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Oxygenation and Semi-Fowler Position to Improve Breathing Patterns in Clients with Acute Decompensated Heart Failure (ADHF)

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Abstract: Acute Decompensated Heart Failure (ADHF) is a cardiovascular emergency commonly characterized by dyspnea, orthopnea, the use of accessory respiratory muscles, and decreased oxygen saturation. These conditions occur due to increased left ventricular pressure and pulmonary congestion, which may lead to an ineffective breathing pattern and require prompt and appropriate nursing interventions. **Objective:** This study aimed to evaluate the effectiveness of combining oxygen therapy using a nasal cannula and the Semi-Fowler position in improving the breathing pattern of patients with ADHF. **Methodology:** This research employed a case study design involving three patients treated in the Intensive Cardiac Care Unit (ICCU) of Kanjuruhan Hospital, Malang. Data were collected through clinical observation of respiratory parameters, including dyspnea, orthopnea, use of accessory muscles, respiratory rate, and oxygen saturation over three days of intervention. The data were analyzed descriptively by comparing patients' conditions before and after the intervention. **Findings:** The results showed significant improvement in respiratory patterns beginning on the second day, indicated by reduced dyspnea and orthopnea, the absence of accessory muscle use, decreased respiratory rate approaching the normal range, and increased oxygen saturation above 94%. By the third day, all patients demonstrated optimal improvement across all respiratory indicators. **Implications:** These findings suggest that the combination of oxygen therapy and the Semi-Fowler position can serve as an effective, simple, and practical nursing strategy to reduce respiratory workload, enhance lung expansion, and optimize ventilation–perfusion mechanisms in ADHF patients, particularly in intensive care settings. **Originality:** This study contributes to the existing literature by highlighting the effectiveness of combining two basic non-invasive nursing interventions in managing ineffective breathing patterns in ADHF patients, thereby reinforcing evidence-based nursing practices in intensive cardiovascular care

Keywords: ADHF, nasal cannula, oxygenation, ineffective breathing pattern, semi-fowler position

INTRODUCTION

Heart failure is the most common type of cardiovascular disease. This condition is a complex syndrome resulting from impaired heart function that inhibits the ventricles' ability to fill and pump blood effectively, making it a leading cause of death and a significant contributor to mortality (Aulia & Daryaman, 2023). Based on data from the World Health Organization (WHO),Acute Decompensated Heart Failure National Registry (ADHERE), approximately three-quarters (75%) of patients hospitalized with a diagnosis of heart failure are patientsAcute Decompensated Heart Failure(ADHF) (Antika et al.,

2025). According to (World Health, 2019) heart disease is the number one cause of death in the world with a death rate reaching around 17.9 million people every year (Annisha et al., 2023; Perhimpunan Dokter Spesialis Kardiovaskular, 2019) reported that as many as 2,784,064 people suffer from heart disease (Riska et al., 2025). The 2018 Riskesdas data also showed that there were 15 people with heart disease per 1,000 people, or around 2,784,064 people, increasing from 0.5% in 2013 to 1.5% in 2019 (Nisa & Nurhakim, 2023)

Given the high incidence of ADHF and the various risks it poses, including increased mortality, the role of nurses is crucial in providing nursing care to prevent complications and improve patient health (Supardi et al., 2021). Patients with ADHF generally experience various complaints such as shortness of breath at rest and during activity, weakness, and leg edema (Putra et al., 2025). (Putra et al., 2025). Frequent nursing problems in heart failure patients include decreased cardiac output, chest pain, a high risk of impaired gas exchange, ineffective breathing patterns, excess fluid volume, and activity intolerance (Zikrina et al., 2022).

Among the various signs and symptoms of ADHF, shortness of breath is the most common complaint and the primary symptom in patients with heart failure (Ayuningtyas et al., 2023). In this condition, patients may experience an ineffective breathing pattern because the left ventricle is unable to pump blood adequately throughout the body, which is exacerbated by pulmonary edema, which causes fluid to block airflow into the lungs (Ardiansyah et al., 2022). Nurses can increase oxygen saturation and improve breathing patterns through collaborative and independent nursing actions (Basrah et al., 2024). Therefore, nurses need to provide careintensive which emphasizes fast and precise nursing (Miranda et al., 2022).

