



Relationship between preoperative fluid therapy and the occurrence of nausea and vomiting in post-spinal anesthetic patients

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ABSTRACT

Background: Spinal anesthesia can cause a significant decrease in blood pressure and increased vagal tone, leading to bradycardia, nausea, and vomiting. To mitigate the risk of nausea and vomiting, it is important to provide appropriate fluid therapy during fasting or anesthesia.

Objective: This study aims to determine the relationship between preoperative fluid therapy and the occurrence of nausea and vomiting events in post-spinal anesthetic patients at Dr. Saiful Anwar Hospital, Malang.

Methods: This research employed an observational analytic design with a cross-sectional approach. A purposive sampling technique was used, and 50 respondents were selected. The research instrument included the Rhodes Index of Nausea, Vomiting, and Retching (RINVR) observation sheet and fluid calculation formulas. The statistical test employed was Spearman's rho with a 95% confidence interval (CI) or a significant level value (α) of 0.05.

Results: The results showed that 52% of respondents did not experience nausea and vomiting, 44% experienced mild nausea and vomiting, and 4% experienced moderate nausea and vomiting. The Spearman Rank statistical test yielded a p-value of < 0.0001 .

Conclusions: In conclusion, there was a significant relationship between preoperative fluid therapy and the incidence of nausea and vomiting in post-spinal anesthesia patients. Therefore, administering adequate fluids before spinal anesthesia can reduce the risk of complications, such as nausea and vomiting, associated with spinal anesthesia.

Keywords: preoperative; fluid therapy; nausea; vomiting; spinal anesthesia

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INTRODUCTION

Nausea and vomiting are common symptoms associated with spinal anesthesia, with an incidence rate of approximately 25% (Artawan et al., 2020). The causes of nausea and vomiting in spinal anesthesia include hypotension, which is the primary cause that can be immediately resolved with prompt treatment; hypoxia, the second major cause, which can be effectively managed through oxygen therapy; and anxiety or other

Nursing and Healthcare Practices

- *Preoperative fluid therapy plays a crucial role in reducing the incidence of nausea and vomiting in post-spinal anesthesia patients.*
- *Administering adequate fluids before spinal anesthesia is recommended to minimize the risk of complications, particularly nausea and vomiting.*
- *The study found a significant relationship between preoperative fluid therapy and the occurrence of nausea and vomiting in patients who underwent spinal anesthesia.*

psychological factors, which can be addressed through proper explanation of the procedure or the administration of sedatives. Other contributing factors include the use of narcotics as premedication, increased parasympathetic activity resulting from spinal block affecting gastrointestinal sympathetic control, and mechanical stimulation of the intestines during the procedure. Nausea and vomiting during surgery not only lead to unfavorable surgical outcomes but also increase the risk of aspiration (Nowak et al., 2022). These symptoms can contribute to higher morbidity, longer hospital stays, increased treatment costs, patient distress, and reduced comfort. Many patients consider nausea and vomiting to be more bothersome than the surgery itself (Gress et al., 2020).

In the United States, approximately 71 million patients undergo surgery each year, with the incidence of postoperative nausea and vomiting ranging from 20% to 30% in general surgeries and approximately 70% to 80% in high-risk groups (Mallin et al., 2019). According to Jin, Gan, and Bergese (2020), nausea and vomiting are common complications associated with spinal anesthesia, occurring in 20% to 40% of cases. However, the precise incidence of postoperative nausea and vomiting in Indonesia has not been clearly recorded. Karnina and Salmah (2022) reported an incidence rate of 27.08%.

