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ORIGINAL ARTICLE

Effect of Coloading Fluid on The Incidence of Post Operative Nausea and Vomiting (PONV) in Patients Post Spinal Anesthesia : A Study at RSUD Wates

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ABSTRACT

Introduction: *Surgery with spinal anesthesia can lead to complications such as nausea and vomiting due to hemodynamic imbalances during and after anesthesia. Perioperative fluid status plays a crucial role in maintaining patients' hemodynamic balance during surgery. One fluid management strategy that can be implemented is co-loading fluid therapy.* ***Objectives:*** *This study aims to determine the effect of co-loading fluid on the incidence of Post Operative Nausea and Vomiting (PONV) in patients after spinal anesthesia at RSUD Wates.* ***Methods:*** *This research employed a quantitative method with a quasi-experimental design. The study design used was a two-group posttest only. The sampling technique utilized non-probability sampling with consecutive sampling, resulting in 36 respondents according to inclusion and exclusion criteria. Data collection was conducted using observation sheets, and data processing in this study utilized the Mann-Whitney test.* ***Results:*** *Data analysis using the Mann-Whitney test yielded a p-value of 0.015 (p < 0.05), indicating that the alternative hypothesis (Ha) is accepted. This result shows that there is an effect of co-loading fluid therapy on the incidence of Post Operative Nausea and Vomiting (PONV) in patients undergoing spinal anesthesia at RSUD Wates.* ***Conclusions:*** *There is an effect of co-loading fluid therapy on the reduction of Post Operative Nausea and Vomiting (PONV) in patients after spinal anesthesia at RSUD Wates.*

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A. Introduction

Surgical procedures are invasive medical interventions that involve incising the body to diagnose, treat, or correct anatomical and physiological abnormalities that cannot be managed solely with pharmacological treatment (Azmi *et al*., 2020; Kasanova *et al*., 2021). According to the World Health Organization (WHO) in 2020, there was an increase in the number of surgeries globally every year, including in Indonesia, which reached 1.2 million cases. Underscores the growing need for effective perioperative care. Anesthesia plays a crucial role in ensuring patient comfort and safety during surgery and is categorized into general, regional, and local techniques (Anditiawan *et al*., 2023).

Among regional anesthesia techniques, spinal anesthesia is widely used, especially for surgeries involving the lower extremities. Its advantages include a rapid onset of action and effective sensory blockade (Soepraptomo, 2020). However, spinal anesthesia can also cause significant complications, particularly hypotension and bradycardia, due to sympathetic blockade. These hemodynamic disturbances can decrease cerebral perfusion and oxygenation, which may activate the Chemoreceptor Trigger Zone (CTZ) and increase the risk of *Post Operative Nausea and Vomiting* (PONV) (Artawan *et al*., 2020; Pranandaru *et al*., 2024).

PONV is one of the most common postoperative complications and is defined as nausea and/or vomiting occurring within the first 24 hours after surgery (Anditiawan *et al*., 2023). Its incidence reaches 30% in the general postoperative population and up to 80% in high-risk patients (Widyanti & Yusniarita, 2024). A study at Jatiwinangun Surgical Specialty Hospital reported that 57.9% of spinal anesthesia patients experienced PONV (Sanubari *et al*., 2024). If not properly managed, PONV can lead to complications such as dehydration, electrolyte imbalance, esophageal injury, venous hypertension, and increased intracranial pressure (Millizia *et al*., 2022).

Previous studies have identified intraoperative hypotension as a major risk factor for PONV. Nakatani *et al*. (2023) and Valiani *et al*., (2025) found that patients who experienced more severe hypotension during surgery had significantly higher PONV incidence. Thus, maintaining hemodynamic stability during the perioperative period is crucial in reducing postoperative complications, one of which is PONV.

