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Pain outcomes after caesarean section in women with and without hypertensive disorders of pregnancy: A retrospective descriptive study

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Background. Hypertensive disorders of pregnancy restrict perioperative analgesic choices because of multisystem involvement and safety concerns related to non-steroidal anti-inflammatory drugs and neuraxial opioids. Despite the high prevalence of these disorders in southern Africa, postoperative pain outcomes in this population have not been previously compared.
Objectives. To compare maximum and minimum postoperative pain scores within 24 hours after caesarean section in women with and without hypertensive disorders of pregnancy, and to describe associated analgesic practices.
Methods. A retrospective descriptive study analysed 377 women enrolled in the PAIN OUT SA registry at Tygerberg Hospital between 1 October 2021 and 31 August 2022. Primary outcomes were maximum and minimum numerical rating scale (NRS) pain scores within 24 hours postoperatively. Secondary outcomes included analgesic use, side-effects, pain relief and patient satisfaction.
Results. A total of 377 women were included, of whom 81 (21.5%) had hypertensive disorders of pregnancy. Maximum NRS pain scores were similar between groups (median (interquartile range (IQR)) 6 (4 - 8) v. 6 (4 - 8); p=0.171)), as were minimum scores (2 (1 - 4.5) v. 3 (1 - 4); p=0.557). Hypertensive patients more frequently received wound infiltration (p=0.038), whereas postoperative ibuprofen use was more common among normotensive patients (p=0.001). Pain relief and satisfaction did not differ significantly.
Conclusion. Women with hypertensive disorders of pregnancy experienced similar postoperative pain scores and similar pain relief compared with normotensive women, despite differences in analgesic regimens. Further research should explore whether postoperative care setting or monitoring practices contribute to pain outcomes in high-risk obstetric populations.

Keywords: caesarean section, pain, hypertensive disorders of pregnancy, analgesia

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Postoperative pain after caesarean section remains a significant contributor to maternal morbidity, particularly in low- and middle-income countries, where inadequate analgesia is common and associated with delayed mobilisation, cardiopulmonary complications, impaired bonding and prolonged recovery.[1-5] Multimodal analgesia is therefore regarded as standard care to optimise recovery after caesarean delivery.[6]

Hypertensive disorders of pregnancy, including pre-eclampsia, affect ~10% of African pregnancies, and contribute substantially to maternal morbidity and mortality.[7-9] Their multisystem effects, including renal impairment, reduced intravascular volume and coagulopathy, limit the use of key analgesics such as non-steroidal anti-inflammatory drugs (NSAIDs) and intrathecal morphine. Consequently, anaesthesia providers may face constraints in achieving effective postoperative analgesia in this population.

Despite the clinical relevance, there is a striking absence of comparative data describing postoperative pain outcomes in women with hypertensive disorders of pregnancy. Understanding whether pain experiences differ between hypertensive and normotensive women is essential for guiding safe and context-appropriate multimodal analgesia. This study aimed to address this evidence gap.

NSAIDs, a cornerstone of multimodal analgesia, are often avoided in women with hypertensive disorders of pregnancy because of concerns related to renal dysfunction, fluid retention, and platelet effects.[10-13] However, the updated American College of Obstetricians and Gynecologists (ACOG) guideline supports the cautious use of NSAIDs in women with pre-eclampsia who have preserved renal and haematological function.[9] Although evidence for selective COX-2 inhibitors remains inconsistent, paracetamol combined with NSAIDs offers important opioid-sparing synergy. Balancing analgesic efficacy with safety therefore remains a central challenge when managing pain in this population.

Understanding these pharmacological restrictions is essential for contextualising postoperative pain outcomes in women with hypertensive disorders of pregnancy. Given these complexities, achieving effective post-caesarean analgesia in patients with hypertensive disorders of pregnancy requires careful individualisation of therapy. Anaesthesiologists must weigh the benefits of adequate pain relief against the risks of drug-related complications, especially in the context of limited access to safer alternatives such as intrathecal morphine. In resource-constrained settings, these challenges are compounded by staff shortages and financial limitations, which restrict the implementation of guideline-recommended multimodal analgesic strategies. In our setting, following the Society for Obstetric Anaesthesia and Perinatology guidelines, intrathecal morphine is reserved for low-risk patients.[14] This underscores the urgent need for context-sensitive research to identify safe, effective and feasible analgesic strategies for this high-risk group.

