IMPLEMENTATION BLOWING BALLON FOR CHRONIC KIDNEY DISEASE WITH SHORTNESS BREATH

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Abstract

Shortness of breath is a complaint that often occurs in patients with chronic kidney disease, characterized by Kussmaul breathing, which is caused by the accumulation of fluid both in the lung tissue and in the chest cavity, and also due to a decrease in blood pH due to electrolyte changes and loss of bicarbonate in the blood. Therefore, breathing exercise therapy is needed that can reduce shortness of breath in patients with chronic kidney disease, one of which is inhalation balloon therapy so that patients can control breathing and shortness of breath is reduced. The aims of this study is to find the implementation of blowing balloon therapy in chronic kidney disease patients with shortness of breath. The research used qualitative research with a case study approach design, the author conducted data collection, analysis, diagnosis, planning, implementation and evaluation. Nursing implementation was done in 3 days and then recorded the results obtained during the 3 days of intervention. The results of oxygen saturation increased on the second and third days, there was also a decrease in respiratory rate from the first, second and third days, besides that the complaints of shortness of breath felt by clients decreased on the second and third days. Blowing ballon therapy effectively to reduces shortness of breath in chronic kidney disease patients who experience shortness of breath.

Keywords: blowing ballon, chronic kidney disease, shortness of breath

INTROCUCTION

Chronic kidney disease is a clinical syndrome resulting from changes in the definitive function and structure of the kidneys, characterized by irreversibility and slow, progressive evolution(1). Sign and symptoms in patients with kidney failure include poor oral intake, vomiting, overdiuresis, arterial-venous nicking or retinopathy in the retina, and back pain. Additionally, there are skin signs such as a rash resembling systemic lupus erythematosus and interstitial nephritis, palpable purpura, telangiectasia, scleroderma, pallor, skin excoriations, wasting, asterixis, myoclonic jerks, and pericardial friction rub(2). The causes of chronic kidney

failure are categorized based on the presence or absence of systemic diseases and the location of anatomical abnormalities. Examples of systemic diseases include diabetes, autoimmune disorders, chronic infections, malignancies, and genetic disorders[3]. Chronic kidney failure in the early stages do not show any signs or symptoms. When the glomerular filtration rate is 60%, there is an increase in urea and creatinine levels in the blood. When the glomerular filtration rate is only 30%, problems arise, such as loss of appetite, weight loss, difficulty sleeping at night, feeling tired all the time, urinating more frequently at night, nausea, vomiting, and pruritus[4].

Chronic kidney failure is a disease that has become a common health issue, especially among individuals over the age of 50. A study by the Global Burden of Disease shows that the global prevalence of chronic kidney failure from stages 1 to 5 is currently estimated at 843.6 million people, making it one of the leading causes of death worldwide[5,6]. In Indonesia, the prevalence of chronic kidney disease reached a total of 638,178 cases in 2023, while in the West Kalimantan region, the prevalence was recorded at 12,637 cases. This significant number positions West Kalimantan as the region with the highest number of chronic kidney failure cases in Kalimantan[7].

The kidneys contain a network of filters called nephrons, which consist of parts such as the glomerulus and tubules. The glomerulus functions to filter fluids and waste for removal from the body while preventing the loss of essential substances like blood cells and large molecules, most of which are proteins. The filtered substances then pass through the tubules, which reabsorb necessary minerals for the body and eliminate unnecessary waste products. Additionally, the kidneys produce the enzyme renin, which regulates blood pressure and salt levels, as well as the hormone erythropoietin[8].

The most common complaints experienced by chronic kidney failure patients are shortness of breath, rapid and deep breathing known as Kussmaul respiration. This can make from fluid accumulation in lung tissue or the chest cavity and may also occur due to decreased blood pH caused by electrolyte imbalances and the loss of bicarbonate in the blood[9]. One of the triggering