Strategies to maintain patient hemodynamics can be implemented through non-pharmacological approaches, one of which is intravenous fluid management, specifically coloading—administering fluids immediately after spinal anesthesia induction (Jin *et al*., 2020). Research by Apriliyanti *et al*., (2024) shows that preloading and coloading fluids are effective in maintaining the hemodynamic status of spinal anesthesia patients at Emanuel Hospital in Banjarnegara. Another studies by Artawan *et al*. (2020) and Gokduman *et al*., (2022) support the effectiveness of coloading using 10–30 mL/kg body weight of crystalloid in reducing intraoperative hypotension and thereby minimizing the risk of PONV. On the other hand, preloading shows less consistent effects.

However, despite the use of antiemetics as part of premedication protocols, preliminary data from RSUD Wates in December 2024 indicated that 30–40% of patients undergoing spinal anesthesia still experienced PONV. This suggests a gap between pharmacological strategies and actual outcomes, emphasizing the need for further research into adjunctive, non-pharmacological measures such as *coloading* fluids.

This study aims to determine the effect of *coloading* crystalloid fluids at 10 mL/kg body weight on the incidence of PONV in post-spinal anesthesia patients at RSUD Wates. This study is expected to make both theoretical and practical contributions. Theoretically, it adds to the growing body of evidence on non-pharmacological approaches in perioperative nursing. Practically, it may inform the development of hospital protocols and standard operating procedures (SOPs) for fluid therapy under the authority of anesthetic nurses, as regulated by Indonesia's Ministry of Health (Permenkes RI No. 18/2016). *Coloading* is a low-cost, low-risk intervention that has the potential to enhance the quality and safety of adult surgical care by reducing one of the most uncomfortable post-operative complications.

B. Methods

This research is a quantitative research with a quasy-experimental approach using a two-group posttest only design. In this design has two groups, a posttest and an intervention. There is no random assignment or pretest. This study was conducted at RSUD Wates, with a population of all patients surgery underwent spinal anesthesia. The sampling technique used was consecutive sampling, where the selection of samples was carried out by setting certain criteria for respondents by the researcher. The sample in this study included 36 respondents who met the inclusion criteria, including being willing to participate in the study by signing an informed consent form, patients aged 17–55 years, patients with ASA physical status 1 or 2, and patients with moderate to severe PONV risk (Koivuranta score ≥ 2). Exclusion criteria for this study included patients with a history of kidney disorders, patients with allergies to crystalloid fluids, and patients at risk of pulmonary edema. The study sample was divided into two groups: 18 respondents in the intervention group and 18 respondents in the control group.

Data were collected using an observation sheet containing Gordon's PONV score, which classifies responses from 0 (no nausea or vomiting), 1 (just nausea), 2 (retching and/or vomiting), and 3 (nausea >30 minutes and/or vomiting ≥ 2 times). Respondents in the intervention group received coloading therapy with Ringer's lactate solution immediately after spinal anesthesia induction, administered over 15 minutes, while the control group received fluids per routine care. The fluid used Ringer Lactate (Asering®), is a balanced isotonic crystalloid solution that closely mimics extracellular fluid and is commonly used for intraoperative hemodynamic support.

Data analysis was performed using the non-parametric Mann-Whitney U test to compare PONV scores between the intervention and control groups. A p-value of less than 0.05 was considered statistically significant. All ethical principles were upheld, including informed consent, confidentiality, and approval from the institutional ethics review board. This research has been declared ethically feasible by the Health Research Ethics Commission of RSUD Wates with ethical number No.KEPK/033/RS/III/2025. he researcher was directly involved during the data collection phase, ensuring that all procedures adhered to the clinical and research standards of RSUD Wates.

C. Results and Discussion

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	Intervention Group		Control Group	
	f	%	f	%
Age				
17-25 (late teens)	1	5,6	2	11,1
26-35 (early adulthood)	6	33,3	8	44,4
36-45 (late adulthood)	1	5,6	2	11,1
46-55 (early elderly)	10	55,6	6	33,3
Total	18	100	18	100
Gender				
Male	5	27,8	3	16,7
Female	13	72,2	15	83,3
Total	18	100	18	100
ASA Status				
ASA I	2	11,1	6	33,3
ASA II	16	88,9	12	66,7
Total	18	100	18	100
Koivuranta Score				
Score 2-3 (moderate risk)	14	77,8	13	72,2
Score 4-5 (high risk)	4	22,2	5	27,8
Total	18	100	18	100

