

THE APPLICATION OF INTRADIALYTIC STRETCHING EXERCISES TO REDUCE MUSCLE CRAMPS IN PATIENTS UNDERGOING HEMODIALYSIS

Wulan Hariyati ^{1*}, Syahruramdhani ¹, Tariyah ²

¹ Nursing Professional Education Program, Faculty of Health Sciences,
Universitas Muhammadiyah Yogyakarta

Jl. Brawijaya, Tamantirto, Kasihan, Bantul 55183, Yogyakarta, Indonesia

² RSUD Tidar Magelang

Jl. Tidar No. 30A, Magelang Selatan 56125, Magelang, Indonesia

Email: syahruramdhani@umy.ac.id

Abstract

Background: Chronic kidney disease (CKD) is a progressive condition that leads to impaired kidney function and various systemic complications, including muscle cramps during hemodialysis. Muscle cramps are a common intradialytic complication that can reduce patient comfort and quality of life. **Objective:** This study aims to examine changes in the level of muscle cramps in CKD patients undergoing hemodialysis before and after the implementation of intradialytic stretching exercise. **Methods:** This study employed a descriptive exploratory case study design involving two CKD patients undergoing hemodialysis. The intervention consisted of intradialytic stretching exercise administered for 20 minutes during the dialysis process. Data were collected through clinical observations focusing on pain intensity and characteristics of muscle cramps before and after the intervention, and were analyzed descriptively. **Results:** Both patients showed improvement in muscle cramp symptoms after the intervention. The first patient experienced a reduction in pain intensity from severe to moderate, while the second patient no longer experienced muscle cramps after the intervention. **Conclusion:** Intradialytic stretching exercise has the potential to be a simple and safe nursing intervention to reduce muscle cramps and improve patient comfort during hemodialysis.

Keywords: Chronic Kidney Disease, Hemodialysis, Muscle Cramps, Intradialytic Stretching Exercise

Introduction

Chronic Kidney Disease (CKD) is a condition characterized by abnormalities in kidney structure or function that persist for more than three months and have implications for health. The diagnosis is established based on a Glomerular Filtration Rate (GFR) of less than 60 mL/min/1.73 m² or the presence of markers of kidney damage, such as albuminuria ^[1]. In Indonesia, based on RISKESDAS 2018 data, the prevalence of chronic kidney disease diagnosed by doctors in the population aged ≥15 years was 0.38%, while in Central Java the prevalence reached 0.42% ^[2]. In advanced stages, CKD significantly reduces patients' quality of life through decreased physical capacity, increased psychological distress, and chronic fatigue. This condition is also associated with sleep disturbances and limitations in performing social roles ^[3]. CKD impairs the kidneys' ability to maintain electrolyte balance, including sodium, potassium, calcium, magnesium, and bicarbonate. This leads to electrolyte imbalances and metabolic acidosis, affecting multiple systems such as the neuromuscular and cardiovascular systems ^[3]. Electrolyte imbalances—particularly hypocalcemia, hypomagnesemia, and dyskalemia—can increase neuromuscular excitability and trigger involuntary muscle contractions. As a result, CKD patients are at higher risk of experiencing muscle cramps, especially during dialysis and in advanced kidney

dysfunction ^[4]. Muscle cramps are common among CKD patients undergoing hemodialysis, with prevalence ranging from 33% to 86%. A study by Naz et al. reported that 78% of hemodialysis patients experienced intradialytic muscle cramps during hemodialysis sessions ^[5]. These cramps often occur in the late phase of dialysis due to fluid shifts, ultrafiltration, hypovolemia, and low-sodium dialysate. Electrolyte disturbances further exacerbate these symptoms ^[6].

Muscle cramps not only cause acute pain but also reduce physical function, mobility, and daily activity. They may interfere with rehabilitation, increase anxiety, and reduce adherence to dialysis therapy, ultimately worsening patients' quality of life ^[7].

Intradialytic exercise is a rehabilitative intervention performed during dialysis sessions, including light aerobic activity, resistance training, and stretching. This approach has been shown to reduce muscle cramps and improve patients' overall physical condition ^{[8],[9]}. Physiologically, intradialytic exercise enhances blood circulation and muscle perfusion, reducing metabolite accumulation and muscle fatigue. It also supports toxin removal during dialysis and improves aerobic capacity, muscle strength, and physical function ^{[9],[10]}.

His study employed a descriptive exploratory nursing case study design. It aimed to identify the level of pain due to muscle cramps in CKD patients undergoing hemodialysis before and after intradialytic exercise.

Method

• Study Design

This study employed a descriptive case study design focusing on clinical observations of patients undergoing hemodialysis. The study aimed to describe changes in muscle cramps and pain levels after the application of intradialytic stretching exercise as part of nursing care.