factors for shortness of breath is uncontrolled hypertension, which causes the arteries around the kidneys to narrow, weaken, and harden. Damage to the kidney arteries obstructs blood flow, which carries oxygen and nutrients to the tissues. This prevents the nephrons from receiving the required substances[10]. Consequently, kidney function is impaired, disrupting the production of red blood cells in the bone marrow, which in turn reduces the amount of oxygen delivered throughout the body[11]. A therapy that can help address breathing problems in chronic kidney failure patients is breathing exercises, such as balloon blowing therapy. This therapy can optimize the effectiveness of the respiratory system, including ventilation, diffusion, and perfusion[12]. The diffusion efficiency in individuals significantly improves when balloon blowing therapy is frequently practiced, showing better results compared to untrained individuals. This is because the efficiency of the "capillary bed" in the lung parenchyma is enhanced, stimulating the area to perform wider diffusion. The blowing balloon relaxation technique is implemented to help patients control their breathing effectively. Moreover, this therapy is simple, has no side effects, is cost-efficient, and can train respiratory status in individuals experiencing breathing difficulties[13].

Other studies conducted on patients diagnosed with ineffective breathing patterns in chronic kidney failure, it was revealed that after the intervention of balloon blowing therapy, the client’s respiratory rate decreased from 28 times per minute to 23 times per minute. Subjective data from interviews showed that patients who received the intervention reported reduced shortness of breath, allowing the intervention to be discontinued[14]. Balloon blowing therapy is a relaxation technique that helps the intercostal muscles evaluate the diaphragm and rib muscles, enabling them to absorb oxygen more effectively. This process facilitates the transformation of oxygen within the lungs and the expulsion of carbon dioxide. Balloon blowing is highly effective in assisting lung expansion, allowing for optimal oxygen supply and the removal of trapped carbon dioxide in the lungs[15].

This exercise can help prevent shortness of breath and inadequate oxygen supply in the body, providing energy to cells and muscles by expelling carbon

dioxide. Research shows a significant impact of balloon blowing therapy on lung function before and after the intervention, marked by increased oxygen saturation or improved peak respiratory flow. The therapy is specifically aimed at patients with respiratory system disorders to improve lung function and restore it to normal levels[16].

Similar research on chronic kidney disease patients with ineffective breathing patterns demonstrated an increase in oxygen saturation from 95% to 99%. The respiratory rate decreased from 25 times per minute to 24 times per minute on the second day and further dropped to 20 times per minute by the third day. Subjective evaluations showed that patients reported feeling less short of breath, while objective data indicated no respiratory muscle fatigue and no additional breath sounds. This confirmed that the problem had been resolved, and the intervention was discontinued[13].

Based on the explanation above, the researcher recognizes the urgency of conducting this study, focusing on the application of balloon blowing therapy in chronic kidney failure patients experiencing shortness of breath. The aim is to provide a therapy that is affordable, simple, side-effect-free, and capable of addressing one of the primary nursing issues—respiratory problems. The aims of this study is to find the implementation of blowing balloon therapy in chronic kidney disease patients with shortness of breath.

RESEARCH METHODS

This study was used nursing care with a case study design, where the author collects data from assessment, data analysis, diagnosis, planning, implementation, and evaluation[17]. The subject of this study is one patient with chronic kidney disease who is experiencing shortness of breath, was conducted in the Integrated Pavilion Care Unit of Dr. Soedarso General Hospital in Pontianak and was carried out over a period of three days of treatment. The researcher used several tools such as a rubber balloon, a watch, an oximeter, an informed consent form, and an assessment sheet. The author performs a physical examination including inspection, palpation, percussion, and auscultation[18]. The next step is to

implement the intervention by teaching the patient to perform balloon blowing therapy. The researcher will position the patient in a comfortable Fowler's or semi-Fowler's position, but if the subject can stand, the therapy should be done while standing. The researcher attaches the oximeter to the subject's finger to monitor oxygen saturation while also observing the chest movement to count the respiratory rate per minute. The researcher then prepares the balloon and holds it with one or both hands; if in Fowler's or semi-Fowler's position, the other hand should rest comfortably beside the head. Then, the researcher instructs the subject to inhale through the nose for 6 seconds and exhale on the seventh second, with exhalation lasting 2 seconds. The next step is to inhale for 3-4 seconds, hold for 2-3 seconds, and then exhale through the mouth while blowing up the balloon for 5-8 seconds. The subject is then instructed to pinch the balloon with their fingers. The balloon blowing exercise is performed three times per set, repeated 20-30 times within 10-15 minutes, with the subject resting for 1 minute to restore muscle strength. The exercise should be stopped if the subject feels dizzy or experiences deep pain. Finally, the researcher evaluates the subject to assess how they feel after the intervention, asking whether the subject feels no change, feels better, or feels worse[19].