Spinal anesthesia offers numerous advantages, including its simplicity, rapid onset, minimal risk of systemic toxicity,

effective anesthesia, well-known methods for prevention and management of complications, reliable analgesia, and minimal impact on the baby during cesarean sections (Szpilman and Morgan, 2021). Despite these benefits, spinal anesthesia carries the risk of hypotension, which is considered a major cause of postoperative morbidity and mortality (Agerskov et al., 2021). Therefore, it is crucial to carefully select drugs and anesthesia techniques to ensure patients recover quickly without experiencing side effects, particularly nausea and vomiting (Jin et al., 2020). Spinal anesthesia can lead to a significant decrease in blood pressure, increased vagal tone, bradycardia, and nausea and vomiting. Hypotension can cause hypoxemia and hypoperfusion in the chemoreceptor trigger zone (CTZ), the center responsible for initiating vomiting reflexes (Turgut and Arslan, 2019).

Side effects of anesthesia must be promptly addressed as they can have detrimental effects on the patient. The management of nausea and vomiting can involve both pharmacological and non-pharmacological therapies. According to Virgiani (2019), pharmacological therapy includes the use of 5-HT₃ antagonist drugs, antihistamines, dopamine antagonists, and anticholinergics. Additionally, the effectiveness of a non-pharmacological approach, namely ensuring sufficient hydration through the administration of preoperative fluids. Their study on the effectiveness of administering Ringer's lactate at a rate of 2ml/kgBW/hour during fasting demonstrated positive results.

Preloading patients undergoing spinal anesthesia with 1-2 liters of intravenous fluids (crystalloid or colloid) is a common practice to prevent hypotension during the procedure. This fluid administration is rational as it aims to increase the volume and compensate for the decrease in peripheral resistance in the bloodstream (Sofullah et al., 2022).

According to Gan et al. (2019), Postoperative Nausea and Vomiting (PONV) comprises three main symptoms: nausea, vomiting, and retching. Nausea is a subjective sensation of the urge to vomit without the actual expulsion of stomach contents. Severe nausea can be accompanied by increased salivary gland secretions, vasomotor disturbances, and sweating. Vomiting, or emesis, refers to the passage of gastric contents through the mouth, while retching is the unproductive urge to vomit. Nausea and vomiting can be categorized as immediate (occurring 2-6 hours after surgery)

or delayed (occurring more than 24-48 hours after surgery).

A preliminary study conducted at Dr. Saiful Anwar Hospital in Malang during January 2021 involved 66 patients who underwent spinal anesthesia. Samples were taken from 20 patients, two of whom experienced nausea and vomiting after the procedure, and two patients experienced it during the recovery period. Based on interviews and document analysis, it was found that when patients experienced nausea and vomiting, they were placed in a sideways position. As a result, these patients required additional time in the recovery room, usually around 1-2 hours. This background prompted the authors' interest in conducting research to determine the relationship between preoperative fluid requirements and the incidence of nausea and vomiting in patients undergoing spinal anesthesia.

METHODS

Design

The research design used in this study was observational and analytic, employing a cross-sectional approach.

Participants and Setting

The study population consisted of all patients who underwent surgery with spinal anesthesia and met the specified criteria. A total of 57 patients from the Anesthesia Installation were included. The inclusion criteria were as follows: (1) Willingness to participate as a respondent, (2) Undergoing surgery with spinal anesthesia, (3) Age between 18 and 55 years, (4) American Society of Anesthesiologists status (ASA) scores of 1 and 2, and (5) Not receiving anti-inflammatory drugs that cause nausea and vomiting. The exclusion criteria were: (1) Patients with decreased consciousness, (2) Patients with kidney disorders, and (3) Patients with heart problems. Non-probability sampling was employed in this study, specifically using purposive sampling. From the population of patients who underwent spinal anesthesia and met the inclusion and exclusion criteria, a sample of 50 respondents was selected.

Instruments

The instruments used in this study included an interview sheet covering the patient's information and observation sheets documenting the time of the last meal and

drink, as well as the amount of fluid consumed since then until the time before spinal anesthesia was administered in the operating room. To measure the incidence of nausea and vomiting, an observation sheet based on the Rhodes Index of Nausea, Vomiting, and Retching (RINVR) scale of 0-32 was used on postoperative patients who received spinal anesthesia (Juartika, Harmi, and Fatmadona, 2020).

