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Application of the 45° Semi-Fowler Position and Pursed Lip Breathing in STEMI Patients with Ineffective Breathing Pattern

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Abstract: ST-Elevation Myocardial Infarction (STEMI) is a cardiovascular emergency caused by complete occlusion of a coronary artery, which may result in myocardial ischemia, decreased cardiac function, pulmonary congestion, and impaired tissue oxygenation. Respiratory problems such as dyspnea, increased respiratory rate, and ineffective breathing pattern may occur in STEMI patients and require supportive nursing interventions. The combination of the 45° Semi-Fowler position and Pursed Lip Breathing is a simple non-pharmacological intervention that may help improve ventilation and oxygenation. **Objective:** This study aimed to describe the implementation of the combination of the 45° Semi-Fowler position and Pursed Lip Breathing in improving respiratory status among STEMI patients with ineffective breathing pattern. **Methodology:** This study used a descriptive nursing case study design involving two STEMI patients treated in the Intensive Cardiac Care Unit. Data were collected through direct observation of respiratory status before and after the intervention. The observed indicators were peripheral oxygen saturation (SpO_2) and respiratory rate. The data were analyzed descriptively by comparing respiratory parameters during the three-day observation period. **Findings:** The results showed a tendency toward improvement in respiratory status in both patients. Oxygen saturation increased from 96% to 98%, while respiratory rate decreased from 20–24 breaths per minute before the intervention to 16–20 breaths per minute after the intervention. **Implications:** The findings suggest that the combination of the 45° Semi-Fowler position and Pursed Lip Breathing may be used as a supportive independent nursing intervention to help improve oxygenation and reduce breathing effort in STEMI patients, without replacing standard medical therapy. **Originality:** This study provides a clinical description of the combined use of body positioning and breathing exercise in STEMI patients with ineffective breathing pattern, an area that remains limited in previous nursing case studies.

Keywords: ineffective breathing pattern; Pursed Lip Breathing; respiratory status; Semi-Fowler position; ST-Elevation Myocardial Infarction.

INTRODUCTION

Cardiovascular disease remains one of the leading global health problems and contributes substantially to worldwide mortality. The World Health Organization reported that cardiovascular disease causes approximately 17.9 million deaths each year, accounting for about 32% of all global deaths (Who, 2021). One acute cardiovascular condition that requires rapid management is ST-Elevation Myocardial Infarction (STEMI), a type of

myocardial infarction commonly caused by total coronary artery occlusion. This condition may lead to transmural myocardial ischemia, impaired cardiac pumping function, and tissue perfusion disturbances if not managed promptly and appropriately (Ibanez et al., 2018; Thygesen et al., 2019).

In Indonesia, heart disease is also one of the major non-communicable diseases that places a significant burden on healthcare services. The Basic Health Research report showed that the prevalence of heart disease based on physician diagnosis reached 1.5% of the Indonesian population (Kementerian Kesehatan, 2018). Lifestyle changes, smoking habits, physical inactivity, and the increasing prevalence of cardiovascular risk factors contribute to the high incidence of heart disease. In patients with STEMI, impaired cardiac function may trigger pulmonary congestion and reduce the body's ability to maintain adequate oxygenation. This condition may be characterized by dyspnea, tachypnea, increased breathing effort, use of accessory respiratory muscles, and discomfort during breathing. If not properly managed, impaired oxygenation may increase myocardial oxygen demand and worsen the patient's clinical condition (Hofmann et al., 2017).

Previous studies on body positioning have shown that the Semi-Fowler position can help improve breathing comfort and support better oxygenation in patients with cardiopulmonary disorders. This position allows more optimal lung expansion by reducing abdominal pressure on the diaphragm. As a result, air movement in and out of the lungs becomes more effective, leading to improved alveolar ventilation. Studies involving patients with cardiac and respiratory disorders have also shown that the Semi-Fowler position may help increase oxygen saturation and reduce dyspnea (Rahmah et al., 2024; Sari et al., 2025).

