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Changes in Breathing Patterns of Patients with COPD Exacerbation After Nebulization at the Pulmonary Outpatient Clinic of RSUD Kabupaten Kediri

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ABSTRACT
Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by persistent airflow limitation. COPD exacerbation often causes increased dyspnea, respiratory rate, and decreased oxygen saturation, leading to an ineffective breathing pattern. This study aimed to determine changes in the breathing pattern of patients with COPD exacerbation after nebulization therapy at the Pulmonary Outpatient Clinic of RSUD Kabupaten Kediri. This study used a descriptive case study design involving five patients with COPD exacerbation. Data were collected through direct observation before and after nebulization using respiratory rate (RR), oxygen saturation (SpO_2), and the Borg CR10 Scale to assess the level of dyspnea. The results showed a decrease in respiratory rate and Borg score, as well as an increase in oxygen saturation in all patients after nebulization. In conclusion, nebulization provides a positive response in improving the breathing pattern of patients with COPD exacerbation in the outpatient setting.

Keywords: **Breathing Pattern, COPD Exacerbation, Nebulization**

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by persistent and progressive airflow limitation caused by chronic inflammatory responses of the airways and lungs to harmful particles or gases. COPD is a global health problem with high prevalence and significant contributions to morbidity and mortality. The World Health Organization (WHO) reports that COPD is among the top three causes of death worldwide and is a major cause of decreased quality of life due to chronic respiratory impairment and activity limitations.

Patients with COPD frequently experience exacerbations, defined as acute worsening of respiratory symptoms beyond normal daily variations. COPD exacerbations are commonly characterized by increased dyspnea, elevated respiratory rate, reduced activity tolerance, and impaired oxygenation. During exacerbations, ineffective breathing patterns become a dominant nursing problem due to increased airway resistance, bronchospasm, and impaired pulmonary

ventilation. Clinically, breathing pattern disturbances are manifested by rapid and shallow breathing, use of accessory respiratory muscles, chest retractions, and subjective complaints of shortness of breath.

One of the primary interventions used in the management of COPD exacerbations is nebulization therapy. Nebulization is an inhalation therapy that delivers medication directly to the respiratory tract in aerosol form, allowing rapid bronchodilation, reduced airway resistance, and improved alveolar ventilation. In pulmonary outpatient clinics, nebulization is frequently administered as part of standard management for COPD exacerbations.

Evaluation of patient responses to nebulization therapy is essential to determine its effectiveness. Objective and subjective parameters commonly used to assess breathing patterns include respiratory rate (RR), oxygen saturation (SpO_2), and dyspnea severity measured using the Borg CR10 Scale. Systematic evaluation of these parameters before and after nebulization can provide valuable evidence regarding changes in breathing patterns.Based on these considerations, this study aimed to describe changes in the breathing patterns of patients with COPD exacerbation after nebulization therapy at the Pulmonary Outpatient Clinic of RSUD Kabupaten Kediri.

METHODS

This study employed a descriptive observational research design using a pre- and post-intervention approach. The study was conducted at the Pulmonary Outpatient Clinic of RSUD Kabupaten Kediri between 29 December 2025 and 6 January 2026. The study subjects were patients diagnosed with COPD exacerbation who attended the pulmonary outpatient clinic during the study period. Inclusion criteria were: patients diagnosed with COPD exacerbation, patients receiving nebulization therapy, patients who were conscious and cooperative, and patients who agreed to participate in the study. A total of five patients met the inclusion criteria and were included as respondents.

The focus of the study was changes in breathing patterns following nebulization therapy. Breathing patterns were assessed using three parameters: respiratory rate (breaths per minute), oxygen saturation (SpO_2) measured using a pulse oximeter, and dyspnea severity assessed using the Borg CR10 Scale. Data collection was conducted through direct observation. Prior to nebulization therapy, baseline measurements of respiratory rate, oxygen saturation, and Borg CR10 score were recorded. Nebulization therapy was then administered according to standard procedures at the pulmonary outpatient clinic. After completion of nebulization, the same parameters were reassessed and recorded using a standardized observation sheet.

All collected data were analyzed descriptively to illustrate changes in breathing patterns before and after nebulization therapy. The focus of this study was changes in the breathing patterns of patients with COPD exacerbation after nebulization, assessed by respiratory rate, oxygen saturation (SpO2), and shortness of breath using the Borg Scale at the Pulmonary Polyclinic of Kediri District Hospital.

The operational definitions of the variables are as follows:

Variabel	Operational Definition	Indicators	Measuring Instrument	Scale
Breathing pattern	The respiratory condition of a COPD exacerbation patient that describes the ventilation capacity	Respiratory rate, SpO2, level of shortness of breath	Observation sheet	Ordinal
Respiratory rate (RR)	The number of breaths a patient takes in one minute as an indicator of respiratory work.	Breaths/minute	Watch	Ratio
Oxygen saturation (SpO2)	Percentage of oxygen-bound hemoglobin SpO2 in peripheral blood	Persentase	Pulse oximeter	Rasio
Degree of shortness of breath	Patient's subjective perception of the degree of shortness of breath	Skor Borg CR10 (0-10)	Skala Borg CR10	Ordinal

The instrument used was an observation sheet containing:

1) Respondent identity;

2) Respiratory rate (RR);

3) Oxygen saturation (SpO2) using a pulse oximeter;

4) Level of shortness of breath using the Borg CR10 Scale. Measurements were taken before and after nebulization.

