

Implementation of Pursed Lips Breathing (PLB) Intervention in Chronic Kidney Disease (CKD) Patients in Inpatient Rooms

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Abstract

Chronic kidney disease (CKD) is defined as kidney damage or a glomerular filtration rate (GFR) of less than 60 ml/min/1.73 m², which persists for a minimum of three months. This ultimately results in a progressive loss of kidney function, necessitating the use of renal replacement therapy (either dialysis or transplantation). Patients diagnosed with chronic kidney disease (CKD) are provided with pursed lips breathing (PLB) interventions in the Inpatient Room. This is in accordance with the nursing problem of ineffective breathing patterns. The researcher used the case report method with two patients with chronic kidney disease (CKD) who underwent PLB treatment for four days to overcome the nursing problem of ineffective breathing patterns. The result of the analysis of the application of pursed lips breathing (PLB) in patients showed a change in breathing frequency to 20 x/minute on the fourth day, while at SpO₂ to 98%-99% room air on the fourth day. The implementation of pursed lips breathing (PLB) interventions in chronic kidney disease (CKD) patients with ineffective breathing patterns in the Inpatient Room in 2 patients can be used to stabilize breath frequency and SpO₂. The researcher suggests PLB be applied to CKD patients with ineffective breathing patterns.

Keywords: Chronic kidney disease, ineffective breathing patterns, pursed lips breathing

INTRODUCTION

Chronic Kidney Disease (CKD) is kidney damage or a glomerular filtration rate (GFR) of less than 60 ml/min/1.73 m², lasting 3 months or more. It then causes progressive loss of kidney function, which ultimately requires renal replacement therapy (dialysis or transplantation) (Vaidya & Aeddula, 2022).

United States Renal Data System (USRDS, 2023), the overall prevalence of CKD in the adult population of the United States (US) based on data from the National Health and Nutrition Examination Survey (NHANES, 2024) from 2017 to March 2020 was 14.0% based on a single examination showing low GFR or albuminuria. Based on the 2018 Basic Health Research data, the prevalence of chronic kidney failure in Indonesia based on a doctor's diagnosis in the population aged ≥ 15 years is 0.38% of the total population, while when classified by province, North Kalimantan obtained a value of 0.64% out of 34 provinces in Indonesia (Risksedas Team, 2019).

The early stages of CKD do not show symptoms. Symptoms are felt when CKD is in stages 4 and 5. Routine blood or urine tests can detect this disease. One of the signs of CKD is shortness of breath due to pulmonary edema caused by excess fluid accumulation (Lestari et al., 2023). The shortness of breath felt by the patient has an impact on causing nursing problems. In such circumstances, one of the nursing problems that may arise is an ineffective breathing pattern. According to PPNI (PPNI, 2016), an ineffective breathing pattern is inspiration and/or expiration that does not provide adequate ventilation. An ineffective breathing pattern can be managed using pharmacological and non-pharmacological therapy. One of the non-pharmacological nursing interventions that can be given to patients is to teach them breathing techniques by exhaling through pursed lips and breathing through the nose with a closed mouth or what is called Pursed Lip Breathing (PLB).

Research (Rojabani et al., 2024) said that the case report method showed a decrease in complaints of shortness of breath in CKD patients after being given Pursed Lip Breathing intervention for 4 days. (Gelok & Mukin, 2024), Through their research, they obtained the results of the effect of Pursed Lip Breathing Exercise in overcoming shortness of breath in 2 patients who experienced problems with ineffective breathing patterns. Another study was also conducted by (Rahmi et al., 2022). After observing the provision of pursed-lip breathing exercises for 3 days of treatment, there were changes in respiration rate, breathing, and shortness of breath. The advantages of pursed lip breathing therapy are that it is cheap and easy to do and does not cause side effects for patients. Through this description, the author is interested in implementing the Pursed Lips Breathing (PLB) intervention in Chronic Kidney Disease (CKD) patients with nursing problems of ineffective breathing patterns in the inpatient ward. Hypertension is one of the global health issues with a prevalence that continues to increase year by year. Hypertension, also known as high blood pressure, is a medical condition where the blood pressure in the arteries consistently exceeds the average threshold of 140/90 mmHg or higher. According to the World Health Organization in 2023, it is estimated that 1.28 billion adults aged 30-79 years worldwide suffer from hypertension, with the majority (two-thirds) living in low- and middle-income countries. As many as 46% of adults with hypertension are unaware that they have the condition, and less than half (42%) of adults with hypertension are diagnosed (WHO, 2023). This condition is a significant risk factor for cardiovascular diseases, stroke, and kidney failure, all of which significantly contribute to global morbidity and mortality rates.

