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Evaluating the Role of Atropine Sulphate in Preventing Motion-Related Postoperative Nausea and Vomiting in Patients Undergoing Cesarean Section using ERACS Protocol

Amalia Rahmadinie*[1], Wayan Dhea Agastya[1]

[1]Universitas Pembangunan Nasional Veteran Jawa Timur
*Corresponding Author Email: amaliarahmadinie.fk@upnjatim.ac.id

ABSTRACT

Background: Postoperative Nausea and Vomiting (PONV) is common after cesarean section (CS) using Enhanced Recovery after Cesarean Section (ERACS) protocol. Motion-related PONV during early mobilization can impair comfort and delay recovery. Anticholinergic agents such as atropine sulphate (atropine) have antiemetic effects via muscarinic receptor antagonism, especially when vestibular pathways are involved, but their intravenous use for motion-related PONV prevention remains underexplored.
Objective: To evaluate the effectiveness of intravenous atropine sulphate in reducing motion-related PONV within two hours postoperatively in patients undergoing CS.
Methods: A retrospective cross-sectional analysis was carried out involving 30 patients at a private hospital in Sidoarjo, Indonesia (May–June 2025). Patients were assigned to either control (no atropine) or treatment (0.5 mg atropine IV after cord clamping). The primary outcome was a combined PONV score: (1) vomiting episodes ≥ 1, (2) moderate-to-severe nausea/vomiting (VAS > 4), and (3) rescue antiemetic use. Secondary outcomes included atropine-related adverse effects.
Results: The treatment group had significantly lower mean combined PONV scores ($p < 0.001$), fewer vomiting episodes ($p = 0.035$), less moderate-to-severe nausea ($p = 0.002$), and borderline reduced rescue antiemetic use ($p = 0.05$). No significant adverse effects were observed.
Conclusion: IV atropine sulphate 0.5 mg after cord clamping effectively reduces motion-related PONV in ERACS CS patients without notable side effects
Keywords: **atropine sulphate, cesarean section, ERACS, PONV, vestibular pathway.**

Peran Sulfas Atropin dalam Mengurangi Kejadian *Motion-Related* PONV pada Pasien yang Menjalani Seksio Sesaria dengan Protokol ERACS

ABSTRAK

Latar Belakang: PONV merupakan komplikasi yang umum terjadi setelah seksio sesarea dengan protokol ERACS. *Motion-related* PONV selama mobilisasi dini dapat menurunkan kenyamanan pasien dan memperlambat pemulihan. Agen antikolinergik seperti sulfas atropine (SA) memiliki efek antiemetik melalui antagonisme reseptor muskarinik, melalui jalur vestibular, sayangnya penggunaan SA intravena untuk pencegahan PONV masih jarang diteliti.
Tujuan: Mengevaluasi efektivitas SA dalam menurunkan kejadian *motion-related* PONV dalam dua jam pertama pascaoperasi pada pasien yang menjalani seksio sesarea.
Metode: Penelitian potong lintang retrospektif dilakukan pada 30 pasien di sebuah rumah sakit swasta di Sidoarjo, Indonesia (Mei–Juni 2025). Pasien dibagi menjadi kelompok kontrol (tanpa atropin) dan kelompok perlakuan (0,5 mg SA intravena setelah pemotongan tali pusat). Luaran primer adalah skor kombinasi PONV yang terdiri dari: (1) episode muntah ≥1, (2) mual/muntah sedang–berat (VAS >4), dan (3) penggunaan antiemetik penyelamat. Luaran sekunder mencakup efek samping terkait SA.
Hasil: Kelompok perlakuan memiliki skor kombinasi PONV rata-rata yang lebih rendah secara signifikan ($p <0,001$), lebih sedikit episode muntah ($p =0,035$), mual sedang–berat yang lebih jarang ($p =0,002$), dan penggunaan antiemetik penyelamat yang lebih rendah secara borderline signifikan ($p =0,05$). Tidak ditemukan efek samping signifikan karena atropin.
Kesimpulan: Pemberian SA intravena 0,5 mg setelah pemotongan tali pusat secara efektif menurunkan *motion-related* PONV pada pasien seksio sesarea dengan protokol ERACS tanpa efek samping yang berarti.
Kata kunci: ERACS, PONV, seksio sesarea, sulfas atropin, jalur vestibular.