This study investigated whether postoperative pain outcomes differ between women with hypertensive disorders of pregnancy and normotensive women undergoing caesarean section in a tertiary South African (SA) hospital.

Methods

Study design and setting

This retrospective descriptive study analysed routinely collected postoperative pain data from the PAIN OUT SA registry at Tygerberg Hospital, a tertiary referral centre in Cape Town, SA. The PAIN OUT registry uses a standardised international methodology to evaluate postoperative patient-reported outcomes within 24 hours of surgery.[15]

Participants

All women undergoing caesarean section between 1 October 2021 and 31 August 2022 who completed the International Pain Outcomes Questionnaire (IPO-Q) were eligible for inclusion. Women aged <18 years or those who did not complete the IPO-Q were excluded. Hypertensive disorders of pregnancy were identified from clinical records, and included gestational hypertension, chronic hypertension, pre-eclampsia and eclampsia.

Data collection and outcomes

Postoperative pain outcomes were recorded using the validated IPO-Q instrument.[16] The primary outcomes were maximum and minimum numerical rating scale (NRS) pain scores reported within the first 24 postoperative hours. Secondary outcomes included pain relief, satisfaction with analgesia, analgesic prescriptions, and opioid- or NSAID-related side-effects. Additional variables extracted from the registry included demographic characteristics, comorbidities, gestational age, anaesthetic technique and perioperative analgesic use.

Sample size considerations

All eligible patients during the study period were included. A *post hoc* power analysis demonstrated that the study sample (n=377) provided >0.95 power to detect moderate effect-size differences in pain scores.

Statistical analysis

Continuous variables were summarised as means and standard deviations or medians and interquartile ranges (IQRs), depending on distribution. Categorical variables were presented as frequencies and percentages. Differences between hypertensive (group H) and normotensive (group N) women were assessed using independent t-tests or Mann-Whitney U tests for continuous variables, and Fisher's exact tests for categorical variables. Statistical significance was defined as $p<0.05$. Analyses were performed using Stata version 18 (StataCorp, USA).

Ethical approval

The PAINOUT SA project received ethical approval from the Human Research Ethics Committee of Stellenbosch University (ref. no. N19/10/140). This substudy received additional approval (ref. no. S24/04/091). Written informed consent was obtained from all participants at the time of registry enrolment, and data were anonymised prior to analysis.

Results

A total of 377 women were included in the analysis, of whom 81 (21.5%) had hypertensive disorders of pregnancy. The median (IQR) age of patients with hypertensive disorders of pregnancy was 36 (32 - 40) years, compared with that of normotensive patients (35 (31 - 39) years; p=0.109). The median (IQR) body mass index in kg/m^2 of hypertensive patients in this cohort was 36 (31 - 41), in contrast to the normotensive group (33 (27 - 41); p=0.070). The median (IQR) gestation period was 38 (34.25 - 38) weeks in the hypertensive group, and 38 (37 - 39) weeks in the normotensive group (p=0.003). Primiparous women comprised 13.0% of the hypertensive group and 6.3% of the normotensive group (p=0.057).

A general anaesthetic was used more frequently in hypertensive patients than in normotensive patients (16/81 (19.8%) v. 14/296 (4.7%); $p<0.00001$).

No statistically significant differences were observed between the groups for any of the pain-related outcomes assessed (Table 1).

Pruritus scores were marginally higher in normotensive women than hypertensive women (median (IQR) 0 (0 - 2) v. 0 (0 - 1); p=0.044). There were no significant differences in the median (IQR) scores recorded for dizziness (group N: 0 (0-3); group H: 0 (0 - 3), p=0.560), drowsiness (group N: 1 (0 - 5); group H: 1 (0 - 5), p=0.820), or nausea (group N: 0 (0 - 1); group H: 0 (0 - 0), p=0.520).