According to data from the 2018 North Kalimantan Provincial Riskesdas, the prevalence of hypertension among individuals aged ≥ 18 years in North Kalimantan is 33.02%, while the city of Tarakan has a prevalence of 30.21% among the total population aged ≥ 18 years in the five districts/cities. Hypertension can be treated using both pharmacological and non-pharmacological approaches. For pharmacological treatment, only 1 in 5 adults (21%) with hypertension take medication. The highest prevalence of irregular medication intake is in the 25-34 age group, which

is 34.04% of all age groups. The most common reason for irregular medication intake is that patients prefer to take traditional medicine or non-pharmacological treatments. In the 25-34 age group, the prevalence of irregular blood pressure monitoring is also very high, with many neglecting their blood pressure or hypertension condition (Tim Riskesdas, 2019).

METHODS

This study uses a case report method. Output can be the introduction and description of a new disease; a rare complication of a previously known or routinely treated disease condition; or a new management approach to a common and important clinical syndrome. Case reports have a clear focus (there is one central issue) and explicit documentation of why the case is worth raising (Nursalam, 2020). This KIAN was conducted in the inpatient ward of H. Jusuf SK Hospital in April-May 2024. The respondents in this KIAN were 2 patients with a medical diagnosis of Chronic Kidney Disease (CKD) stage 5 who experienced the main nursing problem of ineffective breathing patterns. The implementation of KIAN was carried out for 4 days with a pursed lip breathing (PLB) intervention, where 1 session of 5-8 exercises was given every day. This case report is in the form of nursing care starting from assessment, data analysis, nursing diagnosis enforcement, planning, implementation and evaluation of nursing.

RESULTS

Based on the table below, the problem obtained from data analysis in both patients is an ineffective breathing pattern with the diagnosis code D.0005 according to the Indonesian Nursing Diagnosis Standards (PPNI, 2017).

Table 1. Data Analysis of Mrs. P and Mrs. D with CKD in the Adult Inpatient Room

Patient	Supporting Data	Etiology	Problem
Mrs. P	Subjective Data:	Obstruction of respiratory effort	Ineffective Breathing Pattern (D.0005)
	1. The patient said that he felt shortness of breath since the morning before the MRS. 2. The patient said that he still felt short of breath even though he was on HD before moving to the Inpatient Room		
	Objective Data:		
	1. The patient appeared to be using accessory respiratory muscles when breathing. 2. Nasal flaring. 3. Hyperventilation. 4. Tactile fermitus decreased in both lung fields. 5. Ronchi breath sounds in both lung fields. 6. Percussion sound sonor faded. 7. RR: 28x/minute tachypnea. 8. SpO2: 95% using NRM 15 Lpm. 9. Patient position sitting		

Patient	Supporting Data	Etiology	Problem
Mrs. D	Subjective Data: - The patient said that shortness of breath had been felt since 3 days before MRS and had gotten worse until now Objective Data: - The patient appeared to be using accessory respiratory muscles when breathing. - Nasal flaring. - Hyperventilation. - Tactile fremitus decreased in both lung fields. - Ronchi breath sounds in both lung fields. - Percussion sound sonor faded. - RR: 30x/minute tachypnea. - SpO2: 96% using NRM 15 Lpm. - The patient's position was sitting leaning forward.	Obstruction of respiratory effort	Ineffective Breathing Pattern (D.0005)