• Participants

The inclusion criteria in this study were adult patients with Chronic Kidney Disease (CKD) undergoing hemodialysis who experienced muscle cramps during dialysis sessions and were willing to participate. The exclusion criteria included patients with unstable clinical conditions, those experiencing severe complications during hemodialysis, and patients who were unable to perform or follow the stretching exercise instructions ^[11].

• Intervention protocol (Special for experimental study)

The intervention in this study was intradialytic stretching exercise performed during hemodialysis sessions. The exercise was conducted for 20 minutes and focused on lower extremity muscles, including the gastrocnemius, hamstring, and calf muscles, which are commonly affected by muscle cramps in hemodialysis patients. The movements were carried out gradually and repeated on both limbs according to patient tolerance. The purpose of this intervention was to improve muscle perfusion, reduce neuromuscular tension, and decrease the frequency and severity of muscle cramps during hemodialysis ^[11].

• Outcome Measures

Muscle cramp symptoms were assessed using two main instruments. Pain was measured using the Numeric Rating Scale (NRS), with a score range of 0–10, where 0 indicates no pain and 10 indicates the worst possible pain. Muscle cramps were evaluated using an observation checklist adapted from previous studies ^[12], including frequency of cramps (number of episodes during hemodialysis) and duration of each cramp episode (in minutes). The measurements were recorded before and after the intervention to identify changes in pain scores and cramp characteristics.

- **Considerations**

This study involved two adult patients with Chronic Kidney Disease (CKD) undergoing hemodialysis who experienced muscle cramps during dialysis sessions. Participants were selected based on these clinical conditions and their willingness to participate, and informed consent was obtained prior to data collection. This study was conducted as an observational study with minimal risk as part of nursing care practice. The intervention did not replace or modify standard medical treatment. Patient confidentiality was maintained by anonymizing all personal data. During the procedure, patients were monitored to ensure safety and comfort, and the intervention was discontinued if any signs of clinical instability occurred. Ethical principles, including autonomy, beneficence, non-maleficence, and justice, were upheld throughout the study.

Results

In the first patient (Mrs. S), the initial assessment showed that during episodes of muscle cramps in the hemodialysis process, her blood pressure was recorded at 168/97 mmHg. The patient reported pain in the thigh area radiating to the lower calf, with a pain intensity score of 8, categorized as severe muscle cramps. After the intervention in the form of intradialytic stretching exercise, the evaluation results showed a decrease in blood pressure to 152/89 mmHg. Clinically, the patient still reported the presence of muscle cramps; however, the affected area was reduced to the lower calf, and the pain intensity decreased to a score of 5, which falls into the category of moderate muscle cramps. This change indicates an improvement in the patient's subjective condition as well as a reduction in the severity of muscle cramps following the intervention.

In the second patient (Mr. N), the initial assessment indicated that during muscle cramps, the blood pressure was recorded at 173/94 mmHg, with pain localized in the lower calf area and a pain intensity score of 5, categorized as moderate muscle cramps. After receiving intradialytic stretching exercise, the evaluation showed a blood pressure of 169/96 mmHg. Additionally, the patient reported that muscle cramps were no longer experienced after the intervention. These findings indicate clinical improvement in the form of complete resolution of muscle cramp symptoms, although changes in blood pressure did not show clinically significant improvement.

Overall, observations in both patients demonstrated a tendency toward improvement in muscle cramp symptoms after the administration of intradialytic stretching exercise, either in the form of reduced pain intensity or complete resolution of cramps. However, changes in physiological parameters such as blood pressure varied between patients and should be interpreted cautiously, considering that other factors such as underlying clinical conditions and ongoing medical treatments may also influence the outcomes.

Patient	Blood Pressure (Pre)	Blood Pressure (Post)	Pain Location (Pre)	Pain Location (Post)	Pain Score (Pre)	Pain Score (Post)	Cramp Severity (Pre)	Cramp Severity (Post)
Mrs. S	168/97	152/89	Thigh to lower calf	Lower calf	8	5	Severe	Moderate
Mr. N	173/94	169/96	Lower calf	None	5	0	Moderate	None

The observational results from both patients in this study demonstrated an improvement in muscle cramp symptoms after the administration of intradialytic exercise, reflected in reduced pain intensity and decreased frequency of cramps. These findings are consistent with previous studies indicating that intradialytic stretching is an effective non-pharmacological intervention for reducing the

severity of muscle cramps in hemodialysis patients ^[12]. In addition, other quasi-experimental studies have reported significant changes in muscle cramp categories from moderate and severe to mild following regular stretching interventions ^[13]. Muscle cramps in CKD patients undergoing hemodialysis are multifactorial intradialytic complications associated with hypovolemia, electrolyte imbalances, and rapid ultrafiltration rates during the dialysis process. These conditions can cause severe pain and discomfort, and may even lead to early termination of hemodialysis sessions, thereby affecting overall treatment effectiveness ^[7]. Therefore, a comprehensive management approach, including non-pharmacological nursing interventions, is essential to reduce the symptom burden experienced by patients.