Table 1 presents the dominant characteristics of respondents in both groups. The majority of respondents in the intervention group were aged 46–55 years (55.6%), while in the control group the largest age group was 36–45 years (44.4%). Female respondents were dominant in both groups, comprising 72.2% in the intervention group and 83.3% in the control group. Most respondents in both groups were categorized as ASA II, accounting for 88.9% in the intervention group and 66.7% in the control group. In terms of Koivuranta scores, the majority of respondents in both groups were classified as moderate risk (score 2–3), with 77.8% in the intervention group and 72.2% in the control group.

Table 2. Frequency Distribution of Respondent by Post Operative Nausea and Vomiting (PONV) Score Levels

PONV Score post coloading	Intervention Group		Control Group	
	f	%	f	%
Gordon Score 0	13	72,2	6	33,3
Gordon Score 1	4	22,2	7	38,9
Gordon Score 2	1	5,6	5	27,8
Gordon Score 3	0	0	0	0
Total	18	100	18	100

Table 2 presents the distribution of postoperative nausea and vomiting (PONV) score levels based on Gordon's criteria in both the intervention and control groups. In the intervention group, the majority of respondents experienced no symptoms of PONV, as indicated by a Gordon Score of 0, accounting for 13 respondents (72.2%). This was followed by 4 respondents (22.2%) with a Gordon Score of 1, and only 1 respondent (5.6%) with a Score of 2. In contrast, the control group showed a higher frequency of mild to moderate PONV symptoms, with 7 respondents (38.9%) recording a Gordon Score of 1, 6 respondents (33.3%) with a Score of 0, and 5 respondents (27.8%) with a Score of 2. No respondents in the both group experienced a Gordon Score of 3.

Table 3. Mann–Whitney U Test on PONV Scores

Category	Group	n	Mean Rank	Sum of Ranks	*Asymp. Sig. (2-tailed)*
PONV Score	Intervention	18	14.64	263.50	0.015
	Control	18	22.36	402.50	

Table 4.5 presents the results of the Mann–Whitney U statistical analysis, conducted to determine the effect of fluid coloading on the level of postoperative nausea and vomiting (PONV) in patients undergoing spinal anesthesia. The test results showed an Asymp. Sig. (2-tailed) value of 0,015 (<0,05). Since the alternative hypothesis is accepted when the p-value is less than 0.05, it can be concluded that there is a statistically significant difference in the average PONV scores between the intervention and control groups. Therefore, the alternative hypothesis (Ha) is accepted.

1. **Frequency Distribution of Respondent Characteristics**

   Age

   The results of this study showed that most respondents were in the early elderly age group (46–55 years), accounting for 44.4%. However, the highest incidence of Post Operative Nausea and Vomiting (PONV) occurred among those in the early adulthood group (26–35 years), with 10 out of 17 total PONV cases. This finding aligns with Lestishiyami *et al*., (2024) who explained that afferent neurons in individuals under the age of 50 tend to be more sensitive to stimuli, resulting in faster transmission of signals to the vomiting center in the brainstem.

These findings are supported by Mulyasih & Ching Cing (2024) who reported that the highest PONV incidence (23.8%) occurred in early adulthood. Another studies by Karnina & Salmah, (2021) found that individuals aged 25–39 years had the highest incidence of PONV (56.25%). Based on the data and supporting literature, it can be concluded that individuals under 50 years of age, especially those in early adulthood, are more prone to PONV.

This vulnerability may be due to elevated stress hormone levels during surgery, such as cortisol, which affects the central nervous system and contributes to the onset of nausea and vomiting (Mulyasih & Ching Cing, 2024). The increased sensitivity of afferent neurons in younger individuals also lowers the threshold for nausea and vomiting stimuli, thereby increasing the risk of PONV in this age group.