Source: Primary Data, 2024

Based on table 2, respondents Mrs. P and Mrs. D were given ventilation support nursing intervention (I.01002) (PPNI, 2018) with the aim of breathing patterns (L.01004) (PPNI, 2018) providing expectations of improved breathing patterns with criteria of respiratory frequency 12-20 x / minute and SpO2 95% -100%. The specific intervention given that was applied to the 2 respondents was pursed lips breathing (PLB).

Table 2. Nursing Interventions for Post-Surgery Fracture Patients in Adult Inpatient Rooms

Nursing Diagnosis (SDKI)	Patient	Output (SLKI)	Intervention (SIKI)
Ineffective Breathing Pattern (D.0005) related to respiratory effort obstruction	Mrs. P and Mrs. D	After nursing intervention for 4 x 24 hours, it is expected that the Breathing Pattern (L.01004) will improve, with the following outcome criteria: - Decreased dyspnea - Decreased use of accessory muscles of respiration - Decreased nasal flaring Expectations - Increased - Moderately Increased - Moderate - Moderately Decreased - Decreased 4. Breathing frequency improves Expectations: - Worsened - Moderately Worsened - Moderate	Ventilation Support (I.01002) Observation - Identify the presence of accessory respiratory muscle fatigue - Identify the effects of position changes on respiratory status - Monitor respiratory status and oxygenation Therapeutic - Maintain airway patency - Provide semi-Fowler or Fowler position - Facilitate changing positions as comfortable as possible - Provide oxygen as needed Education - Teach deep breathing relaxation techniques and pursed lips breathing

Nursing Diagnosis (SDKI)	Patient	Output (SLKI)	Intervention (SIKI)
		4: Moderately Improved 5: Improved	2. Teach changing positions independently
		1. Breathing frequency improves 12-20 x/minute 2. SpO2 improves 95%-100%	Collaboration Collaborate in administering bronchodilators, if necessary

Source: Primary Data, 2024

Based on Table 2, it shows that changes in respiratory frequency and SpO2 are improving in both respondents with CKD in the Adult Inpatient Ward after pursed lips breathing (PLB) was applied.

Table 3. Results of Respiratory Rate and SpO2 in Mrs. P and Mrs. D with CKD Pre and Post Implementation of PLB in the Inpatient Room

Patient	Indicator	First day		The second day		The third day		The fourth day	
		<i>Pre</i>	<i>Post</i>	<i>Pre</i>	<i>Post</i>	<i>Pre</i>	<i>Post</i>	<i>Pre</i>	<i>Post</i>
Mrs. P	RR x/minute	28	27	26	24	24	22	22	20
	SpO2	95 % NRM 15 Lpm	96 % NRM 15 Lpm	96 % NRM 8 Lpm	97 % NRM 8 Lpm	96 % NK 5 Lpm	97 % NK 5 Lpm	97 % <i>room</i> <i>air</i>	98 % <i>room</i> <i>air</i>
	RR x/minute	30	29	25	24	25	22	22	20
	SpO2	95 % NRM 15 Lpm	95 % NRM 15 Lpm	96 % NRM 6 Lpm	97 % NRM 6 Lpm	97 % NK 5 Lpm	98 % NK 5 Lpm	97 % <i>room</i> <i>air</i>	99 % <i>room</i> <i>air</i>