One of the emergency measures in patients with heart failure is the administration of oxygen therapy and management of the semi-Fowler position. This effort is included in the prevention of hypoxia due to decreased oxygen concentration (Ahmad Muzaki, 2022). Although basic interventions such as oxygen administration and semi-Fowler positioning have long been used in clinical practice, the effectiveness of this combination of interventions has not been specifically evaluated in ADHF patients with ineffective breathing patterns (Ardiyanto et al., 2024). Some patients still show increased work of breathing, use of accessory muscles, and low oxygen saturation despite standard therapy, so a more targeted and evidence-based approach is needed.

Oxygen therapy using a nasal cannula helps meet the body's oxygen needs. In respiratory emergencies, a nasal cannula can be used to deliver oxygen at a flow rate of approximately 1–6 L/minute (Kusuma & Kurniawan, 2020). Nasal cannula use offers several benefits, including improving oxygenation, reducing hypoxia and hypoxemia, and supporting the improvement of patients with gas exchange disorders. With adequate oxygen delivery, patients can experience improved oxygen saturation and a reduction in signs of respiratory distress (Tarfi Budiadari & Darliana, 2024). To date, management of shortness of breath in ADHF patients has typically focused on oxygen administration alone, resulting in suboptimal ventilation in some patients (Tazkirah et al., 2023). Several studies have addressed rapid and appropriate measures in managing heart failure patients, including strategies for optimizing oxygenation through the use of ventilation aids and adjusting body position (Pangukir Rahayu, 2020).

Another treatment for heart failure patients experiencing shortness of breath while lying down is maintaining bed rest in a 45° semi-Fowler's position. This position aims to reduce oxygen demand, maximize lung expansion, and help improve impaired gas exchange due to changes in the alveolar capillary membrane (Laksono et al., 2023). Adjusting the 45° semi-Fowler's position can also relieve breathing difficulties and provide a relaxing effect on the cardiovascular system (Utami & Afni, 2023). However, these interventions are often administered separately, thus not providing maximum effect in reducing the work of breathing. Therefore, this study added a combination of oxygen therapy with a nasal cannula and a simultaneous semi-Fowler's position, as these two interventions can reinforce each other in increasing lung expansion, reducing the use of accessory muscles, and improving oxygen saturation more effectively.

This study assessed the effectiveness of oxygen delivery usingnasal cannula combined with the Semi-Fowler position as a more targeted additional intervention in ADHF patients with ineffective breathing patterns. This combination of interventions was chosen because it is physiologically capable of reducing the workload of breathing while improving oxygenation, but has not been systematically evaluated in the context of ADHF nursing. This study focuses on changes in respiratory complaints, use of accessory muscles, respiratory rate, and oxygen saturation during the intervention. The results of this study are expected to provide clinical evidence that this simple yet appropriate combination of interventions can be used as a standard nursing strategy in ADHF patients with impaired breathing patterns.

RESEARCH METHOD

This study uses a case study design with a nursing care approach to three patients. Acute Decompensated Heart Failure (ADHF) who were treated in the ICCU of Kanjuruhan Regional Hospital, Malang, from May to December 2025. The subjects consisted of Mr. A (72 years old), Mr. S (71 years old), and Mr. R (55 years old), all of whom met the criteria for an ineffective breathing pattern based on the Indonesian Nursing Diagnosis Standards. The intervention provided was oxygen therapy using a nasal cannula with a flow of 4 L/minute combined with a semi-Fowler position of 30–45°, applied consistently for three days. Respiration measurements were carried out every eight hours using a hospital-standard pulse oximeter, including parameters dyspnea, orthopnea, use of accessory respiratory muscles, respiratory rate, and oxygen saturation. Data were obtained through direct observation, interviews, and medical record documentation, then analyzed descriptively to describe changes in respiratory outcomes from the first to the third day.

RESULT

This study uses a case study design with a nursing care approach to three patients. Acute Decompensated Heart Failure (ADHF) who were treated in the ICCU of Kanjuruhan Regional Hospital, Malang, from May to December 2025. The subjects consisted of Mr. A (72 years old), Mr. S (71 years old), and Mr. R (55 years old), all of whom met the criteria for an ineffective breathing pattern based on the Indonesian Nursing Diagnosis Standards. The intervention provided was oxygen therapy using a nasal cannula with a flow of 4 L/minute combined with a semi-Fowler position of 30–45°, applied consistently for three days. Respiration measurements were carried out every eight hours using a hospital-standard pulse oximeter, including parameters dyspnea, orthopnea, use of accessory respiratory muscles, respiratory rate, and oxygen saturation. Data were obtained through direct observation, interviews, and medical record documentation, then analyzed descriptively to describe changes in respiratory outcomes from the first to the third day.

