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CASE STUDY: THE EFFECTIVENESS OF ANKLE PUMP EXERCISE AND WARM COMPRESSES IN REDUCING THE DEGREE OF LEG OEDEMA IN PATIENTS WITH CHRONIC KIDNEY DISEASE (CKD)

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ABSTRACT

Introduction: One of the most common clinical manifestations in CKD patients is leg oedema. Oedema that is not treated promptly leads to several complications such as ischaemia due to reduced tissue function, reduced mobility, skin infections such as cellulitis or ulcers in chronic oedema. Oedema can be managed with non-pharmacological therapies such as a combination of ankle pumping and warm compresses. **Purpose**: This study aims to describe the reduction in the degree of leg oedema in patients with CKD after administration of ankle pump exercise and warm compresses. **Methods**: This research is a case study with a nursing approach to CKD patients with oedema. Participants in this study were 3 CKD patients with leg oedema. Interventions were carried out on 3 consecutive days within 15-20 minutes of each session. Pre and post measurements of the degree of oedema were made at each session. **Discussion**: Oedema is a condition resulting from an increase in hydrostatic pressure in the blood vessels, which causes the veins to become blocked and plasma fluid to accumulate in the interstitial spaces. The results of the measurement of the degree of oedema showed that two participants experienced a decrease in the degree of oedema from degree 3 to 2 and one participant experienced a decrease from degree 2 to 1. **Conclusion:** A combination of ankle pump exercise and warm compresses can reduce the degree of leg oedema in patients with CKD and can be used independently by patients and families.

Keywords: Ankle pump exercise, CKD, oedema, and warm compresses.

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INTRODUCTION

Chronic Kidney Disease (CKD) is damage to the kidneys that causes a gradual decline in kidney function due to the kidneys' inability to remove waste products in the urine (Kalengkongan, Makahaghi & Tinungki, 2018). The main causes of CKD depend on the underlying disease. According to Damayanti, Sutrisno & Widiyanto (2024), several diseases that trigger CKD in Indonesia include hypertension (25.8%), obesity (15.4%), and diabetes mellitus (2.3%).

Hustrini, Susalit & Rotmans (2022) reported that the incidence of CKD in the world reaches 200 per million cases every year. These cases were found in different countries such as the United States, Taiwan and Mexico. World Health Organization (WHO) states that CKD is one of the diseases with a high incidence rate in Indonesia, it is estimated that by 2025 CKD cases will reach a significant increase of 41.4% (Hustrini, Susalit & Rotmans, 2022). The results of the 2018 Basic Health Research (RISKESDAS) by the Health Research and Development Agency show that the prevalence of CKD in Indonesia is 0.38% or 3.8 people per 1000 population, and about 60% of people with kidney failure need to undergo hemodialysis. The prevalence of CKD is higher in the age group of 65-74 years (8.23%). Based on gender, the prevalence of men (4.17%) while in women (3.52%) (Kementerian Kesehatan RI, 2023).

CKD is irreversible, which means that this disease cannot be completely cured as before

and can be a complication of other diseases (secondary illness). Treatment of patients with CKD that can be done focuses on diagnosis and treatment, cannot cure or restore kidney function as a whole, such as hemodialysis or dialysis and kidney transplantation (Kalengkongan, Makahaghi & Tinungki, 2018). A common clinical manifestation in patients with CKD is oedema of the lower extremities. Edema is a condition caused by increased hydrostatic pressure in the blood vessels, resulting in venous obstruction and accumulation of plasma fluid in the interstitial space (Annisa, Kartikasari & Sutanti, 2024). A study by Muti & Chasanah (2016) reported that out of 18 CKD patients, 16 cases (35.56%) of patients experienced limb oedema. A higher percentage was found in a study by Aisara, Azmi & Yanni (2018) which showed that out of 104 CKD patients, 56 patients (53.8%) had peripheral oedema. Edema in CKD patients is caused by low albumin levels, which triggers an increase in osmotic pressure in the tissue around the capillaries, causing capillaries and fluid to enter the tissue, resulting in swelling of the legs (Damayanti, Sutrisno & Widiyanto, 2024). Oedema that is not treated immediately can lead to complications such as anasarca oedema, difficulty with activity and infection in the swollen area of the body. Management to reduce the degree of leg oedema in CKD patients can be done by providing non-pharmacological interventions such as ankle pump exercise and warm compresses.

