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Application of Deep Diaphragmatic Breathing in Cases of Acute Decompensated Heart Failure with Ineffective Breathing Patterns in Surabaya Hospitals

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ABSTRACT

Introduction: Acute Decompensated Heart Failure (ADHF) is a sudden worsening of heart failure symptoms. In 2019, WHO reported 17.9 million deaths worldwide from heart disease, with ADHF affecting 1.5% of Indonesia's population. Shortness of breath is the most common symptom, occurring in 80% of hospitalized ADHF patients. Deep Diaphragmatic Breathing can help improve breathing by strengthening the diaphragm. This case study aimed to evaluate the effectiveness of Deep Diaphragmatic Breathing in improving respiratory status in patients with Acute Decompensated Heart Failure (ADHF).

Objective: This research used a descriptive case study design with a single case study approach 7 days, assessing and evaluating the effects of Deep Diaphragmatic Breathing exercises to reduces ineffective breathing patterns in Acute Decompensated Heart Failure. Data collection through interviews, observation, measurement, physical examination, and medical records.

Case: A 46-year-old patient with Acute Decompensated Heart Failure (ADHF) was admitted with shortness of breath, nausea, vomiting, and loss of appetite for one day. On examination, the patient was conscious (GCS 456), BP 95/66 mmHg, temperature 36.2°C, pulse 68/min, RR 22/min, SpO_2 98% (with nasal cannula), weight 60 kg, and height 167 cm. The main complaint was dyspnea, especially when lying down, with wheezing and irregular breathing. Blood test (B2) showed weak palpable pulse, warm moist extremities, and transient chest pain. Nursing care included respiratory monitoring, deep diaphragmatic breathing, and positioning in Fowler or semi-Fowler. By day 6, breathing improved (RR 18/min, SpO_2 99%) without oxygen support.

Conclusion: Deep Diaphragmatic Breathing reduced ineffective breathing patterns in ADHF patients. Future research should involve larger sample sizes and explore long-term outcomes to strengthen evidence for its clinical application.

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1. INTRODUCTION

Acute Decompensated Heart Failure or ADHF is an aggravation of acute heart failure characterized by rapid onset of symptoms due to a history of cardiomyopathy (Zikrina et al., 2022). The decreased pumping ability of the heart due to cardiomyopathy and cardiomegaly can lead to various clinical manifestations such as shortness of breath, dizziness, mild fatigue and chest pain that appears suddenly,

especially during activity (Hasanah et al., 2023; Indonesia Ministry of Health, 2023). Shortness of breath is the main manifestation that most often appears in patients with ADHF with a percentage of 80% of ADHF patients hospitalized experiencing shortness of breath and easy fatigue (Annisha et al., 2023). Shortness of breath is caused by the patient's inability to control their breathing due to decreased lung expansion, resulting in shortness of breath which leads to ineffective breathing patterns (Nurhidayat, 2022; Waladani et al., 2019).

Heart failure is a disease with a very high morbidity and mortality rate. According to the World Health Organization (WHO) in 2019, 17.9 million people died from cardiovascular disease, representing 31% of deaths in the world. The prevalence of heart disease worldwide is estimated at 1.2 million cases out of 135 million live births per year (Njoroge & Teerlink, 2021). Basic Health Research (Riskesdas) data in 2018 states that the rate of heart disease in Indonesia is around 1.5% of the total population . The province with the highest number of heart disease cases is North Kalimantan province with 2.2%, Gorontalo with 2.1% and Yogyakarta ranks third in Indonesia with a heart disease prevalence of 2% (Kemenkes RI, 2018).

ADHF is a condition of worsening heart failure with a sudden and rapid onset, the first symptoms of which are peripheral edema and shortness of breath (dyspnea) (Dahn & Walker, 2018). As many as 70% of ADHF cases are caused by a history of coronary heart disease, 10% by valvular disorders and 10% by cardiomyopathy. These three factors often lead to impaired circulation flow throughout the body and decreased heart function (American Lung Association, 2022). Common symptoms felt by ADHF patients are shortness of breath and activity intolerance. Most ADHF patients or 80% of ADHF patients are hospitalized due to shortness of breath (Annisha et al., 2023). ADHF patients often have difficulty maintaining oxygenation so they tend to experience shortness of breath which leads to ineffective breathing patterns (Randung & Siagian, 2022).