In addition to body positioning, Pursed Lip Breathing is widely used as a non-pharmacological nursing intervention to improve breathing patterns. This technique is performed by slowly inhaling through the nose and then exhaling through pursed lips. This mechanism may prolong the expiratory phase, maintain positive airway pressure, reduce air trapping, and improve ventilation effectiveness. Several studies have reported that Pursed Lip Breathing can help reduce dyspnea, improve oxygen saturation, and decrease the work of breathing in patients with respiratory disorders (Pereira de Araujo et al., 2015; Sakhaei et al., 2018). In nursing practice, ineffective breathing pattern is also recognized as a nursing diagnosis that requires systematic assessment and intervention based on

clinical signs such as abnormal respiratory rate, dyspnea, use of accessory muscles, and altered breathing pattern (Ppni, 2017).

Another group of studies has discussed the combination of body positioning and breathing exercises in patients with respiratory disorders, such as chronic obstructive pulmonary disease, heart failure, pneumonia, and pulmonary tuberculosis. These studies indicate that combined non-pharmacological interventions may provide benefits for patients' respiratory status. Nursing outcome and intervention standards also emphasize the importance of respiratory monitoring, positioning, breathing exercises, and oxygenation support as part of nursing care for patients with impaired respiratory status (Ppni, 2018, 2019). However, most previous studies have focused on chronic respiratory disorders or cardiopulmonary diseases in general. Research specifically addressing the application of the combination of the 45° Semi-Fowler position and Pursed Lip Breathing in patients with STEMI and the nursing diagnosis of ineffective breathing pattern remains limited (Mayer et al., 2018; Roberts et al., 2017).

The objective of this case study is to describe the application of the combination of the 45° Semi-Fowler position and Pursed Lip Breathing in improving respiratory status among patients with ST-Elevation Myocardial Infarction (STEMI) and the nursing diagnosis of ineffective breathing pattern. This study focuses on changes in respiratory status observed through peripheral oxygen saturation and respiratory rate before and after the intervention. Through a case study approach, this research is expected to provide a clinical description of the implementation of non-pharmacological nursing interventions as supportive measures in meeting the oxygenation needs of patients with STEMI.

The argument underlying this study is that the combination of the 45° Semi-Fowler position and Pursed Lip Breathing has the potential to improve respiratory status in patients with STEMI and ineffective breathing pattern. The 45° Semi-Fowler position is expected to enhance lung expansion and reduce abdominal pressure on the diaphragm, while Pursed Lip Breathing may help regulate breathing patterns, prolong the expiratory phase, and improve ventilation effectiveness. The combination of these two interventions is presumed to provide complementary effects in reducing the work of breathing, improving breathing comfort, and supporting better oxygenation without replacing the standard medical therapy provided to the patient (Mocan, 2025; Vatwani, 2019).

RESEARCH METHOD

The unit of analysis in this study was individual patients diagnosed with ST-Elevation Myocardial Infarction (STEMI) who experienced ineffective breathing pattern as a nursing problem. The study involved two patients treated in the Intensive Cardiac Care Unit (ICCU) of a private hospital in Malang, Indonesia, during November–December 2025. The main focus of this study was the change in respiratory status after the implementation of the 45° Semi-Fowler position combined with Pursed Lip Breathing. Respiratory status was observed through peripheral oxygen saturation (SpO_2) and respiratory rate, supported by clinical signs such as dyspnea, increased work of breathing, use of accessory respiratory muscles, and changes in breathing pattern. The nursing diagnosis of ineffective breathing pattern was determined based on the Indonesian Nursing Diagnosis Standards (Ppni, 2017).

