



ANKLE PUMP EXERCISE AS EVIDENCE-BASED NURSING FOR MANAGING HYPERVOLEMIA IN CHRONIC KIDNEY DISEASE PATIENTS

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ABSTRACT

Hypervolemia in patients with Chronic Kidney Disease (CKD) can cause lower extremity oedema. Non-pharmacological methods like ankle pump exercises and 30° leg elevation effectively reduce oedema and improve circulation by utilising muscle pump action and gravity to enhance venous return to the heart. The purpose of this case report evaluates the patient's response to the therapy provided. The method used is a descriptive design informed by evidence-based nursing (EBN). Data collection was conducted through interviews, observations, and the review of secondary data from medical records. The degree of oedema was measured using the Brodovicz pitting oedema scale. The study subject was Mrs S, a 60-year-old woman with stage V chronic kidney disease (CKD). She experienced fluid overload, shown by swelling, high neck vein pressure, weight gain, and low urine output. The intervention was carried out during four sessions, each lasting 40 minutes. The evaluation included the degree of oedema (Brodovicz pitting oedema), weight change, and foot circumference measurement. The results showed a decrease in the degree of oedema from 3 to 2, a decrease in weight from 48 kg to 46 kg, and an increase in urine output. Patients reported a reduction in heaviness and swelling in the lower extremities after the Ankle Pump Exercise and 30° leg elevation interventions, and no side effects were found during the implementation of these two interventions. Ankle pump exercise and 30° leg elevation proved to be effective, safe, and easy to apply as part of self-care. The results indicate that ankle pump exercise and 30° leg elevation can be used as non-pharmacological nursing interventions in the management of oedema in CKD patients with hypervolemia. Nurses play a crucial role in educating and guiding patients and their families to help them perform self-care interventions independently and continuously.

Keywords: ankle pump exercise; chronic kidney disease; evidence-based nursing; hipervolemia

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INTRODUCTION

Chronic Kidney Disease (CKD) occurs when the kidneys lose their ability to function properly. This affects how the body manages metabolism, fluid balance, and electrolytes. The disease is caused by ongoing damage to the kidneys and the buildup of waste products in the body (Putri et al., 2025). Kidney failure appears when the kidneys do not function properly for three months or more (Gusty et al., 2025). The prevalence of CKD is approximately 10% of the global population, with around 1.5 million patients receiving hemodialysis. This condition shows an increasing trend of about 8% each year (WHO, 2020). In Indonesia, 0.2% of people have been diagnosed with chronic kidney disease, according to the Basic Health Research (Riskesdas, 2020).

Hypervolemia is a clinical effect that frequently occurs with the progression of CKD due to the kidneys' inability to manage fluid balance (Evirgen & Yildiz, 2021). Hypervolemia causes oedema in the upper and lower extremities and is a common problem in stage V CKD patients (Rahmah et

al., 2023). This condition leads to an imbalance between the fluid in blood vessels and the fluid outside them, affecting how much fluid the body can get rid of. This causes an increase in pressure in the blood vessels, pushing fluid into nearby tissues. As a result, swelling occurs in the arms and legs (Y. K. Sari et al., 2023). Increased sodium and water retention, due to a decreased glomerular filtration rate, leads to high levels of intravascular and extracellular fluid (Riska et al., 2023).

Patients with CKD who are undergoing hemodialysis often experience hypervolemia, typically resulting from not adhering to fluid restrictions. If hypervolemia is not effectively managed, it can lead to worsening lower extremity oedema due to fluid retention and imbalances in electrolytes (Y. K. Sari et al., 2023). This condition can increase cardiac workload and worsen the patient's clinical status, making fluid control and monitoring of interdialytic weight crucial to prevent complications from fluid volume overload (Rajendran et al., 2025). Persistent oedema can increase the risk of pressure ulcers, worsen cardiac workload, and potentially lead to respiratory disorders such as pulmonary oedema (Jufan et al., 2020).