Physiologically, intradialytic stretching exercise works through several key mechanisms, including increased blood flow (perfusion) to muscle tissues, reduced local ischemia, and enhanced muscle elasticity and relaxation. Muscle stretching is known to induce local vasodilation, which improves oxygen and nutrient supply to tissues, thereby helping to reduce excessive muscle contractions and pain ^[14]. Furthermore, improved blood circulation accelerates the removal of metabolites such as lactic acid that accumulate during dialysis and contribute to muscle cramp occurrence ^[14]. The findings of this study are also in line with recent systematic reviews showing that intradialytic exercise, including stretching, can reduce the incidence of muscle cramps through neuromuscular adaptation and improved peripheral circulation ^[15]. Other studies have reported that intradialytic stretching interventions significantly reduce pain during the final hours of hemodialysis sessions, which is the period when muscle cramps most frequently occur ^[16].

In the case of Mrs. S, the reduction in pain intensity from a score of 8 to 5 indicates a positive clinical response, although not yet optimal. Meanwhile, Mr. M experienced complete resolution of cramp symptoms. This variation in response may be explained by differences in individual clinical conditions, including fluid status, physiological adaptation to dialysis, and the severity of underlying metabolic disturbances. This is supported by studies suggesting that the effectiveness of intradialytic exercise may vary depending on patient characteristics, duration of therapy, and individual physiological conditions ^[17]. Beyond its effects on muscle cramps, intradialytic exercise also provides additional benefits, such as improved physical function, reduced fatigue, and enhanced quality of life in hemodialysis patients. Recent studies indicate that exercise during hemodialysis can significantly improve muscle strength, balance, and physical activity capacity ^[18]. Other research has shown that intradialytic exercise can reduce fatigue levels by more than 80% in CKD patients undergoing hemodialysis ^[17]. Stretching interventions also have positive psychological effects, including reduced stress levels and increased comfort during hemodialysis. Recent studies report that patients undergoing intradialytic stretching experience significant reductions in stress and improvements in quality of life following the intervention ^[12]. This is particularly important, as hemodialysis patients often experience psychological burdens due to long-term treatment requirements.

However, in this study, changes in blood pressure did not show a consistent pattern between the two patients. This suggests that the primary effects of intradialytic stretching exercise are more pronounced in musculoskeletal aspects and patient comfort rather than in hemodynamic parameters. Recent studies also indicate that the main benefits of intradialytic exercise are observed in improved physical function and symptom reduction, while hemodynamic changes are not always significant ^[19].

Overall, the results of this study strengthen the evidence that intradialytic stretching exercise is an effective, safe, and easily applicable nursing intervention in clinical practice to reduce muscle cramps in hemodialysis patients. This intervention also has the potential to improve comfort, quality of life, and the continuity of hemodialysis therapy without interruption. However, considering the limitations of this descriptive study design and the small sample size, further research using experimental designs with larger samples is needed to more robustly confirm the effectiveness of this intervention.

Conclusion

The implementation of intradialytic stretching exercise in CKD patients undergoing hemodialysis in this study showed a tendency toward improvement in muscle cramp symptoms, both in terms of reduced pain intensity and decreased frequency of cramps. This intervention also has the potential to enhance patient comfort during the hemodialysis process. However, considering the limitations of the study design and the small number of participants, these findings are exploratory in nature and cannot be used to draw causal conclusions. Further research with more robust designs and larger sample sizes is needed to comprehensively evaluate the effectiveness of this intervention in clinical nursing practice.