Ankle pump exercise is an exercise to pump the ankle muscles to improve blood circulation by pumping extracellular fluid through the blood vessels and back to the heart (Laoh et al, 2023; Annisa, Kartikasari & Sutanti, 2024). Research by Damayanti, Sutrisno & Widiyanto, (2024) states that ankle pump exercise therapy can reduce the degree of leg oedema in CKD patients and that this therapy can be performed independently by nurses and patients. According to Jafar & Budi, (2023) compression of oedematous feet with warm water can have a vasodilating effect on muscles and blood vessels, thereby reducing intravenous hydrostatic pressure. Based on this, the authors are interested in discussing the effectiveness of ankle pump exercise and warm compresses in reducing the degree of leg oedema in CKD patients. This study aims to determine the reduction in the degree of leg oedema in patients with chronic kidney disease after ankle pump exercise and warm compresses.

METHOD

This research is a case study approach that describes case management in the implementation of Evidence Based Nursing (EBN) in nursing practice. Nursing care was provided to CKD patients who experienced leg edema, a total of 3 patients. The case study was conducted at Prof. Dr. Margono Soekarjo Purwokerto Hospital from May to September 2024. In this case study, several inclusion criteria were applied, namely patients diagnosed with CKD, patients who experienced lower extremity edema, patients in the adult age group (20-59 years). While the exclusion criteria applied were respondents who experienced anxiety or fear. The instrument used was an observation sheet measuring the degree of edema in the legs.

The implementation procedure, determination of the case study topic, which refers to the PICO analysis (Problem, Intervention, Comparison and Outcome) and search for EBN through the google scholar database. The next stage of EBN application is adapted to the problems that exist in the respondents based on the assessment obtained. The data collection stage is carried out by applying research ethics, which refers to the National Health Research and Development Ethics Commission (KEPPKN) (2017), including respect for the person as a way of explaining the purpose of the study and obtaining consent from patients and families using informed consent. The principle of confidentiality is applied by using the initials of the name as a substitute for the identity of the respondent. The principle of justice in this study is that there are inclusion criteria in the study so that there is no tendency in selecting respondents and ensuring a uniform data collection process in patients. Meanwhile, the principle of beneficence is to provide benefits to patients and minimize the adverse effects on patients. Intervention is given by measuring the degree of edema after action for 15-20 minutes in 3 consecutive days with pre and post observation of edema degree

measurements carried out at each session.

RESULT

Warm compress therapy and ankle pump exercise were performed once a day for 3 consecutive days. The researcher explained the procedure and taught it to the three patients. The mechanism starts with measuring the degree of oedema, followed by ankle pump exercise for 2 minutes and resting the foot for 20-25 seconds. Then a warm compress was applied for 10 minutes and the patient's feet rested for 20-25 seconds. The degree of oedema was then measured after the procedure. Below are the results of measuring the degree of oedema before and after the procedure.

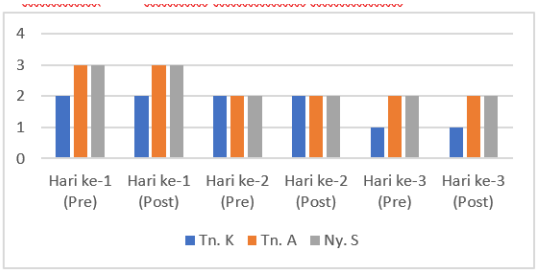

Figure 1. Reduction in oedema

Figure 1 shows that after the intervention of warm compresses and ankle pump exercise for 3 days, there is a decrease in the degree of oedema. In patient Mr. K, the degree of oedema decreased from grade II to grade I. In patient Mr. A, the degree of oedema decreased from grade III to grade II. Patient Mrs. S experienced a decrease in oedema grade from grade III to grade II.

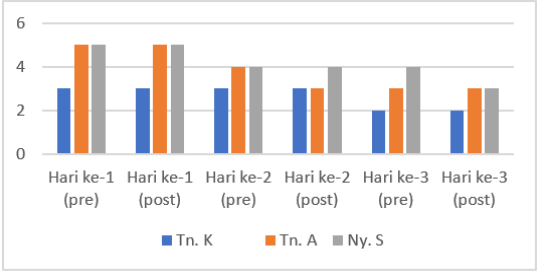

Figure 2. Decrease in oedema depth

Figure 2 shows the results after the intervention for 3 days, the three patients experienced a decrease in oedema depth, namely Mr. K oedema depth decreased by 1 mm, Mr. A oedema depth decreased by 2 mm and Mrs. S oedema depth decreased by 2 mm. Mr K decreased by 1 mm, Mr. A decreased by 2 mm and Mrs. S decreased by 2 mm. The average reduction in oedema depth after the procedure was 1.6 mm.