Tables 2 and 3 compare the analgesia received by the respective patient groups intra- and postoperatively. The normotensive group received a mean dose of 7.7 mg of morphine intraoperatively, compared with 7.9 mg in the group with hypertensive disorders of pregnancy (U=6 509; p=0.437).

Hypertensive patients were more likely to receive local anaesthetic wound infiltration intraoperatively (p=0.038), whereas postoperative ibuprofen use was more common among normotensive patients (p=0.001), reflecting differences in analgesic strategies between the groups (Tables 2 and 3).

These differences in analgesic prescribing patterns highlight the absence of standardised postoperative analgesic pathways for hypertensive obstetric patients, and illustrate how clinicians adapt their choices in response to perceived risks.

Discussion

In this large real-world cohort, postoperative pain outcomes did not differ significantly between women with hypertensive disorders of pregnancy and normotensive women. Reported pain relief and patient satisfaction were also similar. These findings are clinically relevant given the recognised challenges of providing effective analgesia in hypertensive obstetric populations, where multisystem involvement often restricts standard multimodal analgesic options.

To our knowledge, this is the first study to directly compare postoperative pain outcomes in hypertensive v. normotensive obstetric patients in a southern African setting.

Differences in analgesic prescribing patterns between groups provide important context for interpreting these outcomes. Hypertensive patients received significantly less postoperative ibuprofen, reflecting clinician caution around NSAID use in the presence of potential renal impairment, haemodynamic instability, or thrombocytopenia. Although NSAIDs are a core component of multimodal analgesia, their use in women with hypertensive disorders of pregnancy remains controversial owing to concerns about renal perfusion, fluid retention and platelet dysfunction.[10-13] Notably, updated recommendations from ACOG support NSAID use in pre-eclampsia when renal and haematological function is normal, suggesting that selective use may be safe in appropriately monitored patients.[9] The reduced NSAID use observed in this study likely reflects a risk-averse approach rather than an absolute contraindication.

Hypertensive women were more likely to receive local anaesthetic wound infiltration, a strategy well-suited to settings where NSAID use may be restricted. Wound infiltration reduces opioid

Table 1. Pain outcomes for women with and without hypertensive disorders of pregnancy (*N*=377)

Outcome	Group N, *n*=296, median (IQR)*	Group H, *n*=81, median (IQR)*	*p*-value
Minimum pain	3 (1 - 4)	2 (1 - 4.5)	0.557
Maximum pain	6 (4 - 8)	6 (4 - 8)	0.171
Percentage of time spent in severe pain over first 24hrs, *n* (%)	40 (25)	40 (27)	0.931
Relief from treatment received, %	60 (50 - 80)	70 (40 - 90)	0.680
Satisfaction with treatment†	8 (6 - 10)	8 (6 - 9)	0.489

Group N = normotensive; group H = hypertensive; IQR = interquartile range.
*Unless otherwise indicated.
†Maximum score = 10.

Table 2. Intraoperative analgesia received (*N*=377)

Analgesia	Group N, *n*=296, *n* (%)	Group H, *n*=81, *n* (%)	*p*-value
Dexamethasone IV 4 - 8 mg	16 (5.4)	8 (9.8)	0.144
Diclofenac IV 75 mg	11 (3.7)	1 (1.2)	0.259
Indomethacin suppository 100 mg	79 (26.6)	15 (18.5)	0.132
Paracetamol IV 1 g	212 (71.6)	60 (74.0)	0.662
Morphine IV 3 -10 mg	214 (72.9)	58 (71.6)	0.901
Transversus abdominis plane blocks	4 (1.3)	1 (1.2)	0.935
Local anaesthetic wound infiltration	95 (32.1)	36 (44.4)	0.038
Intrathecal morphine 50 µg	62 (20.9)	21 (25.9)	0.337

IV = intravenous; N = normotensive; H = hypertensive.