Nurses can help overcome the problem of shortness of breath through collaborative and independent nursing actions. One of the interventions that can be done in ADHF patients is diaphragmatic breathing exercises (Deep Diaphragmatic Breathing) and positioning (Suhaini, 2023). This action can maximize lung ventilation by maximally inspiring the nose and reducing the work of the respiratory muscles, so as to increase perfusion and improve alveoli performance and streamline oxygen diffusion which will increase O2 levels in the lungs and increase oxygen saturation (Annisha et al., 2023). This exercise can be done independently by the patient with the aim of maximizing diaphragm function. This action can be supported by providing the right position in order to maximize lung expansion and reduce abdominal pressure. The combination of foot positioning can also help ADHF patients to prevent edema in the legs (Zikrina et al., 2022).

2. CASE PRESENTATION

Medical Diagnosis

Acute Decompensated Heart Failure (ADHF) is a clinical syndrome characterized by the sudden onset or worsening of signs and symptoms of heart failure, often requiring hospitalization. Nursing management plays a crucial role in stabilizing the patient's respiratory status and preventing further complications. This case presentation describes the application of Deep Diaphragmatic Breathing and positioning techniques in managing ineffective breathing patterns in a patient with ADHF.

Patient Profile

The subject of this case study was Mr. D, a 46-year-old male admitted to Universitas Airlangga Hospital Inpatient Room on October 17, 2023, with a primary complaint of shortness of breath, nausea, vomiting, and loss of appetite for one day. He denied a history of diabetes or hypertension but reported a history of coronary artery disease (CAD), including percutaneous coronary intervention with stent placement in 2018 and 2019, and a confirmed COVID-19 infection in 2020.

Clinical Findings

On admission, the patient was conscious and oriented (GCS 456). Vital signs were as follows: blood pressure 95/66 mmHg, temperature 36.2°C, pulse 68/min, respiratory rate 22/min, SpO_2 98% (with nasal cannula). His body weight was 60 kg and height 167 cm. The patient's main complaint was **dyspnea**, especially when lying down, accompanied by wheezing and irregular breathing rhythm. Physical examination and B2 assessment revealed a weak palpable pulse, warm moist extremities, and transient chest pain.

Nursing Diagnosis and Intervention

Based on the Indonesian Nursing Diagnosis Standards (SDKI), the primary nursing problem identified was Ineffective Breathing Pattern related to ADHF. Data collection utilized patient interviews, observation, physical assessment, medical records, and nursing documentation. The instruments included a stethoscope, sphygmomanometer, pulse oximeter, and standardized nursing assessment forms. Nursing interventions were guided by the Indonesian National Nurses Association (PPNI) standard operating procedures, including:

1. Respiratory Monitoring: Continuous assessment of respiratory rate, rhythm, oxygen saturation, and breath sounds.
2. Deep Diaphragmatic Breathing Exercises: Patient guided to sit or lie comfortably, place one hand on the abdomen, inhale through the nose for 3 seconds, hold for 3 seconds, and exhale

through pursed lips for 6 seconds; repeated for several cycles per session.
3. Positioning: Placement in Fowler or semi-Fowler position to improve lung expansion and ease breathing effort.

Procedure

The intervention was implemented daily, supported by both primary data (observation, interviews, and physical assessment) and secondary data (medical records). Data were analyzed by categorizing into subjective and objective findings, then matched against SDKI to validate the nursing diagnosis and guide intervention priorities.

3. RESULTS

Patient on behalf of Mr. D 46 years old with a medical diagnosis of Acute Decompensated Heart Failure (ADHF) complained of shortness of breath and heavy breathing since one day before hospitalization, nausea, vomiting and no appetite. Complaints of heavy breathing were felt for approximately 1 week but were ignored. Shortness of breath is worse when sleeping on the back especially at night. The patient has no history of diabetes mellitus or hypertension, but has a history of chronic heart disease. The patient said he had been diagnosed with Covid-19 in 2020 and a history of installing heart rings due to coronary artery disease in 2018 and 2019. After checking blood, the patient has a history of hypercholesterolemia with LDL-Cholesterol = 119 (normal <100) mg/dL. The patient regularly takes ISDN and Furosemide and has a history of allergy to amoxicillin group drugs. The patient said that he often consumed alcohol when he was young almost every week, was an active smoker since adolescence, could use up 1-2 packs a day and started to stop since the age of 42 years. The patient said that he often exercised since he was sick even though it was only to the extent of his ability.