INTRODUCTION

The proportion of deliveries by caesarean section (CS) in Indonesia was 17.6%, based on the 2018 Indonesia Basic Health Research/ *Riset Kesehatan Dasar* (Riskesdas) data (Kemenkes RI, 2019). In recent years, CS procedures utilizing the Enhanced Recovery after Cesarean Section (ERACS) protocol have shown a considerable increase. ERACS is a multi-disciplinary, multi-modal perioperative management designed to decrease stress response during a CS surgery, reduce complications, length of stay, and speed recovery time (Wilson et al, 2018).

Postoperative nausea and vomiting (PONV) represents a frequent complication following CS, occurring in up to 60–80% of cases. This high incidence is partly attributed to the widespread use of spinal opioids, which, while offering effective intraoperative and postoperative analgesia, are well known to induce nausea and vomiting as common adverse effects (Yuill & Gwinnut, 2025). Although often not medically severe, PONV can cause considerable discomfort, prolong hospital stays, and increase healthcare resource utilization. Its etiology is multifactorial, encompassing physiological, pathological, and pharmacological contributors. The condition occurs more frequently in women compared to men and is more prevalent among younger patients (Jacobs et al, 2020). Despite advancements in anesthesia and postoperative care, PONV remains a source of discomfort, delays recovery, and can impair maternal bonding and breastfeeding initiation in the early postpartum period. ERACS protocol emphasizes multimodal, opioid-sparing anesthesia and analgesia, early mobilization, and early oral intake to optimize recovery. However, PONV remains a challenge even within ERACS frameworks, and effective preventive measures are essential. In Indonesia, the ERACS protocol typically employs a regimen comprising bupivacaine, morphine, and fentanyl, in which the use of intrathecal opioids constitutes to contribute to the occurrence of PONV.

Various receptors and stimuli that cause PONV lie in the central and peripheral nervous system. Given the large number of receptors and triggers involved in the genesis of PONV, a multimodal approach for prophylaxis and treatment should be considered (Gan et al, 2020). Opioid (μ) receptors are distributed within both the peripheral gastrointestinal tract and the central nervous system (CNS). Histamine (H_1) and cholinergic muscarinic (M_1) receptors are located inside ear and vestibular apparatus. Key CNS structures involved in the regulation of the emetic reflex include the vomiting center, area postrema,

chemoreceptor trigger zone (CTZ), and nucleus tractus solitarius (NTS). The vomiting center, area postrema, and CTZ harbor multiple receptor types implicated in emesis, including serotonin (5-HT_3), dopamine (D_2), opioid (μ), cholinergic (M_1), and neurokinin-1 (NK_1) receptors. Additionally, the NTS contains serotonin (5-HT_3), neurokinin-1 (NK_1), and opioid (μ) receptors, which play a pivotal role in integrating afferent input and modulating the output to the vomiting center (Kovac, 2025). Stimulation of the vestibular pathway, for example during patient transport and positional change in postoperative, particularly via muscarinic receptors, plays a significant role in motion-related nausea and vomiting.

A variety of pharmacologic agents are available for the management of PONV, categorized according to their receptor targets, one of which is the anticholinergic class. Anticholinergic drugs capable of crossing the blood–brain barrier exert direct effects on the vomiting center, conferring antiemetic activity. This class represents one of the earliest pharmacological approaches to nausea and vomiting, although initially introduced for other purposes. Atropine, for example, was originally employed to inhibit vagal responses to chloroform and later to reduce salivary secretions during ether anesthesia. Over time, it was largely superseded by hyoscine (scopolamine). Both remain in clinical use for nausea and vomiting, with hyoscine demonstrating greater potency and efficacy. Their effectiveness is particularly notable in motion sickness, labyrinthine disorders, vestibular pathology, postoperative states following posterior fossa surgery, and in mitigating opioid-induced emesis. However, their antimuscarinic mechanism can produce adverse effects such as sedation, xerostomia, blurred vision, and urinary retention, which are generally more pronounced with hyoscine (Yuill & Gwinnut, 2025).