Data Collection

The data collection process involved several stages: (1) Reviewing patient data from the register book of those who underwent spinal anesthesia, (2) Recording data in the patient's medical record and the nurse's report book for patients who underwent spinal anesthesia, (3) Selecting research samples based on predetermined timeframes and the specified inclusion and exclusion criteria, and (4) Assessing the fulfillment of preoperative fluid requirements and the incidence of nausea and vomiting in post-spinal anesthesia patients. Data collection took place in the operating room, starting when the patient was about to receive spinal anesthesia and concluding when the patient left the operating room. Observation occurred before spinal anesthesia, involving a review of the patient's medical record and/or direct questioning of the patient regarding the amount of fluid received during fasting. Following the administration of spinal anesthesia, observations were made by directly asking the patient whether they experienced nausea and vomiting, as the patient remained conscious. The researchers or enumerators (anesthetist nurses and resident anesthetic doctors) facilitated these observations using prepared observation sheets. Data collection methods included interviews and direct observations to determine the occurrence of nausea and vomiting in postoperative patients who received spinal anesthesia.

Data Analysis

The study aimed to analyze the incidence of nausea and vomiting in post-spinal anesthesia patients using the Spearman rank correlation test with a significance level of $\alpha = 95\%$.

Ethical Consideration

This research underwent an ethical review at Dr. Saiful Anwar Hospital, Malang. Information that passed the ethical review received

an ethical approval letter with the number 400/231/K.3/302/2021.

RESULTS

Based on Table 1, the majority of respondents are male, a total of 26 people (52%). The age of the respondents in this study ranged from 18-55 years. Most respondents were in the age range of 18-35 years as many as 22 (44%) respondents. Most of the respondents were as many as 28 respondents (56%) with the fulfillment of preoperative fluid needs less than the needs. 52% of respondents (26 people) did not experience nausea and vomiting, 44% experienced mild nausea and vomiting and the remaining 4% of respondents (2 people) had moderate nausea and vomiting.

Table 2 shows that (52%) of respondents did not experience nausea and vomiting in which some respondents (28 respondents) meeting their preoperative fluid needs were less than their needs. The results of the Spearman Rank statistical test obtained a value of $p < 0.0001$ or $p > 0.05$, which means that H_1 is accepted so that it can be concluded that there is a significant relationship between preoperative fluid requirements and the incidence of nausea and vomiting in post-spinal anesthesia patients at the Anesthesia Installation. The strength of the relationship between the two variables is 0.826, in the category of very strong correlation. The direction of the relationship is positive, with the fulfillment of preoperative fluid needs that are sufficient to reduce the incidence of post-spinal nausea and vomiting in the Anesthesia Installation.

DISCUSSION

Based on the results of the study, the relationship between meeting preoperative fluid needs and the incidence of nausea and vomiting showed that out of 50 respondents, there were 28 respondents (56%) who had fluid needs that were less than required, 20 respondents (40%) who had preoperative fluid needs that were sufficient, and the remaining 2 respondents (4%) who had an excess of fluid needs. This is in line with research conducted by Jin et al. (2020), which found that meeting fluid needs adequately during fasting or anesthesia can reduce the risk of hypotension, which can result in nausea and vomiting.

Changes in fluid balance are one of the physiological changes in the perioperative period, especially in patients undergoing surgery.

Patients are required to fast preoperatively for 6-8 hours to avoid intraoperative complications such as aspiration. However, during this fasting period, the body continues to lose fluid through metabolism (Iqbal et al. 2019). According to Gianotti et al. (2020), the principle of giving preoperative fluids is to replace the fluids and calories lost by preoperative patients due to fasting.