Gender

The data show that the majority of respondents in both the intervention and control groups were female, accounting for 77.8% (28 out of 36). Postoperative nausea and vomiting (PONV) was also more prevalent among female patients, with 15 female respondents (41.67%) experiencing PONV compared to only 2 male respondents (5.56%). This finding is consistent with the study by Lestishiyami *et al*., (2024) which reported that 39 out of 45 female patients experienced PONV. Similarly, Lekatompessy *et al*., (2022) found that 48.84% of female respondents suffered from PONV.

One of the factors believed to contribute to the higher incidence of PONV in females is hormonal fluctuation, particularly reproductive hormones such as estrogen, progesterone, and follicle-stimulating hormone (FSH). According to Maysarah *et al*., (2024), nausea and vomiting in females tend to increase during menstruation and decrease after the onset of menopause. The incidence of PONV is especially higher during the third and fourth weeks of the menstrual cycle due to elevated hormone levels that may stimulate the vomiting center in the brain, particularly the Chemoreceptor Trigger Zone (CTZ) (Cing *et al*., 2022; Nurleli *et al*., 2021).

Based on these findings, it can be assumed that gender plays a significant role in PONV incidence, with females being at a higher risk than males. This may be attributed to the biological nature of females, who undergo monthly hormonal cycles, making them more sensitive to nausea and vomiting stimuli.

ASA Status

The results of this study indicate that most respondents were classified as ASA physical status II (77.8%), while the remaining 22.2% were ASA I. Interestingly, a higher proportion of PONV was observed among ASA I patients, with 5 out of 8 individuals (62.5%) experiencing PONV, compared to 12 out of 28 individuals (42.86%) in the ASA II group. This finding aligns with the study Karnina & Salmah, (2021) which reported a higher incidence of PONV in ASA I patients (28.8%). Similar results were also noted by Karnina & Ismah, (2021) who found that 12 ASA I patients (13%) experienced PONV.

Physiologically, patients with better physical health status, such as those categorized as ASA I, may possess a more responsive nervous system, making them more susceptible to nausea and vomiting stimuli. In contrast, individuals with systemic illnesses, such as diabetes mellitus, often experience autonomic neuropathy, which can impair afferent nerve sensitivity and disrupt the transmission of signals to the vomiting center. This condition increases the threshold for nausea, thereby lowering the risk of PONV (Karnina & Ismah, 2021; Suyuthi & Agung, 2024).

Therefore, it can be assumed that patients in better physical condition are paradoxically more vulnerable to PONV, due to an intact and optimally functioning nervous system that reacts more readily to physiological stimuli following surgery.

Risk of PONV

The findings of this study indicate that most respondents fall into the moderate risk category for PONV, as defined by a Koivuranta score of 2–3, with a total of 27 respondents (75%). The remaining 9 respondents (25%) were classified as high risk (score 4–5). Among the moderate-risk group, 10 individuals (37%) experienced PONV, while in the high-risk group, 7 out of 9 respondents (77.7%) reported PONV. These results show a clear trend: the higher the Koivuranta score, the greater the likelihood of experiencing PONV.

The Koivuranta scoring system considers five risk factors: female gender, non-smoking status, history of PONV, history of motion sickness, and surgical duration exceeding 60 minutes. This study's findings are consistent with Widyanti & Yusniarita, (2024) who reported an increased incidence of PONV among patients with these characteristics. Similarly, Nurleli *et al*., (2021) found that most patients with severe PONV were female (88.9%) and had a history of motion sickness (81.8%).

Based on these results, the Koivuranta score appears to be an effective predictive tool for assessing PONV risk. A higher score correlates with an increased likelihood of experiencing PONV. Therefore, patients with high Koivuranta scores should receive greater attention and preventive measures during the preoperative phase to minimize potential complications.