Source: Primary Data, 2024

DISCUSSION

In the assessment process of 2 respondents, Mrs. P, aged 60, and Mrs. D, aged 25 years, with the same primary diagnosis, namely ALO in CKD Stage V. Based on the definition concluded by the author in chapter 2, explains that CKD or chronic kidney failure is a partial or total kidney function disorder characterized by a decrease in the glomerular filtration rate (GFR) $<60 \text{ mL/minute/1.73 m}^2$ which is severe or chronic lasting for 3 months or more which causes progressive loss of kidney function which ultimately requires renal replacement therapy (dialysis or transplantation). Kidney Disease Improving Global Outcomes (KDIGO, 2024) explains that the prognosis of CKD Stage V has a very high risk (red label) for complications. The impaired excretory function will cause increased sodium reabsorption, which results in water retention, leading to edema in vital organs, including the lungs and ALO (Siregar & Ariga, 2020). Both respondents were aged ≥ 15 years, Mrs. P was 60 years 7 months old, and Mrs. D was 25 years 11 months old. Based on the 2018 Basic Health Research data (Ministry of Health of the Republic of Indonesia, 2021), the prevalence of chronic kidney failure in Indonesia based on a doctor's diagnosis in the population aged ≥ 15 years

was 0.38% of the total population. Meanwhile, when classified by province, North Kalimantan obtained a value of 0.64% out of 34 provinces in Indonesia.

The results of the examination of vital signs in Mrs. P showed BP: 165/105 mmHg, Pulse: 110 x / minute, RR: 28 x / minute, T: 36.6 ° C, SpO2: 95% with oxygen NRM 15 lpm, pain scale 3/10 (mild pain). While in Mrs. D obtained the results of BP: 175/120 mmHg, Pulse: 130 x / minute, RR: 30 x / m, T: 36.7 ° C, SpO2: 96% with NRM 15 Lpm. Pain scale 3/10 (mild). Although there are differences in numbers, in terms of interpretation, several things can be concluded that are the same. First, both experiences increased blood pressure (hypertension), tachycardia, and tachypnea. According to (Susianti, 2019), Excretory dysfunction that causes increased sodium reabsorption resulting in water retention will increase blood pressure in CKD patients. Decreased potassium excretion that causes hypercalcemia also affects heart rhythm.

Other accompanying complaints are different; Mrs. P complained of weakness, swelling, tingling in both legs, nausea, and vomiting 5 times while in Dahlia A Room. On physical examination, the patient was found to appear pale, anemic conjunctiva, diaphoresis (cold sweat), swelling in both lower extremities with grade 3 pitting edema, capillary refill time (CRT) > 3 seconds, cold acral, no peripheral cyanosis. Mrs. D felt weak, and itching both feet and hands was disturbing. On physical examination, the patient appeared pale, anemic conjunctiva, CRT <2 seconds, warm acral, no peripheral cyanosis, and intense peripheral pulse pressure. The surface of the skin on both feet and hands looked reddish. According to (Syahputra et al., 2022), other symptoms felt when the decline in kidney function continues to the end stage can cause symptoms of uremia. These symptoms can include nausea, vomiting, decreased appetite, tiredness, itching skin, and edema of the ankles and/or eyelids.

Mrs. P and Mrs. D implemented PLB for 4 days, each day given one session of 5-8 exercises. The intervention that the author implemented was the PLB intervention. According to research (Rojabani et al., 2024), the case report method in 1 patient showed a decrease in complaints of shortness of breath in CKD patients after being given Pursed Lip Breathing intervention for 4 days. Every day, the patient implemented one session consisting of 5 exercises. On the first and second days, Mrs. P and Mrs. D in each session were given PLB exercises 5 times by the patient accompanied by the author, and 3 times were done independently without monitoring outside the exercise session. Still, they will be evaluated in the next session regarding implementing PLB. When PLB was implemented with the author on the first and second days to the patient, each patient could practice PLB well with the author's guidance. On the third and fourth days, each session was given PLB exercises 8 times in full to the patient, and the author accompanied and monitored the patient. Each patient could practice PLB on the third and fourth days independently. According to (Suartini, 2021), in his research, PLB was given 5-8 times of daily training to improve the patient's breathing pattern. When not in a training session, patients may do this PLB technique according to their needs without any limitations by the author.