This study used a nursing case study design with a nursing care process approach, including assessment, nursing diagnosis, intervention planning, implementation, and evaluation. This design was selected because the study aimed to describe the clinical application of a non-pharmacological nursing intervention in a real care setting, rather than to test a causal relationship statistically. A case study approach was considered appropriate because the intervention was applied to a limited number of patients with specific clinical characteristics. Therefore, this study did not use an analytical quantitative design but focused on describing the nursing care process and clinical changes observed during the intervention period. A similar case study approach has been used in previous nursing research involving the application of Semi-Fowler positioning and Pursed Lip Breathing in patients with STEMI (Amalia, 2025).

The data sources in this study consisted of primary and supporting clinical data. Primary data were obtained directly from the two patients through observation of respiratory status before and after the intervention. Supporting data were obtained from nursing assessment records and clinical information relevant to the patients' condition during treatment in the ICCU. The participants were selected purposively based on predetermined criteria. The inclusion criteria were patients with a medical diagnosis of STEMI, having the nursing problem of ineffective breathing pattern, being conscious and communicative, being able to follow breathing exercise instructions, and agreeing to participate in the study. The exclusion criteria were decreased consciousness, neuromuscular disorders affecting respiratory function, severe hemodynamic instability, and the need for mechanical ventilation. Informed consent was obtained from the patients,

and their identities were anonymized using initials to maintain confidentiality and privacy during scientific publication.

Data were collected through direct observation using a nursing observation sheet. Peripheral oxygen saturation was measured using a pulse oximeter available as standard equipment in the care unit, while respiratory rate was measured through direct observation for one full minute. The intervention was carried out by positioning the patient in a 45° Semi-Fowler position to support lung expansion and reduce abdominal pressure on the diaphragm. After the patient was comfortable, Pursed Lip Breathing was performed by instructing the patient to inhale slowly through the nose for two counts and exhale through pursed lips for four counts. The intervention was administered for 10–15 minutes, twice daily, for three consecutive days. This duration was used because breathing exercises within 10–15 minutes are considered feasible to produce a physiological response without causing excessive fatigue in patients (Rahmadhanty, 2022). The intervention procedure was also aligned with nursing intervention standards related to positioning, respiratory monitoring, and breathing exercises (Ppni, 2018).

The data were analyzed descriptively by comparing changes in respiratory parameters before and after the intervention across the three-day observation period. The analysis focused on changes in SpO_2 and RR in each patient, supported by narrative descriptions of respiratory condition during nursing care. The results were presented in tables and explanatory narratives to illustrate the tendency of respiratory status improvement after the intervention. During the observation period, both patients continued to receive standard medical therapy for STEMI according to the protocol determined by the physician in charge. The combination of the 45° Semi-Fowler position and Pursed Lip Breathing was provided as an additional nursing intervention and did not replace pharmacological therapy or standard medical management. The integration of pharmacological therapy and non-pharmacological nursing interventions may support the optimization of oxygenation status in patients with cardiopulmonary disorders (Purnamasari, 2024). The expected nursing outcomes were interpreted in relation to oxygenation and respiratory status indicators based on the Indonesian Nursing Outcome Standards (Ppni, 2019).

RESULT

The respiratory status of the two patients was observed for three consecutive days before and after the administration of the combination of the 45° Semi-Fowler position and

Pursed Lip Breathing. The parameters observed in this study were peripheral oxygen saturation (SpO_2) and respiratory rate. The changes in respiratory status of Mr. T are presented in Table 1.

Table 1. Changes in Respiratory Status of Mr. T After the Administration of the Combination of the 45° Semi-Fowler Position and Pursed Lip Breathing

Day	SpO_2 Before (%)	SpO_2 After (%)	RR Before (breaths/minute)	RR After (breaths/minute)
1	96	97	20	16
2	96	96	20	18
3	97	98	22	20

Based on Table 1, Mr. T showed a slight improvement in oxygen saturation during the three-day observation period. SpO_2 increased from 96% before the intervention on the first day to 98% after the intervention on the third day. Respiratory rate also showed a decreasing pattern after the intervention, from 20–22 breaths per minute before the intervention to 16–20 breaths per minute after the intervention. These findings indicate a tendency toward improvement in respiratory status after the combined intervention. The changes in respiratory status of Mr. N are presented in Table 2.

