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Comparison of Postpartum Oxytocin Infusion Requirements in Patients Exposed to Oxytocin Prior to Caesarean Delivery Versus Patients Not Exposed

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ABSTRACT

Background: Postpartum haemorrhage (PPH) is a leading cause of maternal morbidity and mortality worldwide, with uterine atony being the primary etiology. Oxytocin remains the first-line uterotonic for prevention and treatment of PPH. However, prior intrapartum oxytocin exposure may induce receptor desensitization, reducing myometrial responsiveness in the immediate postpartum period. This study compared postpartum oxytocin infusion requirements in women exposed to oxytocin before caesarean delivery versus those not exposed.

Methods: This retrospective observational study was conducted at Sher-i-Kashmir Institute of Medical Sciences between 2019 and 2021. A total of 200 parturients undergoing caesarean delivery under neuraxial anaesthesia were included. Group A (n=100) had intrapartum oxytocin exposure for induction or augmentation, while Group B (n=100) did not. Demographic data, estimated blood loss, haemoglobin changes, oxytocin infusion rates, additional uterotonic use, and transfusion requirements were recorded. Statistical analysis was performed using t-test, Mann–Whitney U test, and Chi-square test, with $p<0.05$ considered significant.

Results: Group A patients were younger and more frequently nulliparous. They demonstrated higher estimated blood loss (762±166 vs 698±176 ml, p=0.009), greater haemoglobin drop (1.8±0.9 vs 1.2±0.7 g/dl, $p<0.001$), and higher need for high-rate oxytocin infusion (61% vs 32%, $p<0.001$). Additional uterotonics (53% vs 6%, $p<0.001$) and blood transfusions (41% vs 24%, p=0.012) were also more frequent in Group A.

Conclusion: Intrapartum oxytocin exposure significantly increases postpartum oxytocin infusion requirements and is associated with greater blood loss and higher need for adjunct uterotonics and transfusion. Anticipating this risk may help optimize uterotonic strategies and reduce PPH-related morbidity.

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1. INTRODUCTION

Postpartum haemorrhage (PPH) continues to be one of the leading causes of maternal morbidity and mortality worldwide, accounting for nearly one-quarter of maternal deaths, especially in low- and middle-income countries. The most common cause of PPH is uterine atony, which represents the failure of the uterus to contract effectively after delivery. Uterotonics, particularly oxytocin, are the mainstay of both prophylaxis and treatment of PPH. Oxytocin has been widely used during labour for induction and augmentation of uterine contractions and remains the first-line drug in preventing excessive postpartum bleeding. However, prolonged exposure to oxytocin during labour has been shown to cause receptor desensitization at the level of the myometrium, leading to reduced contractile response when oxytocin is administered in the immediate postpartum period. This phenomenon has important clinical implications as women who are exposed to oxytocin before caesarean delivery may require higher doses of postpartum oxytocin infusion compared to those not exposed.

Several studies have documented increased requirements for oxytocin in patients who underwent caesarean delivery after failed induction or augmentation with oxytocin. These patients not only had higher postpartum oxytocin needs but were also more likely to experience greater blood loss and need additional uterotonic drugs. Receptor desensitization, reduced receptor density, and downregulation of oxytocin signalling pathways have been suggested as mechanisms. On the other hand, women undergoing elective caesarean section without prior oxytocin exposure usually respond adequately to standard oxytocin doses. Thus, intrapartum oxytocin exposure appears to be an independent risk factor for uterine atony and postpartum haemorrhage.

Given the high burden of maternal morbidity due to PPH and the central role of oxytocin in its management, understanding the relationship between intrapartum oxytocin exposure and postpartum requirements is of great importance. This study was therefore conducted to compare postpartum oxytocin infusion requirements in patients exposed to oxytocin prior to caesarean delivery versus those not exposed. In addition to infusion requirements, we also assessed blood loss, haemoglobin changes, transfusion needs, and the requirement of additional uterotonic agents.

2. AIMS AND OBJECTIVES

Primary Objective: • To compare the infusion rate of postpartum oxytocin required in patients exposed to oxytocin before caesarean delivery versus those not exposed.

Secondary Objectives: • To assess estimated blood loss and incidence of postpartum haemorrhage.

