South Afr J Anaesth Analg. 2025;31(3):72-77
https://doi.org/10.36303/SAJAA.3123

South Afr J Anaesth Analg
ISSN 2220-1181 EISSN 2220-1173

ORIGINAL RESEARCH

The prevalence of moderate-to-severe rebound pain after spinal caesarean section at Tygerberg Hospital following new analgesia guidelines implementation

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Background: A previous study at Tygerberg Hospital identified a 91.7% prevalence of moderate-to-severe rebound pain (Visual Analogue Scale [VAS] ≥ 4 mm) in patients undergoing spinal caesarean section (CS). Since implementing new analgesia guidelines that focus on using intrathecal morphine and administering systemic, multimodal analgesia before spinal offset and discharge to the ward, the prevalence has not been investigated again.

Methods: A retrospective, non-interventional study of 339 patients from the Tygerberg PAIN OUT South Africa (SA) database who underwent CS under spinal anaesthesia was conducted to determine the prevalence of moderate-to-severe rebound pain and allow comparison to the previous study. Patients completed a questionnaire, including a numeric rating scale (NRS), for the worst pain experienced since surgery on postoperative day one. Demographic and therapeutic data were also collected.

Results: The questionnaire was completed by 99% of the obstetric patients in the PAIN OUT SA database. The prevalence (95% confidence intervals [CI]) of moderate-to-severe pain was 83.2% (79.2% to 87.2%) compared to 91.7% (83.8% to 95.9%) in the previous study. For severe pain alone (NRS ≥ 7), the incidence was 46.6% (41.4% to 51.9%) compared to 65.5% (54.8% to 74.7%). The median (interquartile range [IQR]) intensity of the worst pain was 6 (4–8), compared to the median VAS of 85 (66–100) in the previous study. Therapeutic records revealed partial adherence to the new guidelines.

Conclusion: This study found a high prevalence of moderate-to-severe rebound pain after CS under spinal anaesthesia. Despite this, the prevalence of severe pain and the median intensity of pain have declined significantly after implementing new departmental guidelines. The analgesic options recommended by the guidelines were only partially utilised. Departmental guidelines should be visible, easy to follow, and convincingly advocated to have the optimal effect.

Keywords: acute postoperative pain, spinal anaesthesia, caesarean section, numeric rating scale, developing countries

Introduction

Although it may be routine to the anaesthetist, a caesarean section (CS). is a momentous event for the mother. The prevalence of moderate-to-severe pain in the early postoperative period is as high as 50% and is associated with the development of comorbidities in the postpartum period.[1] Litigation due to pain and discomfort from this procedure is currently the most frequent successful medicolegal claim against obstetric anaesthetists.[2] After spinal anaesthesia, rebound pain occurs due to the sudden unmasking of nociception when the neuraxial block resolves.[3] The anaesthetist should use their knowledge of the duration of spinal anaesthesia to anticipate rapid offset and administer adequate, pre-emptive multimodal analgesia timeously to prevent the occurrence of rebound pain.

A previous study of postoperative pain at Tygerberg Hospital by Murray & Retief found a prevalence of 87% of an episode of moderate-to-severe postoperative pain after CS (VAS ≥ 40 mm).[4] Isolating the spinal CS patients from this data gave a prevalence of 91.7% for moderate-to-severe pain, with a median VAS of 85 mm. This high prevalence is in keeping with other recent studies in developing countries.[5,6] At the time of the previous study, systemic analgesia after spinal anaesthesia was regularly entrusted to ward staff and initiated only after rebound pain had commenced, using intramuscular (IM) rather than intravenous (IV) titrated morphine. Intrathecal morphine and IV paracetamol were excluded from routine use due to financial constraints, and nonsteroidal anti-inflammatory drugs (NSAIDs) and dexamethasone were not routinely used intraoperatively for spinal CS patients.

To address the study's findings, the Department of Anaesthesiology and Critical Care at Tygerberg Hospital released new analgesia guidelines for CS in 2020.[4] The guidelines emphasised the establishment of multimodal analgesia before the patient's departure from the theatre recovery room. Analgesic adjuvants, including 50 µg intrathecal or 0.1 mg/kg IV morphine (up to a maximum of 10 mg), NSAIDs in the form of indomethacin 100 mg suppository or diclofenac 75 mg IM or IV, paracetamol 1 g IV, dexamethasone 8 mg IV, and regional blocks or local anaesthetic (LA) wound infiltration were to be administered in the theatre or recovery room to cover spinal

anaesthesia offset and manage the occurrence of rebound pain. Further, the guidelines advised regular paracetamol, NSAIDs, and tramadol in the ward, with morphine as needed. The addition of intraoperative multimodal analgesia after delivery follows recommendations of the Procedure-Specific Postoperative Pain Management (PROSPECT) guidelines for CS and also forms part of the Enhanced Recovery after Caesarean Delivery (ERAC) guidelines.[1,7,8]