RESULT AND DISCUSSIONS

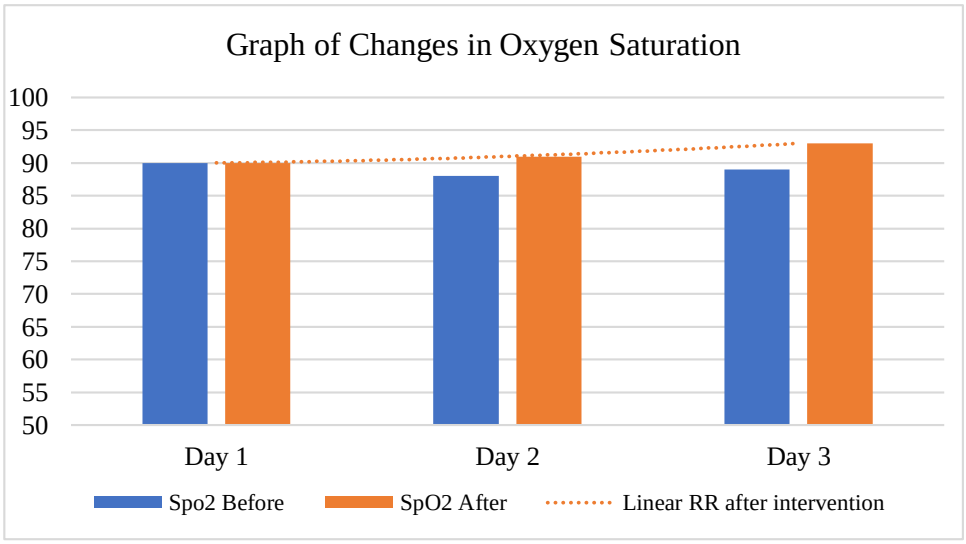
The analysis of subjective data obtained from the client during the examination includes the client reporting occasional shortness of breath, with the shortness of breath sudenly relaps. The family mentioned that the client has a post-operative debridement wound on the right calf and a decubitus wound on the posterior hip. The client also reported itching in the abdominal and upper extremity areas. The client stated that they have difficulty sleeping at night. The family reported that the client wakes up every two hours at night. The client also mentioned feeling dizzy in the morning due to difficulty sleeping at night.

This is supported by the analysis of objective data, including a physical examination that shows the general condition of the client as weak, with the consciousness level being alert (GCS: Eye 3, Verbal 5, Motoric 6, total 14), the