Pharmacological therapy alone is inadequate for controlling oedema, as patients on furosemide may still experience increased swelling, highlighting the need for non-pharmacological treatments as well (Gusty et al., 2025). Oedema management requires a comprehensive approach that includes both pharmacological therapy, such as diuretic administration, and non-pharmacological interventions like dietary management, fluid intake restriction, and renal replacement therapies, including hemodialysis and kidney transplantation (Rahmani & Mardalena, 2025). In nursing practice, this approach can be enhanced by incorporating additional non-pharmacological interventions, such as ankle pump exercises and 30° leg elevation. These interventions aim to support fluid management and promote the reduction of edema. Therefore, the nursing interventions provided include a combination of pharmacological and non-pharmacological therapies, focusing on fluid control and oedema reduction (Gusty et al., 2025).

An evidence-based approach is essential for ensuring optimal quality of care, with independent nursing interventions playing a crucial role. Ankle pump exercises and elevating the legs to a 30° angle have been shown to effectively reduce oedema by utilising muscle activity to help move extracellular fluid back into the blood vessels and improve blood circulation (Manawan & Rosa, 2021). Consistent leg exercises and elevation help reduce fluid buildup in the lower legs, enhance patient comfort, and support long-term care goals for individuals with fluid balance disorders (Wisnu et al., 2023).

Ankle pump exercises alternate between dorsiflexion and plantar flexion of the ankle. These movements increase venous return and reduce swelling in the lower legs by helping move excess fluid back into the blood vessels, improving blood flow to the heart (Fatchur & Palupi, 2020). Elevating the legs to 30° uses gravity to enhance venous and lymphatic flow while reducing peripheral hydrostatic pressure, thus preventing fluid buildup in distal areas. This intervention is straightforward, non-invasive, and does not require any special equipment (Rika et al., 2023). People with chronic kidney disease can reduce oedema by doing ankle pump exercises and elevating their legs to a 30° angle (Nursanti et al., 2024). The study shows that the control group had an average increase in swelling of 0.10, while the intervention group had an average decrease of 0.79. The ankle pump exercise combined with elevating the leg at 30° greatly reduces swelling in patients with CKD. The results showed a p-value of 0.001, which is less than 0.05, indicating significant findings. Before the intervention, the average swelling level was 2.83, and after the intervention, it decreased to 1.92. (Riska et al, 2023).

Nonpharmacological therapy, particularly ankle pump exercises, has not been widely utilised for patients with hypervolemia due to CKD. Case reports on this intervention in clinical nursing are limited, indicating a need for further evidence. This case report aims to outline the results of

combining ankle pump exercises with a 30° leg elevation as an evidence-based nursing practice for hypervolemia in CKD patients and to evaluate their responses to this intervention.

METHOD

This case report employs the Evidence-Based Nursing (EBN) approach, which was selected due to the limited application of ankle pump exercises and 30° leg elevation in patients with hypervolemia et causa CKD. The EBN approach allows for the integration of scientific evidence into clinical practice in the preparation of this report. The subject discussed in this report is a CKD patient experiencing hypervolemia accompanied by lower extremity oedema.

Data collection was conducted through interviews, observations, and the review of secondary data from medical records. The degree of oedema was measured using the Brodovicz pitting oedema scale. Interviews were conducted to gather subjective data, including patient identity, main complaints, medical history, allergy history, and current therapies. Observations were made to assess the patient's general condition and the clinical manifestations of oedema in the lower extremities. Additionally, medical records were examined to collect objective data related to medical diagnoses, supporting examination results, and previous treatment history. The degree of oedema was assessed objectively using the Brodovicz pitting oedema scale. Throughout the assessment process, researchers employed therapeutic communication, which included three stages: the orientation stage, the work stage, and the termination stage.