In the administration of preoperative fluids, patients are given preloading before surgery because crystalloid fluids only last for a short period of time. The formula for giving fluids, known as the 4-2-1 calculation, is closest to the average human body's needs. Alternatively, fluid therapy instead of fasting can also be formulated as 2cc/kgBW/hour of fasting (Gan et al. 2019). According to Puri, Bandyopadhyay, and Ashok (2023), the daily fluid requirement can be determined using the Holiday Fresh formula, which replaces fluid lost through urine formation, gastrointestinal secretions, sweat, and expulsion of fluid through the lungs, also known as insensible losses.

The results of this study showed that out of 50 respondents, 26 respondents (52%) did not experience nausea and vomiting, 22 respondents (44%) experienced mild nausea and vomiting, and 2 respondents (4%) experienced moderate nausea and vomiting. This is consistent with the research conducted by Artawan et al. (2020), which found that spinal anesthesia can cause a significant decrease in blood pressure and increased vagal tone, leading to bradycardia, nausea, and vomiting.

Furthermore, in this study, it was observed that the majority of respondents who experienced nausea and vomiting were male, with 14 male respondents compared to 10 female respondents. Additionally, the age group of 46-55 years experienced the highest incidence of nausea and vomiting. This is in line with the theory that states that nausea and vomiting can be influenced by factors such as age, gender, obesity, and psychological factors.

According to Turgut and Arslan (2019), Post Operative Nausea Vomiting (PONV) consists of three main symptoms: nausea, vomiting, and retching. Nausea is the subjective sensation of wanting to vomit without expulsive muscle movements, and severe nausea is associated with increased salivary gland secretions, vasomotor disturbances, and sweating. Vomiting or emesis refers to the passage of gastric contents through the mouth, while retching is an unproductive urge

Table 1. Participants Characteristics (n=50)

Variable	n	%
Gender		
Man	26	52
Woman	24	48
Age		
18 - 35 years	22	44
36 - 45 years	12	24
46 - 55 years	16	32
Criteria for Preoperative Fluid Requirements		
Over	2	4
Moderate	20	40
Less	28	56
Criteria for the Occurrence of Nausea and Vomiting		
No	26	52
Mild	22	44
Moderate	2	4

Table 2. Bivariate Analysis (n=50)

Fulfillment of preoperative fluid needs	Nausea Vomiting Incident			Total	p	r
	No n(%)	Mild n(%)	Moderate n(%)			
Over	2 (100)	0 (0.0)	0 (0.0)	2 (100)	<0.0001	0.826
Moderate	20 (100)	0 (0.0)	0 (0.0)	20 (100)		
Less	4 (14,2)	22 (78.5)	2 (7.1)	28 (100)		
Total	26 (52)	22 (44)	2 (4)	50 (100)		

to vomit. Nausea and vomiting can occur immediately (2-6 hours after surgery) or later (more than 24-48 hours after surgery). Spinal anesthesia can cause vasodilation, leading to hypotension due to sympathetic block. The severity of hypotension increases with the level of the block. Hypotension results in hypoxemia and hypoperfusion in the chemoreceptor trigger zone (CTZ), which serves as the center of vomiting stimulation (Edwar et al. 2022). Nausea and vomiting are common symptoms associated with spinal anesthesia, with an incidence rate of approximately 25%. The main cause of nausea and vomiting in spinal anesthesia is hypotension (Soljak and Armstrong 2022).

The results of this study obtained a p-value of 0.00, indicating that $p > 0.05$. This means that the alternative hypothesis (H1) is accepted, and it can be concluded that there is a significant relationship between preoperative fluid requirements and the incidence of nausea and vomiting in patients undergoing post-spinal

anesthesia at the Anesthesia Installation. The strength of the relationship between the two variables was 0.826, falling into the category of perfect correlation. The relationship was positive, indicating that meeting preoperative fluid needs sufficiently can reduce the incidence of post-spinal nausea and vomiting in the Anesthesia Installation. The Spearman Rho test showed a correlation between the fulfillment of preoperative fluid needs and the incidence of nausea and vomiting in patients undergoing post-spinal anesthesia.