Anticholinergic agents, including atropine sulfate and scopolamine, possess well-established antiemetic effects and may represent effective therapeutic options for mitigating the incidence of PONV in patients undergoing CS under the ERACS protocol. Its antimuscarinic effect on the vestibular system suggests potential utility in PONV prevention, particularly when motion or head movement triggers symptoms during early postoperative mobilization or transfer. In Indonesia, atropine sulphate is widely available, whereas scopolamine remains infrequently accessible. While numerous studies have investigated the effects of intrathecal atropine sulphate in the context of PONV, research evaluating its intravenous administration, particularly for motion-related PONV, remains limited. Therefore, this study aimed to evaluate the effect of prophylactic intravenous atropine sulfate on the incidence and severity of PONV using a combined PONV score in

ERACS patients undergoing CS, thereby addressing a gap in the current body of evidence and potentially informing multimodal antiemetic strategies in obstetric anesthesia practice.

METHODS

This retrospective cross-sectional investigation was carried out at a private hospital in Sidoarjo, Indonesia, utilizing medical record data from 30 patients who underwent CS following the ERACS protocol between May and June 2025. Approval from the institutional ethics committee was secured before initiating the study. The inclusion criteria are gravid patients aged 18–40 years, with a body mass index (BMI) of 18–30 kg/m^2, and American Society of Anesthesiologists (ASA) physical status I–II. The exclusion criteria included patients with a BMI outside the range of 18–30 kg/m^2, an ASA physical status classification of III or higher, as well as those with systemic conditions such as cardiac, renal, or hepatic impairment; uncontrolled hypertension; and endocrine disorders, for example uncontrolled diabetes mellitus or thyroid disease. The duration of surgery more than 2 hours, conversion from spinal to general anesthesia, and those receiving intravenous atropine for the treatment of bradycardia, which were also considered as dropout criteria from the study.

According to the medical records, a pre-anesthetic assessment was conducted before surgery, during which patients were informed about the procedure and the ERACS protocol. Participants were informed about the use of the Apfel scoring system, and written consent was obtained from each prior to participation. The simplified Apfel score, recognized as the most extensively studied and utilized tool for assessing PONV risk in both clinical and research settings, was employed in this study.

Table 1. Apfel Simplified PONV Risk Score for Adults (Stoops & Kovac, 2020).

Risk Factors	Numbers of Risk Factors	PONV Risk (%)	Degree of PONV Risk
- Female gender. - History of PONV/ motion sickness. - Nonsmoker. - Postoperative opioids	0	10	Low
	1	21	Mild
	2	39	Moderate
	3	61	High
	4	79	Extremely High

ERACS protocol at the study site

The ERACS protocol applied in our hospital includes:

1. Preoperative counselling.
2. Abstinence from solid foods for 6 hours and 2 hours for clear water.
3. 2-hour preoperative carbohydrate loading, using sweet tea drink.
4. Preoperative antiemetic protocol: intravenous dexamethasone 5mg and ondansetron 4mg in premedication room.
5. Spinal anesthesia with hyperbaric bupivacaine, fentanyl, and morphine.
6. Intraoperative measures to maintain normothermia and hemodynamic stability.
7. Multimodal analgesia: NSAID and paracetamol.
8. Early postoperative mobilization.
9. Early feeding within 4 hours after surgery, and
10. Urinary catheter removal within 12 hours postoperatively.

Patient data were collected from medical records. As documented, upon arrival in the operating theatre, monitoring devices including electrocardiogram (ECG), pulse oximeter, and noninvasive blood pressure were applied, and baseline measurements of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and peripheral oxygen saturation (SpO_2) were obtained. Under strict aseptic precautions and local anesthesia, lumbar puncture was performed at the L3–L4 or L4–L5 interspace using a 25/26G Quincke needle. After confirming free cerebrospinal fluid flow, the intrathecal drugs were administered. All patients received the same spinal anesthesia regimen: hyperbaric bupivacaine 7.5 mg, morphine 80 mcg, and fentanyl 25 mcg, with a total drug volume of 2.1 ml loaded into a 3 ml syringe. Following spinal anesthesia, HR, SBP, DBP, MAP, SpO_2, and respiratory rate (RR) were recorded every 5 minutes until the completion of surgery.

The treatment group consisted of patients who received 0.5 mg of intravenous atropine sulphate after umbilical cord clamping (group S), while those who did not receive atropine sulphate served as the control group (group T). Following delivery, and either before or after placental expulsion, oxytocin is administered intravenously as dilute solutions to minimize postpartum bleeding.