Table 2. Changes in Respiratory Status of Mr. N After the Administration of the Combination of the 45° Semi-Fowler Position and Pursed Lip Breathing

Day	SpO_2 Before (%)	SpO_2 After (%)	RR Before (breaths/minute)	RR After (breaths/minute)
1	96	97	24	20
2	97	98	22	20
3	98	98	22	18

Based on Table 2, Mr. N also demonstrated improvement in respiratory status during the three-day observation period. SpO_2 increased from 96% before the intervention on the first day to 98% after the intervention on the third day. Respiratory rate decreased from 24 breaths per minute before the intervention on the first day to 18 breaths per minute after the intervention on the third day. This pattern suggests a positive change in ventilation and oxygenation after the implementation of the 45° Semi-Fowler position combined with Pursed Lip Breathing.

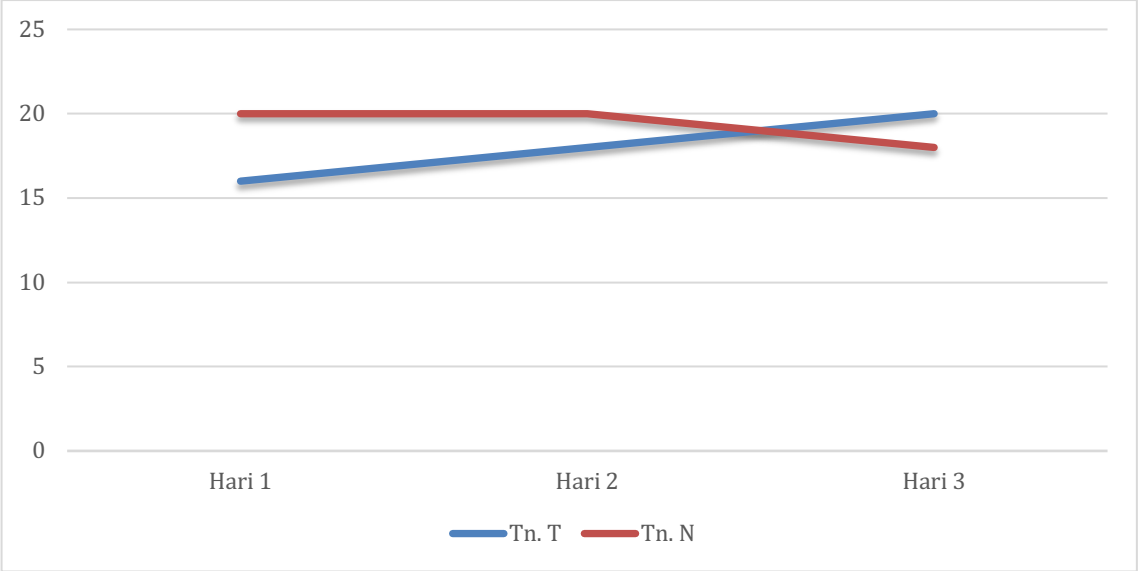

Figure 1. Comparison of Respiratory Rate Between the Two Patients Over Three Days

Based on Figure 1, respiratory rate after the intervention showed an improving trend in both patients during the observation period. Mr. T's respiratory rate ranged from 16 to 20 breaths per minute, while Mr. N's respiratory rate ranged from 18 to 20 breaths per minute. These findings indicate that the combination of the 45° Semi-Fowler position and Pursed Lip Breathing may help reduce the work of breathing and improve breathing patterns in patients with STEMI and ineffective breathing pattern.

Overall, the findings showed that both patients experienced a tendency toward improved respiratory status after receiving the combination of the 45° Semi-Fowler position and Pursed Lip Breathing. This improvement was indicated by increased SpO_2 and decreased respiratory rate during the three-day observation period. However, the findings should be interpreted carefully because this study involved only two patients and was conducted as a case study without a comparison group.