References

- [1] G. Eknoyan, N. Lameire, W. C. Winkelmayer, and M. Jadoul, “KDIGO 2024 CLINICAL PRACTICE GUIDELINE FOR THE EVALUATION AND MANAGEMENT,” vol. 105, 2024, doi: 10.1016/j.kint.2023.10.018.[1] G. Eknoyan, N. Lameire, W. C. Winkelmayer, and M. Jadoul, “KDIGO 2024 CLINICAL PRACTICE GUIDELINE FOR THE EVALUATION AND MANAGEMENT,” vol. 105, 2024, doi: 10.1016/j.kint.2023.10.018.
- [2] “Laporan Riskesdas 2018 Nasional.pdf.” .
- [3] W. W. Amoah and C. Ihudiebube-splendor, “Impact of chronic kidney disease on health-related quality of life in adults : a systematic review and meta-analysis protocol,” no. October, pp. 1–9, 2025, doi: 10.3389/fneph.2025.1630718.
- [4] D. Rathakrishnan, M. K. Moka, L. Sundar, and M. George, “Dialysis Symptom Index : Patient-reported outcome measures study,” vol. 14, no. 4, pp. 1–13, 2025, doi: 10.5527/wjn.v14.i4.111639.
- [5] S. Naz, M. Nazar, W. Khalid, A. Malik, Laraib, A. Tahir, and M. ur Rehman, Muhammad, “Prevalence of Intradialytic Muscle Cramps and Quality of Life in Haemodialysis Patients,” vol. 14, no. 1, pp. 30–34, 2024.
- [6] A. Takahashi, “The pathophysiology of leg cramping during dialysis and the use of carnitine in its treatment,” no. October, pp. 1–10, 2021, doi: 10.14814/phy2.15114.
- [7] J. Anung, A. Widodo, and A. Khoiriyati, “Jurnal Aisyah : Jurnal Ilmu Kesehatan Interventions for treatment of muscle cramps in hemodialysis patients : A systematic review,” vol. 8, no. 2, pp. 1087–1090, 2023, doi: 10.30604/jika.v8i2.2064.
- [8] Š. Bogataj, M. Pajek, B. Ponikvar, J. adranka, and J. Pajek, “Outcome Expectations for Exercise and Decisional Balance Questionnaires Predict Adherence and E ffi cacy of Exercise Programs in Dialysis Patients,” 2020.
- [9] Y. Battaglia, F. Baciga, F. Bulighin, M. Amicone, G. Mosconi, and A. Storari, *Physical activity and exercise in chronic kidney disease : consensus statements from the Physical Exercise Working Group of the Italian Society of Nephrology*. 2024.
- [10] F. Zhang, Y. Bai, X. Zhao, L. Huang, W. Wang, and W. Zhou, “Therapeutic effects of exercise interventions for patients with chronic kidney disease : an umbrella review of analyses systematic reviews and meta- -,” 2022, doi: 10.1136/bmjopen-2021-054887.
- [11] T. Firdaus, Asep, Novi, A. Yulistianingsih, R. N. Agung, and I. Siswandi, “IMPLEMENTATION OF STRETCHING EXERCISE INTRADIALYTICS IN IMPROVING MUSCLE CRAMP SYMPTOMS IN PATIENTS UNDERGOING HEMODIALYSIS,” *Indones. J. Glob. Heal. Res.*, vol. 7, no. 6, pp. 269–276, 2025.
- [12] S. Ahmed, Nahla, A. Allah, Eman, Shokry, and M. Ahmed, Fatma, “Effect of Intradialytic Stretching Exercises on Elderly Patients’ Muscle Cramps and Stress,” vol. 53, no. 2, pp. 4070–

4088, 2024.

- [13] A. A. Shraida, D. K. Abd-ali, and H. Q. Mohammad, “Effectiveness of Intradialytic Stretching Exercises on Prevention and Reduction of Leg Muscle Cramps among Patients undergoing Hemodialysis : Randomized Controlled,” vol. 15, no. 3, pp. 5132–5140, 2021.
- [14] M. Nurchayati, Yulia, and S. Lestari, “Pengaruh Latihan Peregangan Otot Intradialisis Terhadap Kram Otot,” vol. 6, pp. 1465–1471, 2024.
- [15] C. Lee *et al.*, “Comparisons of Intradialytic Exercise Versus Home-Based Exercise in Hemodialysis Patients : A Narrative Review,” pp. 1–14, 2024.
- [16] I. Al Rahbi, E. R. Lazarus, O. Alzaabi, and H. Al-noumani, “Effectiveness of intradialytic muscle stretching exercise on muscle cramps among patients undergoing maintenance hemodialysis in Oman - A randomized controlled trial,” vol. 15, no. 2, pp. 69–75, 2025.
- [17] A. Z. Wahida *et al.*, “The effectiveness of intradialytic exercise in ameliorating fatigue symptoms in patients with chronic kidney failure undergoing hemodialysis : A systematic literature review and meta-analysis,” *J. Taibah Univ. Med. Sci.*, vol. 18, no. 3, pp. 512–525, 2023, doi: 10.1016/j.jtumed.2022.11.004.
- [18] Z. H. Zou, J. Q. Zhang, Z. H. Yi, X. Chen, and W. Qing, “Effects of intradialytic exercise on frailty in maintenance hemodialysis patients : a systematic review and,” no. November, 2025, doi: 10.3389/fphys.2025.1600219.
- [19] X. Feng, J. Sun, Z. Wang, N. Zhang, Y. Liu, and Z. Wang, “The impact of intradialytic elastic band exercise on physical and cognitive abilities in patients on maintenance hemodialysis : a randomized controlled trial,” *Ren. Fail.*, vol. 47, no. 1, p., 2025, doi: 10.1080/0886022X.2025.2482124.