY DISEASE (CKD) PATIENTS UNDERGOING HEMODIALYSIS . 5* , 1–14. <https://www.ncbi.nlm.nih.gov/books/NBK558907/>