DISCUSSION

The findings of this case study showed a tendency toward improvement in respiratory status in both patients after receiving the combination of the 45° Semi-Fowler position and Pursed Lip Breathing for three consecutive days. In Mr. T, oxygen saturation increased from 96% to 98%, while respiratory rate decreased from 20–22 breaths per minute before the intervention to 16–20 breaths per minute after the intervention. A similar pattern was observed in Mr. N, whose oxygen saturation increased from 96% to 98%, while respiratory

rate decreased from 24 breaths per minute on the first day to 18 breaths per minute on the third day. These findings indicate that the combined intervention may support respiratory improvement, particularly through better oxygenation and reduced respiratory effort in patients with STEMI and ineffective breathing pattern.

The improvement in respiratory status may be explained by the complementary physiological mechanisms of the two interventions. The 45° Semi-Fowler position can help improve lung expansion by reducing abdominal pressure on the diaphragm, thereby allowing more effective chest movement during inspiration. This position may also improve patient comfort, reduce the sensation of breathlessness, and support alveolar ventilation. In patients with STEMI, impaired cardiac function may lead to pulmonary congestion and increased work of breathing. Therefore, positioning that facilitates ventilation may help reduce respiratory workload and support oxygen delivery to body tissues (Rahmah et al., 2024).

Pursed Lip Breathing may further contribute to respiratory improvement by helping patients regulate their breathing pattern more effectively. This technique prolongs the expiratory phase, helps maintain positive airway pressure, and supports more controlled airflow during breathing. Through this mechanism, trapped air can be released more effectively, ventilation becomes more efficient, and breathing effort may decrease. In this study, the decrease in respiratory rate after the intervention suggests that both patients were able to achieve a more controlled breathing pattern following the combined intervention. This finding is consistent with the physiological basis of Pursed Lip Breathing as a breathing exercise that supports ventilation efficiency and reduces dyspnea (Sakhaei et al., 2018). The findings of this study are in line with previous studies reporting that the Semi-Fowler position can improve oxygenation and respiratory comfort in patients with cardiopulmonary disorders. Previous research has shown that Semi-Fowler positioning may facilitate chest expansion and improve oxygen saturation in patients with heart failure and other respiratory problems (Sari et al., 2025). Similarly, studies on Pursed Lip Breathing have reported improvements in dyspnea, respiratory rate, and oxygen saturation among patients with respiratory disorders, particularly chronic obstructive pulmonary disease and other conditions associated with impaired ventilation (Pereira de Araujo et al., 2015). However, most previous studies have examined Semi-Fowler positioning or Pursed Lip Breathing separately, or have focused on chronic respiratory disorders rather than acute cardiac conditions.

The novelty of this case study lies in the application of the combined intervention in patients with STEMI who experienced ineffective breathing pattern as a nursing diagnosis. Although the number of cases was limited, this study provides a clinical description of how two simple non-pharmacological nursing interventions can be integrated into cardiovascular nursing care. The combination of Semi-Fowler positioning and Pursed Lip Breathing may offer complementary benefits: positioning supports lung expansion and comfort, while breathing exercise helps regulate inspiration and expiration. This combined approach may be particularly useful in patients who are conscious, cooperative, hemodynamically stable, and able to follow breathing instructions. The use of nursing interventions such as positioning, respiratory monitoring, and breathing exercises is also consistent with nursing intervention standards for patients with respiratory problems (Ppni, 2018).