Patients were observed in the postanesthesia care unit (PACU) for 2 hours, during which the occurrence of PONV was assessed with Combine PONV Score, consisting of three components (ranged between 0-3 total score, 0-1 for each component). The scoring system included: the number of vomiting episodes, with a score of 1 assigned if ≥1 episode occurred; the Likert scale for nausea and vomiting, with a score of 1 assigned if the Visual

Analog Scale (VAS) was ≥4; and the need for rescue antiemetics, with a score of 1 assigned if such medication was administered. In this study, nausea severity was assessed using a Likert scale, with patients rating their symptoms on a scale from 0 to 10. The scores of 0 (no nausea), 1-3 (mild nausea), 4-6 (moderate nausea), and 7-9 determined severe nausea, while score 10 was assigned to vomiting (Vazin, 2017). The secondary outcome was the incidence of adverse effects potentially related to atropine, including tachycardia, dry mouth, blurred vision, or urinary retention.

Data retrieved from medical records encompassed demographic variables (age, body weight, body height, body mass index), ASA physical status, preoperative Apfel score, intraoperative duration, and postoperative assessments related to PONV and adverse events as described earlier. Demographic characteristics between groups were analyzed using either an independent t-test or Mann–Whitney U test, depending on data distribution. Statistical significance was set at $p < 0.05$, and all analyses were performed using SPSS software, version 26. The overall combined PONV score was evaluated using the Mann–Whitney U test, while categorical PONV parameters were assessed with either the Chi-square test or Fisher's exact test as appropriate.

RESULT

Applying the inclusion and exclusion criteria, data from 30 patients were analyzed, comprising 15 patients in the group T and 15 patients in the group S. Baseline demographic parameters— belong to age in years, body weight in kg, height in cm, body mass index (BMI), ASA physical status, Apfel score, and operative duration—were compared between the two groups, with no statistically significant differences observed.

Table 2. Demographic Parameters, Physical Status, Apfel Score, and Duration of Surgery

Parameter	**Group T**	**Group S**	**p-value**
Age in years (Mean±SD)	29.73 ± 3.26	30.8 ± 3.44	0.39
Body weight in kg (Mean±SD)	70,36 ± 3,94	70.61 ± 3.97	0.86
Body height in cm (Mean±SD)	158,8 ± 3,7	158.93 ± 3.75	0.92
BMI (Mean±SD)	27.87 ± 0.54	27.93 ± 0.48	0.78
ASA Physical Status	2	2	-
Apfel Score (Mean±SD)	2.06 ± 0.7	1.86 ± 0.63	U-value = 130
			p-value (2-tailed) = 0.43
Duration of Surgery (Mean±SD)	65.07 ± 6.15	65.43 ± 5.89	0.87

Table 3. Combine PONV Score in PACU

Parameter	Group T	Group S	p-value
≥1 vomiting episode occured	7 (47%)	1 (6%)	0.035
VAS for nausea and vomiting	15 (100%)	7 (47%)	0.002
Antiemetic rescue	8 (54%)	2 (14%)	0.05
Combined Score	2.06 ± 0.70	0.73 ± 0.70	U-value = 200.5
			p-value (2-tailed) = 0.00015

In terms of PONV outcomes within the first 2 postoperative hours, the total combined PONV score was lower in the group S compared with the group T (0.73 ± 0.70 vs. 2.06 ± 0.70, $p < 0.001$), indicating a highly significant difference between the two groups. The incidence of ≥1 episode of vomiting was also significantly reduced in the group T (7 patients) compared with the group S (1 patients) ($p = 0.035$). Moderate-to-severe nausea (VAS >4) occurred in 7 patients in the group S and 15 patients in the group T ($p = 0.002$). The need for rescue antiemetics was lower in the group S (2 patients) than in the group T (8 patients), reaching borderline statistical significance ($p = 0.05$).

Table 4. Atropine-related Adverse Effects

Parameter	Group T	Group S
Dry mouth	0	1
Tachycardia	0	1
Urinary retention	0	0
Blurred vision	0	0
Other (s)	0	0

No significant adverse effects attributable to atropine sulfate were recorded. In particular, there were one case of mild tachycardia (104-108x/minute), and one case of mild dry mouth during the observation period in the group S.