Through research (Gelok & Mukin, 2024), the results obtained the effect of the Pursed Lip Breathing Exercise in overcoming shortness of breath in 2 patients who experienced ineffective breathing patterns. This study was conducted for 3 days and was given 2 times per shift. Mrs. P and Mrs. D were diagnosed with an ineffective breathing pattern when an evaluation was carried out with consistent changes every day in the RR and SpO₂ of both patients. This supports improved breathing patterns with the criteria for reduced shortness of breath (expected RR range 12-20 x / minute and SpO₂ 95-100%), no use of accessory respiratory muscles, and no nostril breathing. Another study was also conducted by (Rahmi et al., 2022). After observing the provision of pursed lip breathing exercises for 3 days of treatment, there were changes in respiration rate, breathing, and reduced shortness of breath.

Significant changes in RR and SpO₂ also occurred in both patients after PLB was applied; with Mrs. P, there was a change in respiratory rate from 28 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 95% with NRM oxygen 15 lpm to SpO₂ 98% room air on the fourth day. In Mrs. D, there was a change in respiratory rate from 30 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 96% with NRM oxygen at 15 lpm to SpO₂ 99% room air on the fourth day.

According to (Smeltzer, 2001), the pursed-lip technique when breathing is effective in helping to slow down expiration, thus preventing the collapse of the small airways, controlling the speed and depth of breathing, and increasing relaxation in patients. (Hidayatin et al., 2023) Stated that PLB can increase alveolar pressure in each lung lobe to increase airflow during expiration; increasing airflow during expiration will activate cilia on the airway mucosa to maximize breathing. It was seen during the implementation of the second PLB that the patient could control the expiration time by pursing her mouth. The evaluation results in section 4.5 showed that PLB effectively overcame ineffective breathing patterns in adult patients with a medical diagnosis of CKD. The results of the review for four days showed improvements in respiratory rate and SpO₂ in Mrs. P and Mrs. D. Based on the results obtained in Mrs. P, there was a change in respiratory rate from 28 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 95% with 15 lpm NRM oxygen to 98% room air SpO₂ on the fourth day. In Mrs. D, there was a change in respiratory rate from 30 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 96% with 15 lpm NRM oxygen to 99% room air SpO₂ on the fourth day. It was seen during the implementation of the second PLB that the patient could control the expiration time by pursing her mouth. The evaluation results showed that PLB effectively overcame ineffective breathing patterns in adult patients with a medical diagnosis of CKD.

CONCLUSION

The results of the case study on Mrs. P and Mrs. D with the implementation of PLB in CKD patients in the Adult Inpatient Ward can be concluded as follows: 1). Nursing care has been provided

to CKD patients Mrs. P and Mrs. D, who have a priority nursing diagnosis of ineffective breathing patterns in the Inpatient Ward for 4 days; both patients were given PLB intervention with the criteria of decreased dyspnea (no shortness of breath), reduced use of accessory respiratory muscles (No use of respiratory muscles), decreased nasal flaring (No nasal flaring breathing) and improved respiratory rate (RR: 12-20x/minute). The evaluation results on the fourth day in both patients showed that the problem of ineffective breathing pattern nursing was resolved. 2). The results of the application of pursed lips breathing (PLB) intervention in chronic kidney disease (CKD) patients with ineffective breathing pattern nursing problems in the Inpatient Ward in Mrs. P and Mrs. D are effective in overcoming ineffective breathing patterns. 3). The results of the analysis of the application of pursed lips breathing (PLB) in Mrs. P showed there was a change in respiratory rate from 28 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 95% with NRM oxygen 15 lpm to SpO₂ 98% room air on the fourth day. In Mrs. D there was a change in respiratory rate from 30 x/minute on the first day and 20 x/minute on the fourth day, while in SpO₂ from 96% with NRM oxygen 15 lpm to SpO₂ 99% room air on the fourth day.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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