• To evaluate the need for additional uterotonic medications.

• To compare red blood cell transfusion requirements and perioperative haemoglobin changes.

• To assess the need for surgical interventions for bleeding control.

• To observe adverse effects of oxytocin such as nausea and vomiting.

Materials and Methods

This retrospective observational study was conducted in the Department of Anaesthesiology and Critical Care, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, between 2019 and 2021. Institutional Ethics Committee approval was obtained. A total of 200 parturients undergoing caesarean delivery under neuraxial anaesthesia were included. Patients were divided into two groups: Group A (n=100) received oxytocin for induction or augmentation of labour prior to caesarean section, and Group B (n=100) did not receive oxytocin prior to surgery.

Inclusion criteria were ASA II status, singleton pregnancy, and receipt of neuraxial anaesthesia. Patients who underwent caesarean section under general anaesthesia, had placenta accreta, or had incomplete oxytocin charting were excluded. Data collected included demographics, obstetric comorbidities, gestational age, indication for caesarean delivery, operative time, neonatal weight, estimated blood loss, haemoglobin changes, oxytocin infusion rates, use of other uterotonics, and need for transfusions.

Statistical analysis was performed using SPSS version 20.0. Continuous variables were expressed as mean ± SD and compared using Student's t-test or Mann-Whitney U test as appropriate. Categorical variables were summarized as frequencies and percentages, and compared using Chi-square test or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

3. RESULTS

A total of 200 parturients were included, with 100 in Group A (OXY+) and 100 in Group B (OXY–). Group A patients were younger and more frequently nulliparous than Group B ($p<0.001$). Gestational age at delivery was higher in Group A (38.9 vs 37.5 weeks, $p<0.001$). There was no significant difference in BMI or operative time. Group A demonstrated

higher estimated blood loss and haemoglobin drop compared to Group B. A larger proportion of Group A required high-rate oxytocin infusion (61% vs 32%, p<0.001), additional uterotonic agents (53% vs 6%, p<0.001), and RBC transfusions (41% vs 24%, p=0.012).

Table 1: Demographic characteristics of the study groups.

Parameter	Group A (OXY+)	Group B (OXY–)	p-value
Mean Age (years)	28.2 ± 2.6	31.6 ± 3.2	<0.001
BMI (kg/m2)	28.3 ± 1.7	28.8 ± 1.6	0.319
Gestational Age (weeks)	38.9 ± 0.9	37.5 ± 1.5	<0.001
Nulliparous (%)	94%	11%	<0.001

Table 2: Intraoperative outcomes between the two groups.

Outcome	Group A (OXY+)	Group B (OXY–)	p-value
Operative Time (min)	48.4 ± 4.2	47.2 ± 6.1	0.096
Estimated Blood Loss (ml)	762 ± 166	698 ± 176	0.009
Hb Drop (g/dl)	1.8 ± 0.9	1.2 ± 0.7	<0.001

Figure 1: Line graph comparing estimated blood loss between Group A (OXY+) and Group B (OXY–).

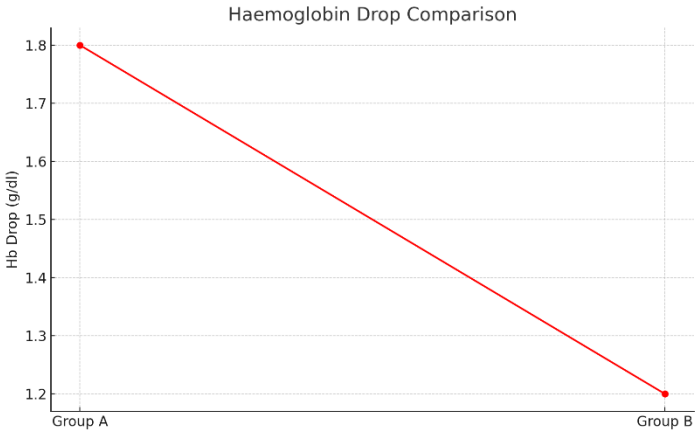


Figure 2: Line graph showing mean haemoglobin drop in both groups.

Table 3: Oxytocin infusion requirements and use of additional uterotonics.