The data collection method used direct observation. The data collection stages were:

1) Researchers approached patients who met the inclusion criteria;

2) Researchers explained the purpose and procedures of the study to respondents;

3) Researchers obtained respondents' informed consent;

4) Researchers conducted initial observations and measurements (respiratory rate, SpO2, Borg Scale) before nebulization;

5) Patients were given nebulization therapy according to standards;

6) After nebulization, researchers conducted repeat measurements;

7) Results were recorded on the observation sheet.

RESULT

All five respondents presented with dyspnea of varying severity prior to nebulization. Following nebulization therapy, all patients demonstrated consistent improvements in breathing patterns. Respiratory rate decreased in all respondents, oxygen saturation increased, and Borg CR10 scores indicated reduced perceived dyspnea.

These findings indicate that nebulization therapy was associated with improved ventilation and reduced respiratory distress among patients with COPD exacerbation in the outpatient setting.

This study involved five patients with exacerbations of COPD who received nebulization therapy at the Pulmonary Polyclinic of Kediri Regency Hospital. All respondents presented with varying degrees of shortness of breath and received nebulization according to the standard of care at the Pulmonary Polyclinic.

Table 4.1 Observation Results of Changes in Breathing Patterns in Patients with COPD Exacerbation

Responden	**RR sebelum (x/menit)**	**RR sesudah (x/menit)**	**SpO_2 Sebelum (%)**	**SpO_2 Sesudah (%)**	**Borg Sebelum**	**Borg Sesudah**
1	28	22	90	95	5	**3**
2	30	24	88	93	6	**4**
3	26	21	91	96	4	**2**
4	32	25	87	92	7	**4**
5	29	23	89	94	6	**3**

Based on Table 4.1, all respondents showed a decrease in respiratory frequency and shortness of breath scores as well as an increase in oxygen saturation after nebulization.

The results showed consistent improvements in breathing patterns across all respondents following nebulization therapy. Respiratory rate decreased in all patients after nebulization, indicating reduced work of breathing. Oxygen saturation levels increased in all respondents, reflecting improved pulmonary ventilation and oxygenation. Additionally, Borg CR10 scores decreased in all patients, indicating a reduction in perceived dyspnea severity.

Overall, the findings demonstrate that nebulization therapy resulted in measurable improvements in respiratory parameters and subjective comfort among patients with COPD exacerbation.

DISCUSSION

The results of this study indicate that administering nebulization therapy to patients with COPD exacerbations in the pulmonary outpatient clinic had a positive impact on improving breathing patterns. The decrease in respiratory rate observed in all respondents indicates a reduction in the work of breathing after bronchospasm is relieved. The increase in oxygen saturation reflects improved ventilation and gas exchange in the lungs.

Furthermore, the decrease in Borg scores in all respondents indicates a decrease in subjective perception of shortness of breath after nebulization. These findings align with the theory that nebulized bronchodilators can improve airflow and reduce shortness of breath in patients with COPD exacerbations. These findings also support the effectiveness of nebulization as an effective intervention in improving breathing patterns in patients with COPD exacerbations in outpatient settings, particularly in the pulmonary outpatient clinic. These results also support the role of nurses in monitoring patients' respiratory responses after nebulization therapy in the pulmonary outpatient clinic as part of nursing care.

The findings of this study indicate that nebulization therapy has a positive impact on breathing patterns in patients with COPD exacerbation treated in an outpatient setting. The observed decrease in respiratory rate suggests a reduction in respiratory effort following bronchodilation. This improvement can be attributed to reduced airway resistance and alleviation of bronchospasm after nebulized medication reaches the lower airways.

The increase in oxygen saturation observed in all respondents indicates improved alveolar ventilation and gas exchange. In COPD exacerbation, airway obstruction and ventilation–perfusion mismatch often lead to hypoxemia. Nebulization therapy helps improve airflow, thereby enhancing oxygen delivery to peripheral tissues.

Furthermore, the reduction in Borg CR10 scores reflects decreased subjective perception of dyspnea. Dyspnea is a primary symptom affecting quality of life in COPD patients, and its reduction following nebulization indicates effective symptom relief. These findings are consistent with previous studies that report improved respiratory comfort and reduced dyspnea after nebulized bronchodilator therapy in COPD exacerbations.

The results emphasize the important role of nurses in monitoring respiratory responses before and after nebulization therapy. Systematic assessment of respiratory rate, oxygen saturation, and dyspnea severity provides essential clinical information to evaluate intervention effectiveness and guide ongoing nursing care in pulmonary outpatient services.

CONCLUSION

Based on the results of a study on five patients with COPD exacerbation, it can be concluded that nebulization at the Pulmonary Polyclinic at Kediri Regency Hospital resulted in positive changes in patients' breathing patterns. These changes were characterized by a decrease in respiratory rate, an increase in oxygen saturation, and a decrease in shortness of breath based on the Borg Scale.

Nebulization therapy resulted in positive changes in the breathing patterns of patients with COPD exacerbation at the Pulmonary Outpatient Clinic of RSUD Kabupaten Kediri. Improvements were demonstrated by decreased respiratory rate, increased oxygen saturation, and reduced dyspnea severity as measured by the Borg CR10 Scale. These findings support the effectiveness of nebulization as an essential intervention in the outpatient management of COPD exacerbations and highlight the importance of continuous respiratory assessment in nursing practice.

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