The intervention involved one patient receiving hemodialysis at a public hospital in Central Java. It was conducted four times on December 24, 27, and 31 in 2025, and January 3 in 2026. The treatment included ankle pump exercises combined with elevating the legs at a 30° angle. This was done once during each session for about 40 minutes. The patient performed the ankle pump exercises by moving their ankle up and down for 10 times in each cycle for 5 to 10 minutes. Then, they elevated their legs using a cushion for 30 minutes. If the patient felt any pain, the intervention stopped, and an evaluation was conducted to ensure the treatment was safe and effective.

The evaluation was conducted after each intervention session by measuring oedema with the Brodovicz scale, monitoring body weight, and assessing foot circumference. Data were recorded in the nursing documentation sheet and analysed to evaluate changes in the patient's condition. Patients received education on fluid intake restrictions until their next hemodialysis session, as well as ankle pump exercises for independent practice at home. This study upheld nursing ethics, ensuring patient privacy and using data solely for scientific and care improvement purposes.

RESULT

Case Illustration

The assessment was conducted on December 24, 2025, for Mrs S, a 60-year-old woman diagnosed with CKD stage V. She has been undergoing routine hemodialysis twice a week for approximately five years and has a history of uncontrolled chronic hypertension. The patient's overall condition appeared weak, with skin turgor taking more than two seconds to return. She exhibited bilateral oedema in her lower extremities, characterised by grade 3 pitting oedema on the Brodovicz scale. Mrs S reported experiencing swollen feet for three days following her last hemodialysis session on December 20, 2025. The patient reported a urine output of approximately 200 ml per day and a weight gain of 2 kg, increasing from 46 kg to 48 kg, which indicates a fluid imbalance leaning toward hypervolemia. A physical examination revealed a blood pressure reading of 186/100 mmHg and a pulse rate of 98 beats per minute. Laboratory results showed haemoglobin at 9.2 g/dL, urea at 57.78 mmol/L, sodium at 131.3 mmol/L, leukocytes at 6.9 mg/dL, potassium at 3.93 mmol/L, ferritin at 31.17, creatinine at 5.06 mmol/L, chloride at 101.3 mmol/L, and albumin at 4.1 g/dL. Based on these findings, the patient exhibited signs and symptoms of hypervolemia, characterised by peripheral oedema, rapid weight gain, and decreased urine output. Consequently, nursing

interventions included daily weight monitoring at the same time each day, restrictions on fluid and salt intake, education regarding fluid restriction, and additional non-pharmacological interventions such as ankle pump exercises and elevating the legs at a 30-degree angle. These measures were implemented for 4 days as part of the fluid management and oedema reduction efforts.

Patient Characteristics

Patient characteristics are presented in Table 1.

Table 1. Summary of Patient Conditions

Name (Age)	Medical History
Mrs S (60 years old)	The patient has chronic kidney failure since 2020 and undergoes hemodialysis every Wednesday and Saturday. He experienced oedema in his feet for 3 days after his last dialysis, with grade 3 oedema. He feels weak and has gained 2 kg.
	Medical diagnosis: CKD stage V History: Hypertension for 5 years Nursing diagnosis: Hypervolemia

The assessment results are summarised in Table 2.

Table 2.

Assessment Summary

Signs and Symptoms

Objective Data:
Peripheral oedema
Rapid weight gain
Jugular venous pressure (JVP) increased by 5-6 cm.
Positive hepatjugular reflex
Oliguria

The results of the ankle pump exercise and leg elevation at 30° for patients are shown in Table 3.

Table 3. \Nursing Implementation

Session	Nursing Implementation
1	- Weigh the patient for baseline data. - Check oedema and measure leg circumference. - Teach ankle pump exercises and 30° leg elevation (move the foot up and down 10 times for 5–10 minutes, then elevate the leg for 30 minutes with padding). - Explain the need to limit fluid and salt intake. - Train patients on the following fluid intake guidelines.
2	- Monitor the patient's weight changes. - Evaluate oedema and remeasure the legs. - Teach the patient ankle pump exercises and elevation of the leg 30° leg - Monitor the patient's fluid and salt intake restrictions.
3	- Assess weight gain and oedema. - Re-measure lower leg circumference. - Assist with ankle pump exercises and maintain 30° leg elevation. - Reinforce fluid and salt restriction education as needed.
4	- Measure weight for final evaluation. - Assess oedema and leg circumference changes. - Continue ankle pump exercises and 30° leg elevation. - Advise patients to maintain exercise and fluid restrictions at home.