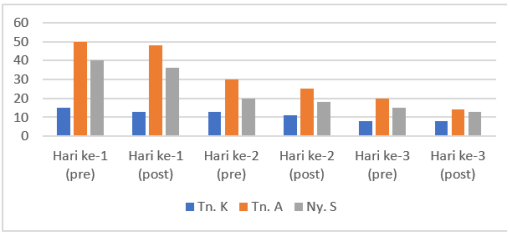

Figure 3. Reduction in oedema recurrence time

Figure 3, After 3 days of intervention, the three patients experienced a reduction in oedema recurrence time: Mr. K from 15 seconds to 8 seconds (down 7 seconds), Mr. A from 50 seconds to 14 seconds (down 36 seconds) and Mrs. S from 40 seconds to 13 seconds (down 27 seconds). The average reduction in oedema recurrence time after intervention was 23 seconds.

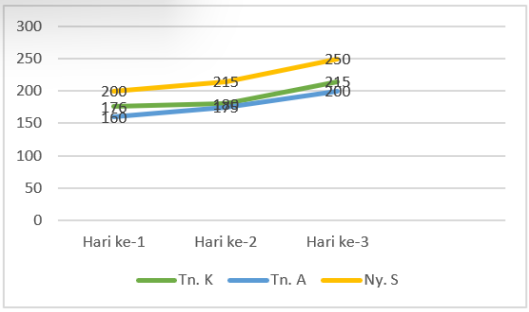

Figure 4. 8-hour urine volume

Figure 4 shows that all three patients had an increase in urine volume calculated every 8 hours. Mr. K had an increase from 176 ml/8 hours to 215 ml/8 hours. Mr. A had an increase in urine volume from 160 ml/8 hours to 200 ml/8 hours. Mrs. S had an increase from 200 ml/8 hours to 250 ml/8 hours.

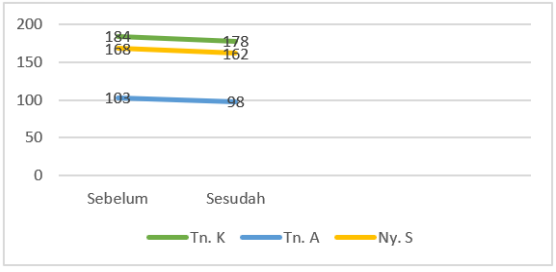

Figure 5. Decrease in ureum (mg/dL)

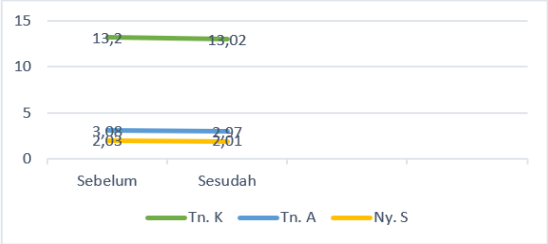

Figure 6. Creatinine reduction (mg/dL)

Figures 5 and 6 show the decrease in ureum and creatinine in the patients before and after 3 days of intervention. In Mr. K, before the intervention, urea decreased from 184 mg/dL to 178 mg/dL and creatinine decreased from 13.2 mg/dL to 13.02 mg/dL. Mr. A urea decreased from 103 mg/dL to 98 mg/dL and creatinine decreased from 3.08 mg/dL to 2.97 mg/dL. Mrs. S urea decreased from 168 mg/dL to 162 mg/dL and her creatinine decreased from 2.03 mg/dL to 2.01 mg/dL.

DISCUSSION

The results of the case study show that the three patients had oedema in both legs. After measuring the degree of oedema, the results showed that prior to implementation, two patients experienced grade III oedema and decreased to grade II oedema. In addition, one patient experienced grade II oedema and decreased to grade I oedema. These results are consistent with the research of Annisa, Kartikasari & Sutanti (2024) who found that the provision of ankle pump exercise can reduce the grade of oedema from an initial grade 4 to grade 3 with a reduction in depth from 8mm to 6mm and the duration of oedema recurrence from 180 seconds to <60 seconds. This is consistent with the research of Laoh et al, (2023) who explain that the combination of warm water therapy and ankle pump exercise can reduce the degree of oedema from grade 4 to 3. This combination of therapies aims to improve blood circulation and produce a significant reduction in oedema.