These findings indicate that intravenous atropine sulphate administration effectively reduces motion-related PONV, vomiting episodes, nausea severity, and the need for rescue antiemetic medications in patients undergoing CS under the ERACS protocol.

DISCUSSION

The study aims to evaluate the effect of intravenous atropine sulphate in preventing motion related PONV in patients undergoing CS using ERACS protocoll in the preoperative phase, patient management encompassed minimizing the fasting duration, administering oral carbohydrate-containing fluids, and providing comprehensive preoperative counselling. Intraoperatively, care focused on maintaining hemodynamic stability through hypotension prevention, preserving normothermia, ensuring optimal uterotonic therapy, administering prophylaxis for intraoperative nausea and vomiting or PONV, implementing multimodal analgesia, and optimizing perioperative fluid balance. Postoperative management included early initiation of enteral nutrition, prompt mobilization, timely removal of the urinary catheter, prophylaxis against venous thromboembolism, continuation of multimodal analgesia, and strict glycemic control (Sardimon et al, 2022). In this study ERACS protocol, patients receiving intratechal morphine and fentanyl along with hyperbaric bupivacaine. It showed that administration of intravenous atropine sulphate after cord clamping reduced the incidence and severity of PONV statistically significant.

Intrathecal opioids administered for CS offer superior postoperative analgesia but are frequently associated with substantial nausea and vomiting. The occurrence of PONV is influenced by multiple risk factors, reflecting its multifactorial etiology. Contributing determinants include patient-related characteristics, the nature of the surgical procedure, and the anesthetic technique applied. Genetic predisposition also plays a role, with individuals homozygous for the A118 variant of the *OPRM1* gene exhibiting a heightened susceptibility (Moon, 2014). Excluding surgical duration as a factor, Apfel et al. introduced a simplified scoring system that assesses four predictors: patient gender, smoking status, history of PONV or motion sickness, and the anticipated need for postoperative opioid administration (Stoops & Kovac, 2020).

The pathophysiology of PONV is multifaceted, engaging multiple neuroanatomical pathways and receptor systems. Five principal afferent routes are recognized in the initiation of the vomiting reflex: CTZ, vagal afferents from the gastrointestinal tract mucosa, neural inputs from the vestibular apparatus, reflex from the cerebral cortex, and midbrain projections. Activation of any of these pathways can trigger emetic responses through the involvement of cholinergic/muscarinic, dopaminergic, histaminergic, or serotonergic receptor mechanisms (Gan et al, 2014).

The central regulation of nausea and vomiting is mediated by a poorly demarcated

region within the medullary reticular formation, commonly referred to as the “vomiting center.” This area integrates afferent inputs from the various emetogenic pathways and communicates extensively with the nucleus of the solitary tract. Neurokinin-1 (NK-1) receptors, located predominantly in the area postrema, are believed to play a pivotal role in the emetic response. Notably, CTZ is located outside the blood–brain barrier, enabling direct interaction with circulating and cerebrospinal fluid–borne emetogenic stimuli (Shaikh, 2016).

CTZ facilitates interaction between circulating substances in the blood and cerebrospinal fluid. Systemic toxins or pharmacologic agents can provoke nausea and vomiting by stimulating the CTZ, which in turn transmits emetogenic signals to the medullary vomiting center, initiating the vomiting reflex. Activation of this center can also occur through gastrointestinal or oropharyngeal irritation, vestibular stimulation, nociceptive input, hypoxemia, or hypotension. The efferent pathway involves nervus glossopharyngeus, hypoglossus, trigeminal, accessorius, and segmental spinal nerves, coordinating a forceful contraction of abdominal musculature against a closed glottis, thereby elevating intra-abdominal and intrathoracic pressures. Concurrently, the pyloric sphincter contracts, the lower esophageal sphincter relaxes, and retrograde peristalsis in the esophagus expels gastric contents. This motor sequence is accompanied by pronounced vagal and sympathetic activation, producing diaphoresis, pallor, and bradycardia. PONV is typically multifactorial, influenced by patient-specific, surgical, and anesthetic determinants. Its pathogenesis frequently involves the release of 5-hydroxytryptamine (5-HT) within an interconnected cascade of central and gastrointestinal neuronal events, with 5-HT3 receptors playing a key role in mediating the emetic respons (Shaikh, 2016).

