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THE EFFECT OF NASAL CANNULA USE ON BLOATING INCIDENTS AT KARSA HUSADA HOSPITAL, BATU CITY

Pengaruh Penggunaan Nasal Kanula Terhadap Kejadian Kembung di RSUD Karsa Husada Kota Batu

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ABSTRACT
Oxygen administration via nasal cannula at a dose of 3-4 liters/minute is standard therapy for hypoxemic patients, but it has the potential to cause bloating due to air insufflation into the gastrointestinal tract. This study analyzed the relationship between nasal cannula use at a dose of 3-4 liters/minute for >8 hours and the incidence of bloating. The study used an observational analytical study with a cross-sectional design in 30 patients who received oxygen therapy via nasal cannula at a dose of 3-4 liters/minute for >8 hours at Karsa Husada Batu Hospital. Data were analyzed using a Chi-Square Test comparing the proportion of bloating before and after the intervention. Before the intervention, no patients reported bloating. After administration of 3-4 liters/minute for >8 hours, 26 respondents (86.7%) experienced bloating. The Chi-Square test showed a significant difference (χ^2=24.04; df=1; p<0.05). Conclusion: Use of a nasal cannula at a dose of 3-4 liters/minute for >8 hours significantly increases the risk of bloating.

Keywords: *Bloating, Hypoxemia, Duration of therapy, Nasal cannula, Oxygen dose*

ABSTRAK
Pemberian oksigen melalui kanula hidung dengan dosis 3-4 liter/menit merupakan terapi standar bagi pasien hipoksemia, namun berpotensi menimbulkan kembung akibat masuknya udara ke dalam saluran cerna. Penelitian ini menganalisis hubungan antara penggunaan kanula hidung dengan dosis 3-4 liter/menit selama >8 jam dengan kejadian kembung. Penelitian ini menggunakan penelitian analitik observasional dengan rancangan potong lintang pada 30 pasien yang mendapatkan terapi oksigen melalui kanula hidung dengan dosis 3-4 liter/menit selama >8 jam di RSUD Karsa Husada Batu. Data dianalisis menggunakan Uji Chi-Square yang membandingkan proporsi kembung sebelum dan sesudah intervensi. Sebelum intervensi, tidak ada pasien yang melaporkan kembung. Setelah pemberian 3-4 liter/menit selama >8 jam, sebanyak 26 responden (86,7%) mengalami kembung. Uji Chi-Square menunjukkan adanya perbedaan yang bermakna (χ^2=24,04; df=1; p<0,05). Kesimpulan: Penggunaan kanula nasal dengan dosis 3-4 liter/menit selama >8 jam secara signifikan meningkatkan risiko kembung.

Kata kunci: *Dosis oksigen, Durasi terapi, Hipoksemia, Kanula hidung, Kembung*

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INTRODUCTION

To address hypoxic conditions in patients, oxygen administration is an important nursing intervention frequently performed in hospitals. Various oxygen delivery methods can be used to meet the required oxygen concentration and patient condition. One of the most commonly used is low-flow oxygen therapy, which is 1-6 liters per minute. This is considered convenient and practical, and does not significantly interfere with patient activities such as eating or speaking.

Despite its many benefits, the use of nasal cannulas also carries risks. Air insufflation into the gastrointestinal tract, causing bloating or abdominal distension, is a possible but often overlooked or untreated complication. When the administered oxygen flow exceeds the capacity of the pharynx to accommodate it, the flow flows into the trachea. As a result, some pressurized air enters the esophagus and stomach. This risk increases in patients with a lower level of consciousness, mouth breathers, or patients receiving higher oxygen flows (e.g., above 4-5 liters/minute) than generally recommended.

Abdominal distension is not a condition to be taken lightly. In critically ill patients, bloating can lead to increased intra-abdominal pressure, which in turn can push the diaphragm upward, restrict lung expansion, and worsen the patient's respiratory status. Furthermore, bloating causes discomfort, pain, decreased appetite, nausea, and can increase patient and family anxiety, ultimately impacting the healing process and length of hospital stay.

