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COMBINATION OF HIGHT FLOW NASAL CANULA AND SEMI FOWLER POSITION TO INCREASE OXYGENATION WITH ACUTE LUNGS CARDIOGENIC OEDEMA

Alifa Tanti Purnamasari[1], Syafira Aulia Rahmah[2] , Indah Dwi Pratiwi[2]
[1]Universitas Airlangga Surabaya
[2]Universitas Muhammadiyah Malang
Corresponding Email: alifa.tanti.purnamasari-2023@fkm.unair.ac.id

ABSTRACT

Acute cardiogenic lung edema is an emergency condition in which fluid accumulates in the lung cavity due to ventricular failure including blood throughout the body. The most fatal consequence of this condition is the disruption of the gas exchange process in the alveoli. One of the characteristic symptoms of this disease is shortness of breath which must be treated immediately so as not to fall into hypoxic or hypoxemic conditions. Therefore writing this paper aims to test the effectiveness of the combination of high-flow nasal cannula and semi-Fowler's position to increase oxygenation in patients with cardiogenic acute pulmonary edema. The research method used is a case report. This research was conducted for 4 days of treatment from 11-15 May 2022 at the Kanjuruhan Regional General Hospital, Malang Regency. After 4 days of action, there was a positive change in the patient's oxygenation. It can be seen from the results of monitoring SpO2 and RR on day 3 of treatment that there was an increase in SpO2 of 93% and a decrease in RR of 18x/minute which was getting better until day 4 of treatment. Problems related to oxygenation in the lungs, acute cardiogenic edema occurs due to accumulation of fluid in the lung cavity Actions that must be taken to continue to meet the need for adequate oxygenation in patients so that a combination of high-flow nasal cannula therapy and semi -Fowler's position is carried out to improve patient oxygenation. The recommendations for giving this therapy are by considering the replacement of the type of mask and the flow of oxygen given.

Keywords

Accurate Lungs Edema, Oxygenation , High Flow Nasal Canul, Semifowler's Position

INTRODUCTION

Accurate cardiogenic pulmonary edema is an emergency condition that is life-threatening if action is not taken as soon as possible (Hayat, 2021) . In sufferers of acute lung cardiogenic edema, fluid accumulation occurs in the lung cavity due to the left ventricle being unable to pump blood

coming from the lungs, resulting in increased pressure in the pulmonary circulation which causes fluid to push into the lung tissue (Khasanah & Yudono, 2019) . So there will be interference with the patient's oxygenation which is related to the oxygen supply in the blood and tissues. If this occurs continuously, it will result in hypoxia and disrupt the continuity of cell metabolism and can even result in tissue death (Saripudin, Emaliyawati, & Somantri, 2018) .

Based on data from WHO, cardiovascular disease is one of the main health problems in developed and developing countries. In the world, 17.5 million people (31%) of the 58 million deaths are caused by heart disease (Peek & Buczinski, 2018) . In Australian case reports, there are 96-700 adults suffering from heart failure with complications, namely acute lung cardiogenic edema (Purvey, 2017) . Meanwhile, data from the Indonesian Ministry of Health (2019) shows that in Indonesia there are 5% of heart failure cases which are the cause of acute lung edema . Cases of acute pulmonary edema at Margono Soekarjo Hospital, Purwokerto, based on data collected from the Intensive Care room , including the ICU/ICCU/HCU, found cases of patients with acute pulmonary edema cardiogenic from January 2021 to December 2021 totaling 84 cases with the use of mechanical ventilators for treatment. as many as 64 cases (Kurniawan [1] & Kariasa [2] , 2022) . Meanwhile, based on the results of interviews with the head of the room at the ICCU at Kepanjen Regional Hospital, he stated that in 2022 he reported that there would be 21 cases from March-September.

Impaired oxygenation in patients with acute lung cardiogenic edema is also caused by disruption of the oxygen diffusion process in the lungs resulting in a decrease or increase in pH, PCO2 and HCO3 (Ilyas, 2016) . The impact of disrupting this process will result in the patient experiencing hypoxemia (Hetty Nendrastuti, 2010) . This is characterized by a decrease in oxygen saturation reaching <90% and an increase in respiration rate (Laksmi, Suprapta, & Surinten, 2020) .