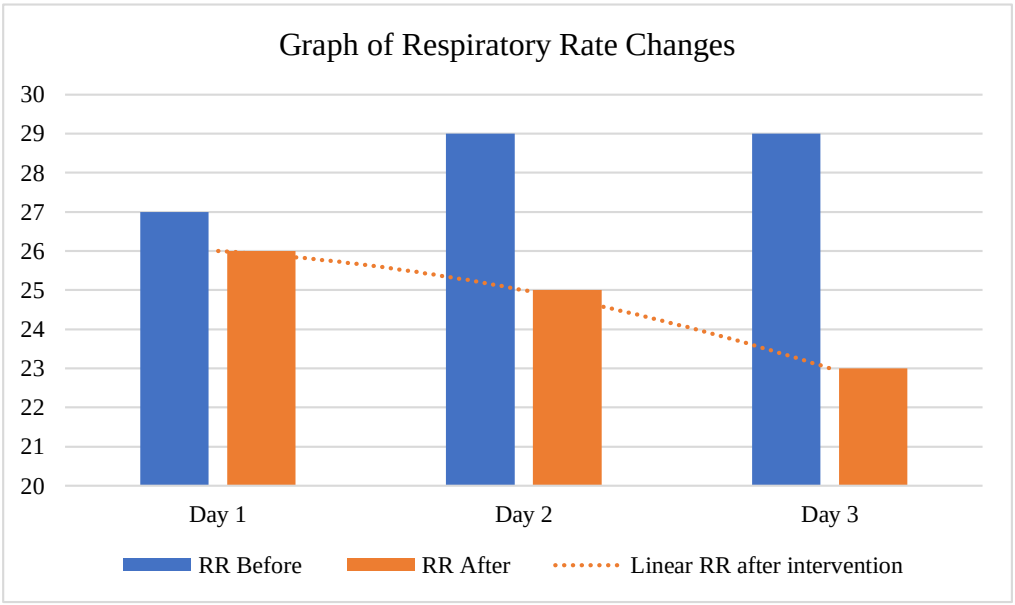
client was using an oxygen non-rebreathing mask at 8 lpm. Vital signs include a temperature of 36.8°C, pulse rate of 77 bpm, respiratory rate of 27 times per minute, blood pressure of 153/67 mmHg, and SpO2 of 90%. The client had additional respiratory muscles along with signs of dyspnea, and chest X-ray showed pulmonary edema. Complete blood count results indicated hemoglobin of 10.0, hematocrit of 30.0, and erythrocytes of 3.56 × 10^6/µL. Rales were heard in almost the entire lung field. There was also grade 3 edema in the lower extremities, with redness in the wound on the right calf (5x3 cm) and the posterior hip wound (10x8 cm, approximately 4 cm deep), with no bleeding. The client's skin appeared dry, with areas of dead skin that had already detached around the body. Medical therapy received by the patient was ambroxol, pulmicort, irbesartan, amlodipine, clonidine, furosemide, metronidazole and ciprofloxacin. The family said that the client began experiencing swelling in his body in 2023 and it continued to worsen. At that time, the client's condition deteriorated and he was rushed to Dr. Rubini Mempawah Hospital, where he was diagnosed with stage 5 kidney failure. The client was then referred to Mitra Medika Hospital in Pontianak, where a double-lumen catheter was inserted as an access point for intravenous therapy and hemodialysis, as all of the client's extremities were swollen.

The therapy is performed once a day for 3 days. The results of the change in one of the interventions related to the primary diagnosis of ineffective breathing patterns in the client with the main intervention of balloon blowing therapy are as follows: On the first day of the exercise, before the intervention, the client's oxygen saturation was 90% with a respiratory rate of 27 times per minute. After the intervention, the oxygen saturation remained at 90%, but the client's respiratory rate decreased from 27 times per minute to 26 times per minute. On the second day, before the balloon blowing exercise, the client's oxygen saturation was 88% with a respiratory rate of 29 times per minute. After the intervention, the oxygen saturation increased to 91%, and there was also a change in the respiratory pattern from 29 times per minute to 25 times per minute. Then, on the third day, before the exercise, the oxygen saturation was at 89% with a respiratory rate of 29 times per minute. After the intervention, the oxygen saturation increasing from 89% to 93%, and there was a change in the respiratory rate from 29 times per minute to 23 times

per minute. The changes after the balloon blowing therapy can be seen in the graph below:



Picture 1. Graph of Changes in Oxygen Saturation



Picture 2. Graph of Respiratory Rate Changes

The nursing problems identified include ineffective breathing pattern related to impaired breathing efforts, characterized by shortness of breath, use of accessory respiratory muscles, and abnormal breathing patterns; ineffective peripheral perfusion related to

hyperglycemia, decreased hemoglobin concentration, and decreased arterial and/or venous flow, as indicated by capillary refill time >3 seconds, decreased peripheral pulse, cold extremities, and pale skin color; hypervolemia related to impaired regulatory mechanisms, characterized by shortness of breath, peripheral edema, additional lung sounds, hepatomegaly, and decreased hemoglobin and hematocrit; impaired skin and tissue integrity related to excess fluid volume and decreased mobility, as indicated by tissue damage and/or skin layers, and redness; sleep pattern disturbance related to environmental barriers, characterized by complaints of difficulty sleeping, frequent waking, dissatisfaction with sleep, and altered sleep patterns. The analysis of one intervention with the concept related to the primary diagnosis of ineffective breathing pattern in the client, with the main intervention being balloon blowing therapy, is as follows: Balloon blowing therapy was administered for 3 days with a duration of 10-15 minutes per day. On the first day, before the intervention, the client's oxygen saturation was 90% with a respiratory rate of 27 times per minute. After 15 minutes of balloon blowing therapy, where the client completed 2 sets of exercises, the oxygen saturation remained at 90%, but there was a change in the respiratory rate, which decreased from 27 times per minute to 26 times per minute. On the second day, before the therapy, the client's oxygen saturation was 88% with a respiratory rate of 29 times per minute. After 15 minutes of balloon blowing therapy, where the client completed 2 sets of exercises as on the previous day, the oxygen saturation increased to 91%, and there was also a change in the breathing pattern, with the respiratory rate decreasing from 29 times per minute to 25 times per minute. On the third day, before the therapy, the client's oxygen saturation was 89% with a respiratory rate of 29 times per minute. After 15 minutes of therapy, with the client completing 3 sets of exercises, the oxygen saturation increased to 93%, and there was a change in the respiratory rate from 29 times per minute to 23 times per minute. This evaluation can be directly observed a few minutes after the breathing exercise intervention.