Based on initial observations and unstructured interviews with several nurses at Karsa Husada Hospital in Batu City, nasal cannula use is the most commonly chosen method of oxygen delivery, especially for patients with mild to moderate respiratory distress. However, monitoring for complications such as bloating does not appear to be a primary focus of nursing care. There is no measurable and systematic data on the extent of this occurrence at the hospital.

Therefore, this study is crucial to identify and quantify the effect of nasal cannula use on the incidence of bloating in patients at Karsa Husada Hospital, Batu City. Empirical data are expected to provide a basis for developing more specific nursing protocols or interventions to prevent this complication, thereby improving the quality of nursing care and patient safety.

Oxygen therapy is the administration of oxygen at higher concentrations than those found in the ambient atmosphere to treat or prevent the symptoms and complications of hypoxia(Perry et al. 2021). This intervention is a basic lifeline frequently performed in various healthcare settings, from emergency departments and inpatient wards to home care. The primary goal of oxygen therapy is to increase oxygen transport to tissues, reduce the work of breathing, and decrease cardiac workload(Urden et al. 2022).

Oxygen delivery is classified into two broad systems: low-flow and high-flow systems. Low-flow systems, which include nasal cannulas, deliver oxygen at a flow rate less than or equal to the patient's inspiration, mixing room air with the administered oxygen. High-flow systems, on the other hand, provide a flow rate that exceeds the patient's inspiration, providing a more precise and consistent FiO2(American Association for Respiratory Care (AARC) 2018). The choice of oxygen delivery method is based on several considerations, including the required oxygen concentration, patient comfort, cost-effectiveness, and ease of use(Potter et al. 2021).

A nasal cannula is a device consisting of two short cannulas (approximately 1 cm) inserted into the patient's nares and connected to an oxygen tube. This device is one of the most popular and widely used low-flow oxygen delivery devices(Sole et al. 2021). Nasal cannulas are generally used to deliver low to moderate oxygen concentrations, between 24% and 44%, at flow rates of 1 to 6 liters per minute (L/min)(Perry et al. 2021).

The main advantage of nasal cannulas is their comfort for the patient. Compared with oxygen masks, nasal cannulas are lighter, less claustrophobic, allow patients to speak, eat, and drink more easily, and allow for freedom of facial expression(Potter et al. 2021). However, administering oxygen at a

flow rate greater than 6 L/min via nasal cannula is not recommended because it can cause dryness of the nasal mucosa, irritation, nosebleeds (epistaxis), and significant discomfort without a significant increase in FiO2(American Association for Respiratory Care (AARC) 2018). Furthermore, its effectiveness is highly dependent on the patient's breathing pattern (nose vs. mouth) and can be significantly reduced if the patient is a frequent mouth breather(Sole et al. 2021).

Abdominal bloating or distension in the context of oxygen therapy often refers to aerophagia, a condition in which air is swallowed and accumulates in the digestive tract(Pinto and Chavannavar 2019). This condition is clinically manifested by a distended and tense abdomen, a feeling of fullness or pressure, abdominal pain, and, in severe cases, can cause shortness of breath due to upward displacement of the diaphragm(Haque and Aneja 2020).

The mechanism of aerophagia caused by nasal cannula use is related to excessive oxygen flow, which is attached to the patient using an adult nasal cannula oxygen. When the oxygen flow rate exceeds the capacity of the pharynx (throat) to channel it to the trachea, the resulting positive pressure can force some oxygen into the esophagus and then into the stomach, especially if the patient's swallowing reflex is impaired or if the patient is unconscious(Jubran 1999). Other risk factors include patient positioning, sedative use, and the presence of neurological disorders that affect swallowing and breathing coordination(Pinto and Chavannavar 2019).