Parameter	Group A (OXY+)	Group B (OXY–)	p-value
High-rate Oxytocin (%)	61%	32%	<0.001
Other Uterotonics (%)	53%	6%	<0.001

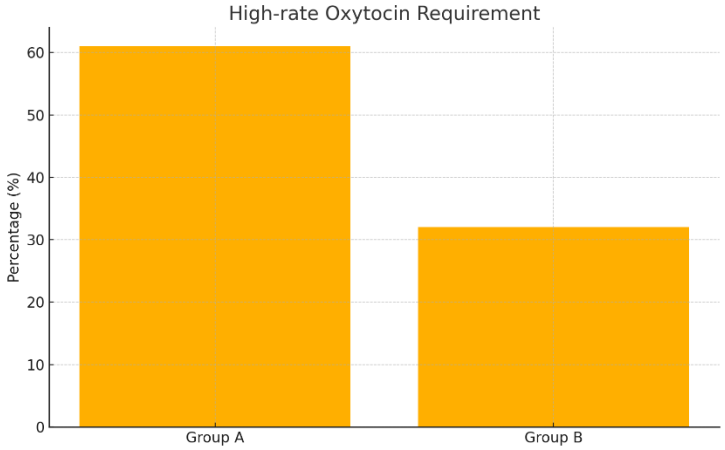
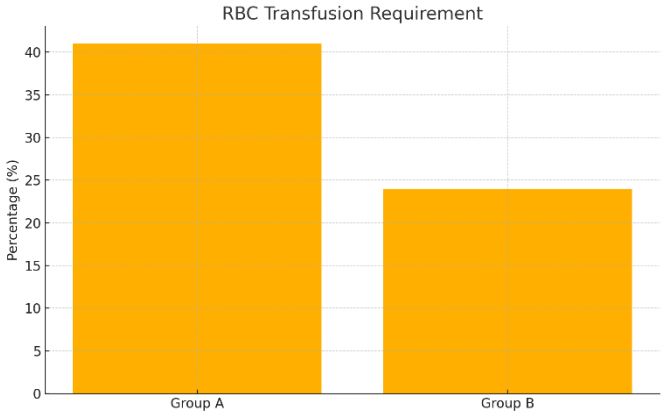


Figure 3: Bar chart comparing requirement of high-rate oxytocin infusion between groups.

Table 4: Requirement of red blood cell transfusion.

Parameter	Group A (OXY+)	Group B (OXY–)	p-value
RBC Transfusion (%)	41%	24%	0.012

Figure 4: Bar chart comparing proportion of patients requiring RBC transfusion.



4. DISCUSSION

This study demonstrates that prior intrapartum exposure to oxytocin significantly increases postpartum oxytocin infusion requirements during caesarean delivery. Women exposed to oxytocin not only required higher infusion rates but also experienced greater blood loss, larger haemoglobin drops, and more frequent need for additional uterotonic agents and

blood transfusions. These findings support the concept of oxytocin receptor desensitization, where prolonged stimulation during labour reduces myometrial responsiveness to oxytocin.

Our results are consistent with previous studies, including those by **Carvalho et al., Balki et al., and Foley et al.,** which reported increased oxytocin requirements in women undergoing caesarean section after labour augmented with oxytocin. The clinical implication is that anaesthesiologists and obstetricians should anticipate higher uterotonic needs in such patients and be prepared with second-line agents like carboprost, misoprostol, or methylergometrine.

Strengths of this study include a relatively large sample size and comprehensive analysis of perioperative outcomes. However, limitations include its retrospective design, reliance on charted data, and lack of long-term follow-up. Future prospective randomized studies are warranted to better define optimal dosing strategies for oxytocin in labouring versus non-labouring women.

5. CONCLUSION

In conclusion, women exposed to oxytocin during labour prior to caesarean delivery required significantly higher postpartum oxytocin infusion rates than those without prior exposure. This was accompanied by greater blood loss, larger haemoglobin decreases, and increased requirements for additional uterotonic drugs and blood transfusion. These findings highlight the clinical impact of oxytocin receptor desensitization and underscore the need for tailored uterotonic strategies. Clinicians should anticipate higher oxytocin requirements in women with intrapartum exposure and be prepared to escalate therapy appropriately to prevent postpartum haemorrhage.

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