Respondents who had insufficient preoperative fluid requirements experienced the highest incidence of nausea and vomiting. These results align with the findings of Virgiani (2019). Considering current guidelines, literature, and daily clinical experience, comprehensive management of circulatory parameters is the first step to reduce the incidence of intraoperative and postoperative nausea and vomiting (IONV and PONV). This management includes liberal perioperative fluid

administration and the use of vasopressors when necessary. Additionally, using low-dose local anesthetics, intrathecal or spinal opioids, or hyperbaric solutions can help control neuraxial distribution and reduce maternal hypotension. However, this finding contradicts the research conducted by Sofiullah et al. (2022), which concluded that a continuous infusion of 5 mg/minute of ephedrine for the first 2 minutes followed by 1 mg/minute for the next 18 minutes immediately after spinal anesthesia is more effective in preventing nausea and vomiting compared to a 6% sterile HAES preload of 7.5 ml/kg body weight.

Nausea and vomiting are common symptoms associated with spinal anesthesia, with an incidence rate of approximately 25%. Spinal anesthesia can cause vasodilation, leading to hypotension due to sympathetic block. The severity of hypotension increases with the level of the block. Hypotension results in hypoxemia and hypoperfusion in the chemoreceptor trigger zone (CTZ), which serves as the center of vomiting stimulation (Edwar et al. 2022). According to Gan et al. (2019), meeting fluid needs adequately during fasting or anesthesia can reduce the risk of hypotension, which can result in nausea and vomiting.

The researchers assume that post-spinal anesthesia nausea and vomiting can occur due to sudden hypotension caused by vasodilation from spinal anesthesia. The main mechanism of hypotension after spinal anesthesia is sympathetic block, which causes arterial and venous vasodilation. Arterial vasodilation leads to a decrease in total peripheral resistance and systolic blood pressure. Venous vasodilation can cause severe hypotension due to decreased venous return and cardiac output. Adequate fluid requirements can reduce a significant decrease in cardiac output and the incidence of severe hypotension, thereby reducing the occurrence of nausea and vomiting.

Moreover, drastic hypotension can also occur due to rapid changes in position. Spinal anesthesia is usually performed in a sitting position, and immediately after the procedure, the respondent is placed in a horizontal supine position. The rapid administration of spinal drugs also plays a significant role in sudden hemodynamic changes. Additionally, achieving a high spinal block can increase the incidence of nausea and vomiting.

Furthermore, nausea and vomiting can be influenced by several factors, including the choice of anesthetic drugs, intraoperative

manipulations such as intestinal manipulation, and the psychological condition of the respondent. To reduce the occurrence of nausea and vomiting complications due to spinal anesthesia, management involves providing adequate fluid volume and administering antiemetic drugs such as ondansetron or metoclopramide.

In this study, there were respondents who did not experience nausea and vomiting despite having insufficient preoperative fluids. This could be attributed to maintaining a tilted or seated position for several minutes after spinal anesthesia, thus avoiding sudden position changes. The speed of entry of anesthetic drugs also significantly affects the incidence of nausea and vomiting. Slower drug administration during block achievement reduces the risk of severe hypotension, thereby decreasing the incidence of nausea and vomiting.

CONCLUSIONS

There is a significant relationship between meeting preoperative fluid needs and the incidence of nausea and vomiting. The strength of the relationship between the two variables is a very strong correlation. The results of this study are expected to provide valuable information for instructing implementing nurses to pay attention to preoperative instructions from doctors and to provide accurate information to patients regarding the timing of fasting, enabling accurate calculation of patients' preoperative fluid needs. Additionally, it is hoped that there will be frequent socialization regarding preoperative patient preparation and informative sessions on fluid management and calculations.

Declaration of Interest

No conflict of interest

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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