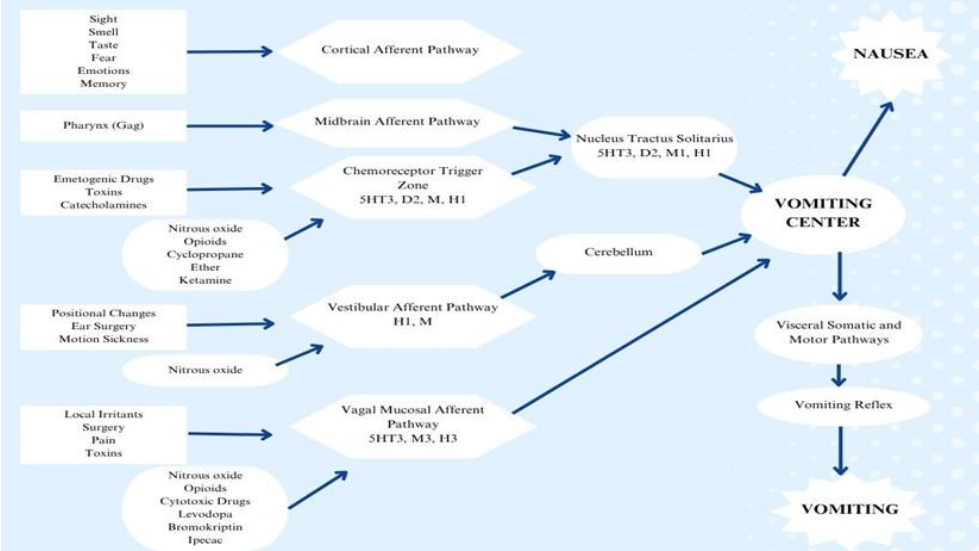

Figure 1. The pharmacological and physiological pathways involved in nausea and vomiting. Receptor abbreviations: 5-HT_3 – serotonin (5-hydroxytryptamine) subtype 3; H_1, H_3 – histamine; M, M_1, M_3 – muscarinic; D_2 – dopamine (Shaikh, 2016).

The reported incidence of nausea among patients undergoing elective CS ranges from 40% to 81%, with a higher likelihood observed during uterine exteriorization. Intraoperative nausea can interfere with the surgical field and disrupt procedural flow, whereas postoperative nausea not only causes significant patient discomfort but also increases the risk of wound dehiscence. A wide range of pharmacologic interventions has been employed to prevent or manage nausea and vomiting in this setting, demonstrating variable efficacy and differing adverse effect profiles (Jain et al, 2015).

Anticholinergics are shown to possess antiemetic properties. Five muscarinic receptors have been identified. All muscarinic subtypes are expressed in the CNS but M_4 and M_5 seem to be restricted there. Their activation induces emesis. Atropine is a broad-spectrum muscarinic agonist and it could prevent motion induced nausea, although its efficacy is not as potent as that of scopolamine. The antiemetic dose of atropine is 0.3-0.6mg IM or IV 30-60 minutes preop (Yuill & Gwinnut, 2025) or IV atropine 0.006-0.009mg/kg (Abdalla et al, 2019).

Turai et al. notified that administration of 100 mcg of intrathecal atropine has been shown to decrease both the incidence and severity of PONV in patients undergoing lower abdominal procedures with intratechal bupivacaine and 200 mcg morphine. Additionally, patients in the atropine group required fewer rescue antiemetic interventions compared with those receiving placebo (Turai et al., 2021). Similarly, Abdalla et al. reported that combining intravenous dexamethasone with intrathecal atropine produced an additive

antiemetic benefit in CS patients receiving spinal anesthesia with bupivacaine and morphine (Abdalla, 2019).

This study found that administering 0.5 mg of intravenous atropine sulfate prophylactically, immediately following cord clamping, significantly decreased the incidence of early postoperative nausea and vomiting in ERACS patients undergoing CS. The benefit was observed both in the overall combined PONV score and in each individual component, without any significant adverse effects reported.