The results of the physical examination of the patient showed good consciousness / compos mentis (GCS 456), blood pressure 95/66 mmHg, temperature 36.20C, pulse 68x / min, respiration rate 22x / min, SpO2 98% (with the help of nasal cannula), body weight 60 kg and height 167 cm. the patient's current complaint is shortness of breath, especially when lying on his back. Breathing appears wheezy and the rhythm of breathing is irregular. Blood examination (B2) found a weak palpable pulse, warm red wet acral, and complaints of chest pain that disappeared. Abnormalities were also seen during the bladder examination (B4) where urine production began to decrease by about 250 ml / 8 hours and the patient received advice from the doctor to limit fluids 750 ml / day because there was a suspicion of ascites. The results of abdominal ascites examination were positive with shifting dullness examination, but other supporting examinations were needed to confirm the findings. On psychosocial examination, the patient was cooperative and had a high spirit of recovery. In terms of personal hygiene, the patient did not experience obstacles, while in the spiritual aspect the patient needed motivation and support to worship.

The results of the supporting examination in the form of a complete blood check showed abnormalities in Hb = 13.1 (13.2-17.3) g / dL, Hematocrit = 39.6 (40-52) %, RDW = 14.7 (11.5-14.5) %, Eosinophil% = 0.4 (2-4) %. The clinical chemistry examination showed an increase in BUN values around 18.1 (8-18) mg/dL, HS Troponin I around 65.6 (<2 ng/L), and LDL-cholesterol = 119 (<100) mg/dL. Decrease from normal values in blood serum electrolyte examination also occurred. Sodium = 122 (135-147) mmol/L, Potassium = 2.6 (3.5-5) mmol/L and Chloride = 85 (98-108) mmol/L. On thorax photo examination, it was found that there was Cardiomegaly and Pulmonary Congestion, while on ECG examination, it was found normal sinus rhytm with prolonged QT and high lateral MI.

Based on the results of data analysis from the assessment results and adjustments to the SDKI PPNI book (2016), nursing diagnoses that can be established are ineffective breathing patterns (D.0005), decreased cardiac output (D.0008) and hypervolemia (D.0022). priority nursing diagnosis focused on ineffective breathing patterns associated with body position that inhibits lung expansion d.d dyspnea, tachypnea, and decreased minute ventilation. The interventions applied are monitoring respiration (I.01014) combined with Deep Diaphragmatic Breathing exercises and positioning. The expected outcome of the intervention is an improved breathing pattern (L.01004) with outcome criteria in the form of decreased dyspnea, improved breath frequency, improved breath depth and decreased orthopnea. By day 6 of hospitalization, the patient showed improved respiratory function: respiratory rate decreased to 18/min, SpO_2 improved to 99%, and the patient was able to maintain adequate oxygenation without supplemental oxygen. Dyspnea was reduced, and breathing rhythm became more regular.

4. DISCUSSION

Ineffective breathing pattern is defined as inspiration and/or expiration that does not provide adequate ventilation (SDKI, 2017). Acute decompensated heart failure (ADHF) is a common and potentially fatal cause of cardiac dysfunction that can lead to acute respiratory distress. Research by Gregory and Hedwig (2022) explains that ineffective breathing patterns in patients with heart failure are caused by pulmonary congestion, specifically an excessive increase in blood volume in the lung area causing an increase in hydrostatic pressure resulting in fluid entry into the alveoli. Fluid entering the alveoli causes pulmonary edema so that lung expansion is not optimal, triggering ineffective breathing patterns in ADHF patients (Randung & Siagian, 2022). Although cardiogenic pulmonary edema is often caused by increased cardiac preload

pressure (King & Goldstein, 2024). Another cause is the narrowing of the lung expansion space due to cardiomegaly which triggers shortness of breath because the lungs cannot expand completely, stimulating breathing to work faster to meet ventilation needs (Napoli et al., 2022). The position of the body when breathing can affect the expansion of the lungs so that errors in sleep positioning in ADHF patients can cause persistent dyspnea symptoms that do not decrease despite supplemental oxygen (Suhaini, 2023).