The level of oedema following ankle pump exercises and leg elevation at a 30° angle is shown in Figure 1.

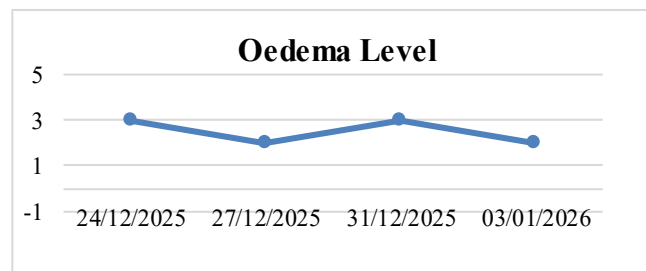


Figure 1. Oedema level after ankle pump exercises and elevating the leg at a 30° angle.

After undergoing a series of four sessions that included ankle pump exercises and maintaining a 30° leg elevation, the patient exhibited notable improvements related to hypervolemia. The assessment revealed a reduction in the degree of oedema, decreasing from grade 3 to grade 2, along with a decrease in the depth of pitting oedema from 6 mm to 4 mm. Additionally, the patient experienced weight loss following hemodialysis, dropping from a pre-dialysis weight of 48 kg to a post-dialysis weight of 46 kg. The patient also reported a reduction in the sensation of heaviness and swelling in both legs, feeling significantly more comfortable after the intervention, as illustrated in Figure 2.

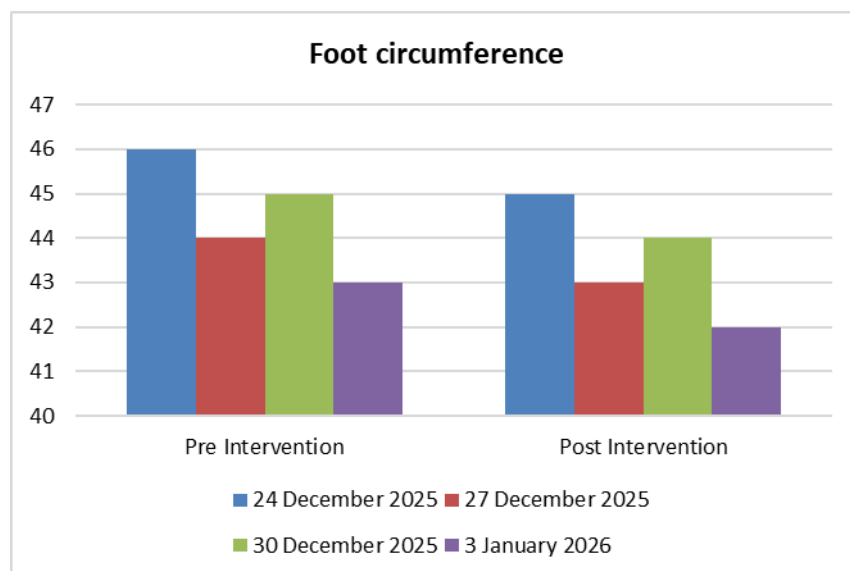


Figure 2. Changes in foot size after ankle pump exercises and elevating the leg to 30°.