Providing oxygen is one of the therapies used to meet the oxygenation needs of patients (Mugihartadi & Handayani, 2020) . Based on Susihar & Pertiwi, (2021) the use of a nasal cannula to maintain an adequate oxygen supply in the body can increase oxygen levels in sufferers. In administering oxygen therapy, an effective position is also required so that the lungs can expand completely and adequate oxygen flow will enter the lungs (Safitri et al., 2011) . Based on Wirawan et al., (2022) reported that giving a semi-Fowler position with the head elevated 45 degrees can effectively reduce shortness of breath due to the effect of gravity, thus helping to reduce abdominal pressure and increase lung expansion. This research was conducted to determine the effectiveness of a combination of high flow nasal cannula therapy and semi-Fowler position to improve oxygenation in patients with acute lung cardiogenic edema .

Case Report

A 73 year old man was taken to the intensive cardiac care unit with complaints of severe shortness of breath, restlessness and an unproductive cough since 3 days ago. Based on the results of interviews with the patient's family, they said that 3 years ago the patient was admitted to hospital with the same complaint, while at home he regularly took the recommended medicines but often felt short of breath when doing heavy activities.

The results of the examination of the patient's vital signs showed blood pressure 94/55 mmHg, pulse 122x/minute or tachycardia, temperature 37˚C, respiration

rate 29x/minute and oxygen saturation 87% in free air. Meanwhile, the results of the examination based on B1-B6 showed: in B1 (Breathing) , there was use of the accessory muscles for breathing, namely the intercostae, and when auscultated, crackles were heard in the right lung field. B2 (Bleeding) shows the third heart sound, namely a gallop at IC 4, irregular heart rhythm and visible jugular venous pressure. B3 (Brain) The patient's GCS is E 4 V 4 M 6 and positive light reactions in the right and left eyes. B4 (Bladder), B5 (Bowel) and B6 (Bone) are within normal limits.

Laboratory examination results showed an increase in the troponin enzyme from the normal limit of 0.15 ng/mL. Then, in the results of the blood gas analysis, there was a decrease in blood pH levels reaching 7.28 and an increase in pCo2 of 43.0 mmHg and pO2 of 226.0 mmHg. This condition is called metabolic acidosis. Meanwhile, the thorax photo showed cardiomegaly with a cardio thorax ratio of 77% and perivascular haze. The results of the electrocardiogram showed atrial fibrillation and ventricular tachycardia with a heart rate of 120x/minute.

Pharmacological therapy given to the patient included IVFD Nacl 0.9% 12 tpm. Then drugs are given via bolus such as Digoxin 0.5 mg, Morphine 2 mg, Furosemide 40 mg and Lansoprazole 2x 30 mg . Type of antibiotic Cefoperazon 2x1 gram. The administration of a drip is Carnit 50 mcg. The patient was also given medication for nebulization, namely Cambiven 2x/day.

METHOD

The research design used was Case Study with a Single Case in patients with acute lung cardiogenic edema. This case study was carried out on 11-15 May 2022 in the intensive cardiac care unit at the Kanjuruhan Regional General Hospital, Malang Regency.

DISCUSSION

Acute lung cardiogenic edema is a condition where there is an accumulation of fluid in the pulmonary intestinal space due to failure of the ventricles to contract to pump blood throughout the body to meet adequate oxygen needs (Khasanah, 2019) . An increase in lung fraction is a form of compensation for the body to be able to meet oxygen perfusion in the tissues as well as a trigger for patients experiencing shortness of breath (Suharto, Agusrianto, Manggasa, & Liputo, 2020) . This shortness of breath also causes the patient to tire easily due to insufficient heart fluid, which inhibits normal fluid circulation and oxygen circulation. This condition is supported by a decrease in oxygen saturation and an increase in the patient's respiration rate which can result in hypoxemia.

The condition of hypoxemia in patients with acute lung cardiogenic edema is also characterized by an imbalance in the partial pressure of O2 and Co2. This is caused by problems in the simple passive diffusion process of O2 and CO2 down the partial pressure gradient. In patients with acute cardiogenic pulmonary edema, this occurs due to increased pressure in the left ventricle so that blood from the lungs has difficulty entering the heart and pooling in the pulmonary blood vessels. If the pressure in the blood vessels of the lungs gets higher, some of the fluid from the blood vessels will be pushed in and out of the alveoli (Komiya, Akaba, Kozaki, Kadota, & Rubin, 2017) .

According to (Putra, 2016) gas exchange in the lungs affects pCO2 and pO2 levels in the alveoli and blood vessel capillaries. Disturbances in gas exchange are caused by lack of ventilation so that O2 levels cannot remove Co2 in the alveoli. So the pCO2 level in the alveoli is higher than pO2, this causes pCO2 to diffuse into the capillaries causing hypoxemia and pCO2

levels to increase, as is the case with Mr. T's blood gas analysis (Ko et al., 2020) .