The ankle pump exercise uses the properties of blood vessels, which are influenced by the work of muscle pumps, so that during strong muscle contractions, the muscles compress the blood vessels and oedema fluid can be transported into the bloodstream, increasing oxygen transport capacity, oxidation processes and the amount of Na (Laoh et al, 2023). This is consistent with several studies showing that ankle pump exercise is a simple therapy that effectively reduces oedema. Warm compresses work in much the same way as ankle pump exercise. Warm compresses can dilate blood vessels and reduce intravenous hydrostatic pressure, which causes an increase in plasma fluid in the interstitial space, and fluid in the interstitial space returns to the veins, reducing oedema (Anggreini & Amelia, 2021). This is consistent with the research of Jafar & Budi, (2023) that a combination of 30˚foot elevation therapy and warm compresses can reduce peripheral pressure and thereby reduce oedema.

A decrease in oedema can be detected by an increase in urine volume. Increased urine volume can be influenced by the administration of diuretics such as furosemide. The results of research by Basrah, Majid & Ningrat (2024) showed that a reduction in the degree of oedema from grade 4 to grade 2 after administration of furosemide diuretics and fluid restriction for 6 days increased urine output by 14-54 ml/hour. Giving diuretics can increase urine production up to 30-50ml/hour, but this depends on the stage of CKD and individual response to treatment. In addition, the reduction in oedema is influenced by the level of effectiveness of the therapy provided, such as the pumping action process in ankle pump exercises can better improve blood circulation and increase renal perfusion to support production in patients with residual renal function (Annisa, Kartikasari & Sutanti, 2024).

Decreased kidney function is also characterised by increased urea and creatinine. A decrease in ureum-creatinine in the urine results in a decrease in glomerular filtration rate, which leads to an increase in ureum-creatinine in the blood (Heriansyah, Humaedi & Widada, 2019). This case study shows that all three patients experienced a decrease in urea and creatinine after the procedure. According to Hasanah, Hammad & Rachmadi (2020), a decrease in urea and creatinine occurs in the haemodialysis process, with an average decrease in urea between 1-100 mg/dL in most patients, and creatinine levels, which were generally above 7.6 mg/dL before dialysis, decreased to lower levels, indicating

a temporary improvement in filtration function during dialysis therapy. This is in line with a study by Heriansyah, Humaedi & Widada (2019), who found that there were changes in urea and creatinine levels before and after haemodialysis, based on the results of 149 patients undergoing haemodialysis, all of whom experienced a decrease in urea and creatinine, with a decrease in urea levels of up to 65% after haemodialysis, and as much as 39.6% after haemodialysis. The researchers believe that the reduction in urea and creatinine levels in the three patients was influenced by the haemodialysis therapy they were receiving. The use of an ankle pump and warm compresses did not have a significant effect on the reduction of urea and creatinine.

Based on observation during implementation, the three patients looked relaxed and the degree of oedema gradually decreased. After implementation, all three patients reported that their legs felt more comfortable and lighter. In addition, after 3 days of implementation, the patients experienced an improvement in their condition, namely a decrease in shortness of breath and an increase in haemoglobin and haematocytes. According to theory and research, the combination of ankle pump exercise and warm compresses can reduce the degree of leg oedema in CKD patients if performed for 3 consecutive days.

CONCLUSION

The use of ankle pump exercise and warm compresses has been shown to reduce the degree of leg oedema in patients with CKD. This is evidenced by the observation of a decrease in oedema grade showing that two patients who had oedema grade III decreased to oedema grade II and one patient who had oedema grade II decreased to oedema grade I. In addition, the evaluation of urine production and laboratory results carried out on day 3 showed that the results of the three patients had increased urine and decreased urine levels. In addition, evaluation of urine production and laboratory results on day 3 showed that the three patients had increased urine and decreased urea and creatinine levels and increased albumin, haemoglobin and haemotocrit levels.

This report of the results of evidence-based nursing interventions can be used as a reference in the nursing process for patients with chronic kidney disease (CKD) who have lower extremity oedema. The results of this study can be further developed by intervening according to the correct SOP and for a longer duration using experimental research.

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