2. Comparison of PONV Incidence Between Intervention and Control Groups

Based on the findings of this study, the incidence of Post Operative Nausea and Vomiting (PONV) in the intervention group was 27.8% (5 respondents), while in the control group it reached 66.7% (12 respondents). This indicates a reduction in PONV incidence among patients who received coloading therapy of 10 ml/kg body weight of crystalloid fluids compared to those who did not received coloading at dose 10 ml/Kg body weight. Statistical analysis using the Mann–Whitney U test showed a p-value of 0.015 ($p < 0.05$), indicating a significant difference between the two groups. These results suggest that fluid coloading can effectively reduce the incidence of PONV in patients undergoing spinal anesthesia. This finding is in line with a study by Gokduman *et al.*, (2022) which also reported a significantly lower incidence of PONV in patients receiving 10 ml/kgBW coloading ($p = 0.019$). Gan *et al.*, (2020) further supported this, stating that crystalloid coloading at a dose of 10–30 ml/kgBW is an effective intervention for reducing early-onset PONV.

PONV is a complication influenced by various factors, one of which is physiological changes due to spinal anesthesia. Artawan *et al*., (2020) explain that one of the common complications of spinal anesthesia is hypotension and nausea. A significant decrease in blood pressure (hypotension) can lead to impaired blood flow to the brain, including the Chemoreceptor Trigger Zone (CTZ) and the area postrema. Hypotension is often accompanied by hypovolemia, a condition that disrupts the body's fluid and electrolyte balance (Chen *et al*., 2025). This can activate the vomiting reflex triggered by fluid and electrolyte imbalances in the central nervous system and gastrointestinal tract.

Coloading fluid administration serves to replenish intravascular volume and prevent hypotension caused by vascular dilation following sympathetic blockade, as well as maintain fluid and electrolyte homeostasis during surgery. Valiani *et al*., (2025) state that increasing intravascular volume plays a crucial role in preventing blood pressure drops during anesthesia induction. This is further supported by Artawan *et al*., (2020) a who showed that patients receiving coloading with 1000 ml of Ringer's lactate did not experience PONV and showed a reduction in the incidence of intraoperative hypotension. In comparison, the incidence of PONV in the preloading group was 10%, while it reached

90% in the control group. In the study by Rahmawati *et al*., (2023) a strong correlation was found between perioperative fluids and the incidence of PONV, where respondents who received excessive and adequate perioperative fluids did not experience PONV. Therefore, intravenous fluid administration via coloading is recommended to replace fluid loss, maintain vascular volume, and reduce the risk of hypotension and stimulation of the vomiting center in the brain, which is a primary trigger for PONV.

In this study, it can be concluded that the Mann–Whitney test results showed a p-value of 0.015 (<0.05), indicating that the alternative hypothesis (Ha) is accepted and the null hypothesis (H0) is rejected. This confirms that coloading fluid administration has a significant effect on the incidence of Postoperative Nausea and Vomiting (PONV) in patients undergoing spinal anesthesia at Wates General Hospital.

D. Conclusion

This study concludes that fluid coloading of 10 ml/kg body weight with crystalloid solution is effective in reducing the incidence of postoperative nausea and vomiting (PONV) in patients undergoing spinal anesthesia. The intervention group had a lower incidence of PONV (27.8%) compared to the control group (66.7%). A statistically significant difference was confirmed through the Mann–Whitney U test (p = 0.015), indicating that fluid coloading contributes to better postoperative outcomes. The majority of respondents were female, aged 46–55 years (early elderly), and classified as ASA II with a moderate PONV risk score based on the Koivuranta scale.

The results highlight the clinical relevance of integrating fluid coloading as a preventive strategy against PONV, particularly in spinal anesthesia cases. This intervention may serve as a simple, cost-effective, and low-risk non-pharmacological approach to improving patient comfort and recovery.

E. Recommendations

Future research is encouraged to classify respondents based on the type of surgical procedure, as variations in surgical techniques may influence the incidence of PONV. It is also recommended to include additional variables by documenting and controlling the use of antiemetic and analgesic medications during the preoperative, intraoperative, and postoperative phases. Moreover, a more detailed analysis of each indicator within the Koivuranta scoring system should be conducted. This approach will provide deeper insights into the contribution of individual risk factors to PONV and improve the accuracy of prediction models and the effectiveness of preventive strategies.

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