Table 3. Postoperative analgesia received (*N*=377)

Analgesia	Group N, *n*=296, *n* (%)	Group H, *n*=81, *n* (%)	*p*-value
Ibuprofen (400 mg 8-hourly)	66 (22.3)	5 (6.2)	0.001
Paracetamol oral (1 g 6-hourly)	271 (91.5)	70 (86.4)	0.163
Morphine IM (5 - 10 mg 6-8 hourly)	166 (56.1)	41 (50.6)	0.381
Morphine IV (10 mg stat)	2 (0.67)	1 (1.2)	0.615
Tramadol oral (50 mg 6 - 8 hourly)	240 (81.1)	68 (83.9)	0.553

IM = intramuscular; IV = intravenous; N = normotensive; H = hypertensive.

requirements and is inexpensive, safe and widely accessible, which may explain its increased use in this population and its contribution to comparable pain outcomes despite differing medication profiles. Conversely, normotensive patients appropriately received higher rates of ibuprofen, consistent with standard multimodal analgesic practice.

Intrathecal morphine use differed between the groups, but was not entirely avoided in hypertensive women. Approximately one-quarter of hypertensive patients received intrathecal morphine, despite guidance recommending caution in individuals with comorbidities such as obstructive sleep apnoea, or when postoperative monitoring capacity is limited.[14,17] Although the absolute risk of respiratory depression is low,[18-23] decisions to administer neuraxial opioids must consider local resource constraints. The variation observed likely reflects clinicians' attempts to balance analgesic efficacy with the realities of monitoring capacity in a busy tertiary obstetric unit.

Interpretation of these findings is limited by the absence of comparable published data examining postoperative pain outcomes specifically in women with hypertensive disorders of pregnancy. This study therefore provides novel real-world evidence from a southern African tertiary setting, where analgesic availability, staff shortages and monitoring limitations influence perioperative decision-making. The comparable pain outcomes observed between groups suggest that carefully tailored analgesic strategies can compensate for restrictions on NSAIDs and neuraxial opioids.

Study limitations

This study has several limitations. Its retrospective design restricts control over confounding variables, and analgesic prescriptions were not standardised. Patient-reported outcomes were collected only within the first 24 postoperative hours, and may not reflect longer-term pain trajectories. Differences in postoperative care environments, especially for hypertensive patients requiring high-dependency monitoring, may also have influenced access to analgesia and patient-reported scores. Missing data inherent to registry studies further limit precision.

Despite these limitations, this study provides the first comparative evidence on postoperative pain outcomes in hypertensive v. normotensive women after caesarean section in a southern African setting. The findings demonstrate that satisfactory analgesia can be achieved in women with hypertensive disorders of pregnancy through tailored multimodal strategies, even when NSAID or neuraxial opioid use is restricted. Future research should define evidence-based analgesic pathways for hypertensive obstetric patients, and clarify how postoperative care environments, monitoring capacity and clinician practice patterns shape analgesic selection and pain trajectories in this high-risk group.

Conclusion

Women with hypertensive disorders of pregnancy experienced postoperative pain outcomes comparable with those of normotensive women following caesarean section, despite differing analgesic regimens. These findings suggest that tailored multimodal strategies, including the use of local anaesthetic wound infiltration, can provide effective analgesia even when NSAIDs or neuraxial opioids are limited by comorbidity or monitoring constraints. As the first study to examine postoperative pain outcomes in this high-risk obstetric population, the results highlight the need for prospective research to define optimal multimodal analgesic pathways, and to evaluate how postoperative monitoring environments influence pain control in resource-constrained settings. Standardised multimodal analgesic pathways tailored to hypertensive obstetric patients may help to reduce practice variability and optimise postoperative pain outcomes in resource-constrained settings.

Data availability. The datasets generated and analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Declaration. The research for this study was done in partial fulfilment of the requirements for JR's MMed (Anaes) degree at Stellenbosch University.

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Author contributions. JR was the investigator of the study and was responsible for writing the manuscript. SC was the co-national principal investigator and study supervisor, and reviewed and edited the manuscript. KS was the principal investigator for the trial at Tygerberg Hospital. RP was co-national principal investigator.

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