Foot circumference measurements demonstrated a consistent reduction in oedema after each intervention session. In all sessions, foot circumference decreased by 1 cm when comparing pre- and post-intervention measurements. The pre-intervention values ranged from 43 to 46 cm, while the post-intervention values ranged from 42 to 45 cm. This pattern of decline indicates a stable trend of improvement, suggesting that the intervention is effective in continuously reducing swelling in the lower extremities. During the intervention, no adverse effects, such as pain, were observed in the patients. They appeared to be more comfortable during and after therapy. Additionally, with guidance from a nurse, the patients were able to understand and independently practice the Ankle Pump Exercise. Therefore, this intervention was considered easy to implement as part of self-care at home.

DISCUSSION

The application of ankle pump exercises and 30° leg elevation in patients with CKD experiencing hypervolemia demonstrated significant clinical improvement. Notable changes included a reduction

in oedema from grade 3 to grade 2, a decrease in foot circumference from 45 cm to 42 cm, a weight reduction from 48 kg to 46 kg, and an improvement in blood pressure from 186/100 mmHg to 168/98 mmHg after just four sessions. These improvements indicate a reduction in excess body fluid and a better hemodynamic status for the patients. Physiologically, ankle pump exercises promote venous return through the contraction and relaxation of the calf muscles, which act as a peripheral pump. This process helps mobilise interstitial fluid back into the central circulation. Meanwhile, elevating the legs to a 30° angle utilises gravity to decrease peripheral hydrostatic pressure and enhance fluid drainage (Sangadah et al., 2025). Research indicates that exercise and limb elevation enhance peripheral circulation and speed up oedema reduction (Kristinawati et al., 2021).

This report shows that ankle pump exercises and leg elevation can reduce swelling in the legs for patients with too much fluid in their bodies and chronic kidney disease. These findings match results from other studies on this topic (Rahmani & Mardalena, 2025). This intervention was reported not to worsen the patient's condition and provided a lighter, more comfortable, and relaxed sensation in the legs (Lestari et al., 2025). Reassessment of the level, depth, and duration of oedema after the intervention showed a significant difference compared to the condition prior to the intervention (Rahmasari et al., 2025). Furthermore, the combination of ankle pump exercises and 30° leg elevation has shown effectiveness in reducing oedema levels in patients with chronic kidney disease (CKD) undergoing hemodialysis. These exercises can be performed independently by patients with some assistance from nursing staff (Damayanti et al., 2024). This intervention is recommended to be performed by patients independently, with nursing assistance, and has been shown to reduce the severity of lower extremity oedema (Maro & Pitang, 2024).

Improving the physiological condition and comfort of patients with chronic diseases can be achieved through non-pharmacological and complementary nursing interventions, particularly for those with systemic conditions. This concept is illustrated in a case study involving patients with CKD and hypervolemia, where ankle pump exercises and 30° leg elevation were employed to reduce oedema without causing side effects and to enhance patient comfort. These findings emphasise the significant role of nursing interventions that are easy to perform independently, straightforward, and safe, serving as adjunctive therapies in managing oedema in patients with chronic diseases (Kristinawati & Runtuwene, et al., 2021)

Enhanced self-care skills lead to better clinical outcomes. Nurses play a crucial role in educating families and caregivers to ensure they consistently perform ankle pump exercises and elevate the legs to a 30° angle (K. I. P. Sari & Setiyowati, 2024). Ankle pump exercises are commonly recommended as an effective mechanical prevention method. These exercises, along with elevating the legs to a 30° angle, help pump blood from the veins in the lower extremities to the upper body. This is achieved by causing the calf muscles to rhythmically contract and relax (Li et al., 2022). In the case report, there were limitations due to the patient's non-compliance with fluid restrictions, which led to increased oedema by the third meeting after initially decreasing.

CONCLUSION

This case report shows that Ankle Pump Exercise combined with 30° Leg Elevation effectively reduces oedema in CKD stage V patients with hypervolemia. This therapy effectively reduces swelling in the lower extremities and enhances patient comfort. Its success depends on patient adherence to fluid restrictions and overall fluid balance management. Ankle Pump Exercises and 30° Leg Elevation are safe, easy, and low-cost non-pharmacological options for managing hypervolemia in patients with CKD.

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