The results of this study have practical meaning for nursing care in cardiovascular units. Patients with STEMI may experience respiratory discomfort due to impaired cardiac function, pulmonary congestion, anxiety, and increased oxygen demand. In this context, nurses need interventions that are safe, simple, low-cost, and easy to apply without interfering with standard medical treatment. The combination of the 45° Semi-Fowler position and Pursed Lip Breathing may be used as a supportive nursing intervention to help improve comfort, reduce respiratory effort, and support oxygenation. However, this intervention should not be interpreted as a replacement for pharmacological therapy, oxygen therapy, reperfusion therapy, or other standard medical management for STEMI (Ibanez et al., 2018)

Reflectively, the positive implication of this intervention is that it can strengthen independent nursing actions in managing oxygenation problems. The intervention does not require special equipment, can be performed at the bedside, and may be repeated according to patient tolerance. Nevertheless, there are also limitations and potential risks that must be considered. Pursed Lip Breathing requires patient cooperation and may not be suitable for patients with decreased consciousness, severe hemodynamic instability, extreme fatigue, or those requiring mechanical ventilation. In addition, changes in oxygen saturation and respiratory rate may be influenced by other factors, such as oxygen therapy, medication, pain control, anxiety level, and the patient's overall cardiac condition. Therefore, the improvement observed in this case study should be interpreted cautiously.

Based on these findings, the combination of the 45° Semi-Fowler position and Pursed Lip Breathing can be considered as a supportive nursing intervention for STEMI patients with ineffective breathing pattern, particularly in patients who are stable and able to follow instructions. Nurses in cardiovascular care units may integrate this intervention into routine nursing care by first assessing respiratory rate, oxygen saturation, breathing pattern, level of consciousness, hemodynamic status, and patient tolerance. The intervention should be performed under continuous observation and documented systematically before and after implementation. Future studies with larger samples, control groups, and longer observation periods are needed to confirm the effectiveness of this combined intervention and to determine its clinical significance in improving respiratory status among patients with acute cardiac conditions.

PRACTICAL IMPLICATION

The combination of the 45° Semi-Fowler position and Pursed Lip Breathing can be used as an independent nursing intervention to support oxygenation management in cardiovascular care settings. This intervention is simple, low-cost, does not require special equipment, and can be integrated into routine nursing care for patients with STEMI who experience ineffective breathing pattern. Nurses should apply this intervention after assessing patient stability, consciousness, respiratory status, and ability to follow breathing instructions.

In clinical practice, this intervention may help improve breathing comfort, reduce respiratory effort, and support oxygenation when used alongside standard medical therapy. Therefore, healthcare institutions may consider including Semi-Fowler positioning and guided breathing exercises in nursing care protocols for patients with cardiopulmonary problems. Training and standard operating procedures are also needed to ensure that nurses perform the intervention consistently, safely, and according to patient condition.

CONCLUSION

This case study shows that the combination of the 45° Semi-Fowler position and Pursed Lip Breathing tended to improve respiratory status in two patients with ST-Elevation Myocardial Infarction (STEMI) and ineffective breathing pattern. The improvement was indicated by an increase in peripheral oxygen saturation from 96% to 98% and a decrease in respiratory rate from 20–24 breaths per minute before the

intervention to 16–20 breaths per minute after the intervention. These findings suggest that the combined intervention may help support ventilation, improve oxygenation, and reduce breathing effort during the acute care period.

The scientific contribution of this study lies in its clinical description of a simple, safe, and applicable non-pharmacological nursing intervention for patients with STEMI who experience respiratory problems. This study provides practical evidence that the integration of body positioning and breathing exercise may serve as a supportive nursing approach in cardiovascular care settings. The intervention can strengthen independent nursing actions in supporting oxygenation needs without replacing standard medical therapy.

However, this study has several limitations. The study involved only two patients, used a case study design, and did not include a control group. Therefore, the findings cannot be generalized to all patients with STEMI. Changes in oxygen saturation and respiratory rate may also be influenced by other factors, such as pharmacological therapy, oxygen therapy, hemodynamic status, pain, and anxiety. Further studies using experimental designs, larger sample sizes, control groups, and longer observation periods are needed to confirm the effectiveness and clinical significance of the combination of the 45° Semi-Fowler position and Pursed Lip Breathing in improving respiratory status among patients with acute cardiac conditions.

AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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