The feeling of coughing and body fatigue in ADHF patients occurs due to various kinds of compensation carried out by the body. Research from Nisa Meina and Furkon (2023) said that continuous and non-stop coughing is one of the body's mechanisms to remove Co2 trapped in the respiratory system, usually this event is accompanied by body fatigue and fatigue (Nirmala & Nurhakim, 2023). Feeling tired and exhausted is thought to be due to respiratory muscle fatigue due to increased breathing frequency and elongated expiratory patterns (Marufah et al., 2022). A study showed that Deep Diaphragmatic Breathing therapy performed for 15 minutes for 3x a day for two days was shown to help reduce shortness of breath experienced by patients with ADHF (Yesa, 2019). In addition, giving the fowler or semi-fowler position can also support increased oxygen saturation and reduce symptoms of shortness of breath experienced by patients with heart failure (Zikrina et al., 2022). Based on this description, by carrying out nursing interventions for monitoring respiration and non-pharmacological techniques for Deep Diaphragmatic Breathing exercises, it is hoped that the shortness of breath and orthopnea experienced by Mr. D can be resolved in accordance with the goals and objectives. D can be resolved in accordance with the objectives and outcome criteria that have been set.

Nursing implementation focused on the main problem of ineffective breathing patterns carried out for 7 days from October 17-23, 2023. Nursing actions taken are monitoring respiration, Deep Diaphragmatic Breathing exercises and setting the fowler and semi-fowler positions. In the Deep diaphragmatic breathing exercise, the patient is asked to close their eyes and relax their body muscles, then direct the patient to inhale for 3 seconds, hold for a moment for 3 seconds, then exhale for 6 seconds through the mouth while pursing their lips or half-open lips, the patient's hand may be placed on the abdomen to focus on diaphragmatic breathing (Nabila, 2023). Providing fowler and semi-fowler positions is intended to provide the most comfortable position possible and avoid tension during the intervention process (Duwila, 2023).

Deep diaphragmatic breathing exercises with a combination of fowler or semi-fowler position settings can be useful in reducing symptoms of shortness of breath experienced by heart failure patients (Febyastuti et al., 2024). Another consideration needed in overcoming shortness of breath in ADHF patients is the presence of ascites experienced by clients. Patients with ascites or excess fluid volume that has not been resolved can inhibit the diaphragm when contracting so that the diaphragm contraction is not optimal (Nirmala & Nurhakim, 2023). In this condition, it is necessary to collaborate with medical personnel for follow-up, be it the administration of diuretic drugs, abdominal ultrasound examination, or abdominal parasynthesis to reduce excess fluid (Georges et al., 2023). The application of energy conservation such as Myra Levine's energy conservation approach can reduce the burden on the heart in meeting circulatory needs (Ardiansyah et al., 2022). Pharmacological therapy in acute heart failure with oxygen administration can help adequacy of perfusion ventilation and is proven to improve complaints of shortness of breath, and normalize respiratory rate significantly (Hasanah et al., 2023; Sebastian, 2018).

5. CONCLUSION

Based on the results of the case study, it can be concluded that the trigger for complaints of shortness of breath, especially when lying down in ADHF patients, is triggered by a decrease in cardiac output, lung congestion and ascites. Shortness of breath that is not treated immediately can lead to ineffective breathing patterns due to the body's compensation mechanism to balance ventilation and gas exchange. Interventions that can be given to ineffective breathing patterns can be in the form of monitoring respiration and selecting non-pharmacological techniques for Deep Diaphragmatic Breathing exercises to reduce shortness of breath which are carried out 3x a day on the first day, 2x a day on the second day and 1x a day on the third day until day seven with a duration of 15 minutes per session. Close monitoring during the exercise process is required for optimal results. Deep Diaphragmatic Breathing exercises can be done with the 3-3-6 principle including 3 seconds inhaling, 3 seconds holding the breath and 6 seconds exhaling through the mouth with pursed lips. Deep Diaphragmatic Breathing exercises can be used as a supporting therapy along with pharmacological interventions.

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