High Flow Nasal Cannula (HFNC). HFNC is a non-invasive ventilation therapy device that has been established in recent years as an alternative to non-invasive ventilation therapy. HFNC is also used well in patients who experience hypoxemia or respiratory failure (Salaka, ., S, & Sudarta, 2022) . In sufferers of acute lung cardiogenic edema, using High Flow Nasal Cannula can provide oxygen and moisturize up to 100%. This is in line with Mauri et al., (2017) that the use of High Flow Nasal Cannula can increase gas exchange by up to 57% compared to the use of conventional oxygen therapy. In research (Huang et al., 2019), administering the High Flow Nasal Cannula produces positive pressure which can reduce PaCO2 levels so that the oxygen saturation target reaches 88-92%, which can significantly reduce the death rate due to hypoxemia.

Meanwhile, give a semi-fowler or half-sitting position by elevating the head 30°–45°. So it can reduce oxygen consumption and increase maximum lung expansion, as well as overcome damage to gas exchange associated with changes in alveolar capillary membranes (Kanine, Bakari, Sarimin, A.Merentek, & Lumi, 2022) . In a study by Wirawan et al., (2022), the results showed an increase in oxygen saturation in patients in the semi-fowler position compared to the fowler position. This is related to the semi-fowler position which can maximize lung volume, speed and flow capacity, increase spontaneous tidal volume, and reduce blood pressure. on the diaphragm provided by the stomach contents, increasing the compliance of the respiratory system so that oxygenation increases. In line with Aprilia et al., (2022), the average oxygen saturation before being given the semi-Fowler position was 95.40% and there was an increase in oxygen saturation after being given the semi-Fowler position, which was 98.20%.

The combination of these two therapies has a positive effect on Mr T's oxygenation. Oxygen saturation is an applicable predictor for describing gas exchange problems in the lungs. One of the results of providing this therapy shows that this therapy was given for 5 days, namely an increase in oxygen saturation starting from the 3rd day of treatment reaching 93 % and on the 5th day reaching 98%. When oxygen saturation increases, it indicates that the body's oxygen needs are sufficient so that the respiration rate which initially increases due to hyperventilation gradually decreases.

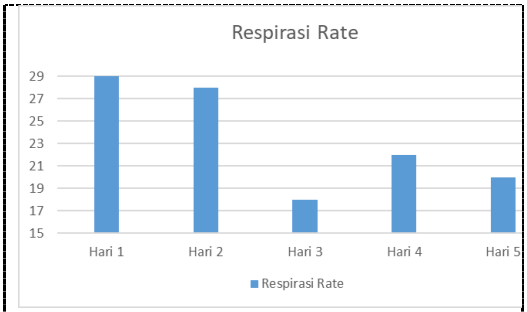

Figure 1. Respiration Rate Observation Results

This is in line with the decrease in RR for Mr. T as shown in Table 6 1 on the 3rd day of treatment reached 18x/minute until the 5th day of treatment, namely 20x/minute. The results of the evaluation used during the 5 days of treatment based on the SIKI DPP PPNI Working Group, (2018) namely related to airway clearance, gas exchange and breathing patterns showed positive results. The criteria for success in providing this intervention are dyspnea which decreases starting on the 3rd day of treatment. Then the improved breathing pattern was proven by the RR results, namely 18x/minute on the 3rd day of treatment and 20x/minute on the 5th day of treatment.

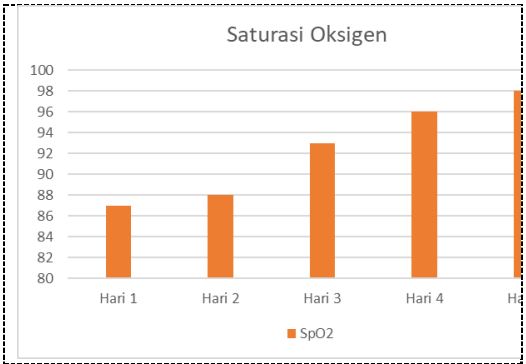

Figure 2. SpO2 observation results

Conclusion

Based on the results of 5 days of treatment in patients with Acute lung cardiogenic edema , it shows that there is a positive effect from the combination of giving a High Flow Nasal Cannula and the semi-fowler position. The expected outcome is a decreased level of dyspnea. This can be seen from the results of monitoring Mr.'s respiration rate and oxygen saturation. T showed improvement on day 3 with an increase in oxygen saturation of 93% and a decrease in RR of 18x/minute until on day 5 of treatment the condition was getting better with oxygen saturation of 98% and RR of 20x/minute.

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