Table 1. Output Results according to NOC

No.	Exterior	Case 1			Case 2			Case 3		
		Day 1	Day 2	Day 3	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
1.	Dyspnea Complaints (+/-)	+	+	-	+	+	-	+	-	-
2.	Orthopnea Complaints (+/-)	+	-	-	+	+	+	+	+	-
3.	Use of respiratory muscles	+	-	-	+	+	-	-	-	-
4.	Respiratory Rate (RRx/minute)	26	23	22	34	28	23	23	22	21
5.	Oxygen Saturation	91	93	94	90	94	96	96	98	98

Information : + there are complaints/findings, - there are none

DISCUSSION

Monitoring results showed that all patients experienced improved respiratory outcomes during the three days of intervention. On the first day, all three patients still exhibited respiratory distress in the form of *dyspnea, orthopnea*, increased respiratory rate, and low oxygen saturation. Two patients were still using accessory muscles to compensate for ventilation. By the second day, signs of improvement began to appear. *Dyspnea* decreased in all patients, *orthopnea disappeared* in one patient, and the use of accessory muscles remained in only one patient. The respiratory rate decreased from 26–34 breaths/minute to 22–28 breaths/minute, while oxygen saturation increased to 93–98%. On the third day, all respiratory parameters achieved optimal improvement. No further respiratory symptoms were observed. *Dyspnea, orthopnea,* and use of accessory muscles in all three patients. Respiratory rates were near normal (21–23 breaths/minute), and oxygen saturation was stable above 94%. These results indicate that the intervention was effective in improving ventilation and oxygenation clinically from the first to the third day.

The results of the study showed a decrease *dyspnea*, improved respiratory rate, loss of accessory muscle use, and increased oxygen saturation after nasal cannula oxygen administration and the Semi-Fowler position. Clinically, these findings indicate decreased work of breathing and improved gas exchange. The decreased respiratory rate indicates a reduced ventilatory load, which is consistent with the mechanism of the Semi-Fowler position, which decreases diaphragmatic pressure and increases lung volume.

These findings align with those of (Antika et al., 2025) who stated that 30–45° head elevation utilizes gravity to lower the diaphragm, increasing chest expansion, and increasing alveolar ventilation. This mechanism supports increased oxygen saturation and reduces pulmonary congestion in ADHF patients. The initial condition of the patients in this study, consisting of dyspnea, orthopnea, tachypnea, and low saturation, also aligns with the clinical picture of ADHF in (Antika et al., 2025), which is influenced by increased left ventricular pressure and fluid accumulation in the lungs.

After three days of intervention, respiratory symptoms decreased in all patients, indicating that the combination of nasal cannula oxygen and the semi-Fowler position effectively improved ventilation and reduced the work of breathing. The physiological mechanisms involved increased lung expansion, optimized ventilation-perfusion, and decreased respiratory resistance. Overall, these study findings reinforce the evidence that simple interventions such as positional management and oxygen therapy play a significant role in improving breathing patterns in ADHF patients.

CONCLUSION

This study shows that the combination of oxygen therapy using a nasal cannula and the semi-Fowler position is effective in improving breathing patterns in patients with acute decompensated heart failure. The main findings indicate that this intervention reduces dyspnea and orthopnea, eliminates the use of accessory respiratory muscles, decreases respiratory rate toward the normal range, and increases oxygen saturation within three days of treatment.

This study contributes to nursing knowledge by strengthening evidence that simple and non-invasive interventions can be applied as an effective strategy to manage ineffective breathing patterns in ADHF patients, particularly in intensive care settings. The study also provides practical value by supporting the use of oxygen therapy and semi-Fowler positioning as part of standard nursing care for respiratory stabilization.

However, this study has limitations due to the small number of participants and the use of a case study design, which restrict the generalizability of the findings. As a result, this research cannot fully represent the broader population of ADHF patients. Further studies with larger sample sizes and more rigorous research designs are recommended to produce more comprehensive evidence and strengthen the clinical applicability of these interventions.

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