The subjective evaluation obtained from the client after the intervention, by asking how the client felt, showed that on the first day, the client still complained of intermittent shortness of breath. However, on the second and third days after

the intervention, the client reported that the shortness of breath had decreased after the exercises. This is consistent with similar research conducted on patients with chronic kidney disease who had ineffective breathing patterns, where oxygen saturation increased from 95% to 99%, and respiratory frequency decreased from 25 times per minute to 24 times per minute by the second day. By the third day, the frequency of breathing further decreased to 20 times per minute. Subsequently, a subjective evaluation was conducted by asking the patient how they felt after the breathing exercises, and the patient reported a reduction in shortness of breath. Objective data showed no fatigue in the accessory breathing muscles, no additional breath sounds, indicating that the problem was resolved, and the intervention was stopped[13].

Another study conducted on patients diagnosed with ineffective breathing patterns due to chronic kidney disease also revealed that after the balloon blowing intervention, the patient's respiratory rate decreased from 28 times per minute to 23 times per minute. In the subjective data from the interview, the patient who received the intervention stated that their shortness of breath decreased, allowing the intervention to be stopped[14].

Balloon blowing therapy is a relaxation technique that helps the intercostal muscles assess the diaphragm and costal muscles, allowing them to absorb oxygen, which will then be exchanged in the lungs and remove carbon dioxide from the lungs. The balloon blowing technique is very effective in helping lung expansion, enabling oxygen supply and the removal of carbon dioxide trapped in the lungs[15]. Balloon blowing exercises can help prevent shortness of breath and oxygen insufficiency in the body, providing energy for cells and muscles by expelling the carbon dioxide in the lungs. There is evidence that balloon blowing therapy impacts changes in lung function before and after the intervention, as shown by an increase in patient oxygen saturation or peak respiratory flow. This is because the balloon blowing therapy is designed for patients with respiratory system disturbances, aiming to improve and normalize lung function[16]. Based on the above discussion, the researcher concludes that breathing exercises using balloon blowing are effective in reducing shortness of breath in chronic kidney disease patients and would be more effective if performed routinely every day.

In addition to the above therapies, therapeutic management according to[23]

which includes non-pharmacological therapies such as dietary interventions that prioritize fruits and vegetables over saturated fats, reducing sodium intake, increasing potassium intake, while pharmacologically, medications such as antihypertensive drugs can be administered for chronic kidney disease patients with hypertension, as well as ACE inhibitors (ACEi) and angiotensin receptor blockers (ARB) for patients with albuminuria. Other therapeutic management approaches, according to[24], include medical nutrition therapy, which is a crucial aspect of intervention in patients with chronic kidney disease, as this therapy primarily relies on nutrition to help slow disease progression and prevent comorbidities. In addition, other assumptions that support the success of this therapy are that there is no lung leakage, blood pressure and pulse do not change drastically, and therapy is performed regularly. The success of the therapy can be seen from the decrease in respiratory rate and increase in oxygen saturation.

CONCLUSIONS

There is an effect before and after the balloon blowing therapy intervention in chronic kidney disease patients experiencing shortness of breath. This can be observed from the objective data showing changes in oxygen saturation and respiratory rate after the intervention, from the first to the third day, as well as from the subjective evaluation where the patient reported a decrease in shortness of breath on the second and third days after the intervention.

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ETHICAL CLEARENCE

This research obtained ethical approval from the Tanjungpura University Faculty of Medicine Research Ethics Committee with ethical number: 2139 /UN22.7/PG/2024.

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