METHODS

This research uses an analytical observational design. Research Location: Inpatient wards (Internal Medicine Ward and ICU) of Karsa Husada Hospital, Batu City. The number of class 3 beds is 97, and the number of nurses is 85 people as well as the Class B Regional General Hospital in Batu City. Data collection was conducted for one month in March 2025. The population was all patients at Karsa Husada Hospital in Batu City who received oxygen therapy via nasal cannula. The study sample consisted of a portion of patients at Karsa Husada Hospital who met the inclusion and exclusion criteria during the study period. Inclusion Criteria: adult patients (age ≥ 18 years), receiving oxygen therapy via nasal cannula with a flow rate of ≥ 3 L/minute, hospitalized for at least 24 hours, willing to participate and sign informed consent (if the patient is unable to do so, a close family member may do so on their behalf). Exclusion Criteria: patients with abdominal distension before nasal cannula insertion (e.g., ileus, constipation, liver cirrhosis with ascites), patients with swallowing difficulties (dysphagia) or using a nasogastric tube (NGT), patients with severe neurological impairment (GCS < 9) who do not have a companion to observe them, and patients following abdominal surgery.

Sampling Technique: Consecutive sampling, namely every patient who meets the inclusion and exclusion criteria who is treated during the data collection period will be asked to participate.

Data were analyzed using Bivariate Analysis Chi-Square Test before and after use of nasal cannula 3-4 L/minute >8 hours with the patient still eating 3 times a day.

RESULTS AND DISCUSSION

This section describes the outputs generated in the methodology section. Results before and after use of nasal cannula 3-4 L/minute >8 hours (Table 1). The nurse assesses bloating by measuring abdominal distension, an increase in abdominal circumference > 2 cm from baseline (initial measurement after cannula insertion), and tympanic percussion. Subjective complaints include abdominal fullness, pain, or bloating.

Table 1. Before and after use of nasa cannula

Before intervention	0 (a)	30 (b)	30
After intervention	26 (c)	4 (d)	30
Total	26	34	60

The chi-square test results, which showed a χ^2 value of 24.04 with a p value of <0.05, provide strong evidence that the relationship is not coincidental. The significant difference in proportions before and after the intervention (0% vs. 86.7%) indicates that exposure to oxygen therapy with these parameters is strongly temporally related to the occurrence of bloating. In other words, changes in the independent variable (nasal cannula use) directly affect the dependent variable (bloating incidence). This finding supports Roy's adaptation theory, where nasal cannula administration is a focal stimulus that triggers a maladaptive response in the physiological mode, namely, disruption of the gas elimination process(Roy and Andrews 1999).

Several factors may have contributed to the high incidence in this study. First, the long duration of use (>8 hours) allows for increased air accumulation. Second, patient characteristics such as level of consciousness, sleep position, and mouth breathing habits can exacerbate air entry into the gastrointestinal tract(Jubran 1999). Patients with decreased consciousness may not complain of discomfort at the beginning, so bloating is only detected when distension has already occurred.

These findings have significant clinical implications. Bloating causes discomfort, pain, decreased appetite, and nausea. The incidence of bloating indicates that this complication is often unanticipated and underestimated in daily nursing practice. No data has been found on the minimal dangers of bloating. However, bloating not only causes subjective discomfort such as fullness and pain, but it can also increase intra-abdominal pressure. This increased pressure can push the diaphragm upward, limiting lung expansion, and ultimately counterproductive to the goal of oxygen therapy, which is to improve ventilation and oxygenation(Urden et al. 2022). Furthermore, bloating can decrease appetite, exacerbate nausea, and increase patient anxiety, all of which can reduce quality of life and prolong recovery(Ely and Mehta 2019).

Therefore, proactive monitoring by nurses is essential. Nurses are not only responsible for installing devices but also must routinely monitor for signs of abdominal distension, especially in patients receiving long-term therapy. Selecting a more appropriate oxygen delivery device, such as a Venturi mask for higher flow rates or inserting a nasogastric tube (NGT) for decompression in high-risk patients, may be considered as an alternative to prevent this complication(American Association for Respiratory Care (AARC) 2018). Educating patients to breathe through their nose whenever possible may also help reduce the incidence of aerophagia.

CONCLUSION

Using a nasal cannula at 3-4 liters/minute recommendations:

1. Limit the duration of administration to ≤8 hours
2. Closely monitor for symptoms of bloating
3. Consider alternatives (Venturi mask) for therapy >8 hours

The limitations of this research include only being conducted in only one medical ward, for one month, in a private hospital.

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