Comparison with Previous Studies

Although atropine sulfate is traditionally used for premedication or the treatment of bradycardia, its antimuscarinic properties can also modulate vestibular input, thereby reducing nausea and vomiting triggered by motion or positional changes. Previous studies in non-obstetric populations have suggested a potential benefit of anticholinergics in PONV prevention, but evidence in CS under ERACS protocols remains scarce. Our findings align with smaller trials that reported reduced PONV incidence when atropine was included in multimodal antiemetic regimens, particularly in cases where vestibular stimulation was likely to contribute to symptoms. A randomized clinical study involving 150 women undergoing CS under spinal anesthesia compared the prophylactic efficacy of three intravenous medications—atropine, dexamethasone, and droperidol—in preventing intraoperative nausea, vomiting, and abdominal discomfort. Patients were equally divided into three groups. The results indicated that low-dose intravenous atropine (0.006–0.009 mg/kg) was more effective in reducing these symptoms compared to dexamethasone (0.04–0.1 mg/kg) and droperidol (0.08–0.12 mg/kg) (Abdalla, 2019).

Vestibular Pathway and PONV

PONV is a multifactorial phenomenon involving multiple receptor systems located both centrally and peripherally. In addition to well-recognized triggers such as opioid administration and hypotension, stimulation of the vestibular pathway plays an important role in certain perioperative contexts. The vestibular system, through muscarinic (M_1) and histamine (H_1) receptors, can activate the vomiting center via the cerebellum and brainstem. Atropine, as a competitive antagonist at muscarinic receptors, may inhibit this pathway, reducing symptoms, particularly during early postoperative mobilization or transfer from the operating table to the recovery area.

Relevance to ERACS Protocols

In ERACS, early mobilization and early oral intake are encouraged to optimize

recovery, but both can provoke PONV in susceptible patients. Our hospital's ERACS protocol includes multimodal analgesia, minimization of intraoperative opioids, and attention to fluid balance. The addition of atropine to the antiemetic regimen, even in a setting already optimized for PONV prevention, was associated with a marked improvement in patient comfort and potentially faster recovery milestones such as ambulation and initiation of breastfeeding.

Clinical Implications

The most notable finding of this study was the dramatic reduction in the combined PONV score in group S. This suggests that atropine may offer particular benefit when vestibular stimulation is a prominent trigger, as may occur during patient transfer, uterine exteriorization, or changes in position postoperatively. Given its low cost, wide availability, and favorable safety profile in this context, atropine could be considered in selected ERACS patients at higher risk for vestibular-related PONV.

Adverse Effects

Atropine is an antimuscarinic agent that acts through competitive inhibition of postganglionic acetylcholine receptors and exerts a direct vagolytic effect. This mechanism suppresses parasympathetic activity at acetylcholine receptors in smooth muscle. Consequently, the reduction in parasympathetic tone permits unopposed sympathetic stimulation, leading to an increase in cardiac output along with the characteristic antimuscarinic side effects (Patel et al, 2025).

In this study, atropine was administered after cord clamping, almost close in time to oxytocin administration. Since bolus injection of oxytocin cause hypotension and could trigger a reflex tachycardia, it was not given as a bolus but diluted (10 units in 500 ml intravenous fluid) and infused at 10 mU/min, then tapered to 1–2 mU/min until the patient is ready to transfer to the PACU. So, the hemodynamic instability due to oxytocin administration could be avoided. In the group S, one patient developed dry mouth and another presented with tachycardia. No cases of urinary retention, blurred vision, or other complications were reported in either group.

Limitations

This study has several limitations. Its retrospective design limits the ability to control for all confounding factors. The relatively small sample size and single-center setting may restrict the broader applicability of the findings. The observation period was restricted to the first two postoperative hours, so delayed PONV was not assessed. Further randomized

controlled trials are warranted to confirm these findings and explore optimal dosing strategies.

CONCLUSION

Intravenous administration of 0.5 mg atropine sulphate after umbilical cord clamping effectively reduces the incidence and severity of motion-related PONV in patients undergoing CS using ERACS protocol. This includes significant reductions in vomiting episodes, moderate-to-severe nausea, and lower rescue antiemetic requirements. For its widespread availability, cheap cost, safety at low doses, and mechanistic plausibility, atropine sulphate represents a practical and valuable addition to multimodal PONV prophylaxis strategies in obstetric anesthesia. Future multicenter randomized trials with substantial sample sizes are recommended to affirm this study and also to explore long-term outcomes.

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