The standard drugs for spinal anaesthesia at Tygerberg Hospital are 8–12 mg of bupivacaine 0.5% with dextrose combined with fentanyl 10–15 µg. Intrathecal low-dose morphine (50 µg) is a new addition to the guidelines as routine practice for spinal CS in patients without contraindications like morbid obesity, significant respiratory impairment, or severe preeclampsia requiring magnesium sulphate infusions. This is in keeping with consensus guidelines from the Society for Obstetric Anaesthesia and Perinatology (SOAP) and PROSPECT guidelines.[1,9] The range of mean times to first analgesia request after intrathecal morphine was 9.7–26.6 hours, according to a recent meta-analysis, and the risk of respiratory suppression was very low.[10,11] It is ideal in settings where staff shortages might contribute to delays in analgesia administration in the ward and is currently the standard of care for post-caesarean analgesia.[8]

The impact of the new analgesia guidelines has not been studied. This study aimed to determine the current prevalence of moderate-to-severe rebound pain after spinal CS and compare it to the results of the previous study as part of a quality improvement project. Secondary objectives were to determine and compare the intensity of rebound pain, describe the current utilisation of analgesic modalities, identify possible associations between rebound pain and individual analgesic strategies, and determine patient satisfaction with early postoperative analgesia.

Methods

Approval was obtained from the Human Research Ethics Committee (HREC) of Stellenbosch University (S22/06/109). All patients captured on the PAIN OUT SA database (HREC reference N19/10/140) who underwent elective or emergency spinal CS at Tygerberg Hospital between 1 October 2021 and 31 August 2022 were included in the study for retrospective analysis. No additional informed consent was required as no new data were collected, and consent for the PAIN OUT SA database includes data analysis and publication.

Inclusion criteria for PAIN OUT SA were patients 18 years and older who were postoperative day one and had been in the ward from surgery for at least six hours. Exclusion criteria were patients who received general anaesthesia, combined spinal-epidural, or epidural anaesthesia, and patients who did not correctly complete the pain scales on the outcome questionnaire. The database included the patients' demographic information, medical history, surgical procedure, anaesthetic technique, and all analgesics given in the theatre, recovery room, and ward up to the time the outcome questionnaire was completed.

The International Pain Outcomes questionnaire, assessing pain experience, was completed by patients on postoperative day one in English, Afrikaans, or isiXhosa. Patients rated their worst pain since surgery on a numeric rating scale (NRS). This would capture an episode of rebound pain following spinal anaesthesia if it occurred. These methods are similar to those used in the previous study by Murray & Retief at Tygerberg Hospital, where patients were asked to indicate the worst pain they experienced since surgery on a visual analogue pain scale.[4]

Pain scores on the NRS were categorised according to literature: no/mild pain (0–3), moderate pain (4–6), and severe pain (7–10).[12,13] The pain scores indicated on the NRS were compared to those documented on the previous audit's Visual Analogue Scale (VAS). A literature review revealed that NRS and VAS scores correspond excellently and that mean values on the two scales correlate closely with the efficacy of analgesic treatment.[14,15] Thus, comparing patients' NRS scores in the PAIN OUT SA database to the VAS scores in a previous audit is reasonable.

Descriptive statistics were compiled as means and standard deviations (SD) for continuous, normally distributed data, and as medians, IQRs, or frequencies and percentages for other data. Pain prevalences were reported with 95% CIs. The prevalence of moderate-to-severe pain and other pain categories were compared to the previous study using chi-square tests. As a secondary analysis, the median NRS scores and prevalences of moderate-to-severe pain were compared between groups of women who did or did not receive specific analgesics following the new guideline. Wilcoxon signed-rank tests were used to compare pain scores and chi-square tests for proportions.

Results

A total of 358 patients who underwent spinal CS between 1 October 2021 and 31 August 2022 were captured on the PAIN OUT SA database (Figure 1). There were 17 patients who were excluded because they indicated a higher NRS for the least pain

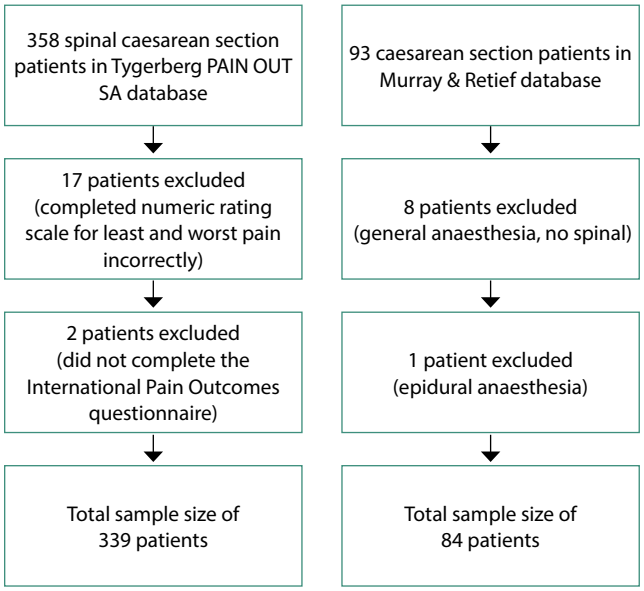

Figure 1: Patient flow diagram of the current study and the previous study by Murray & Retief [4]

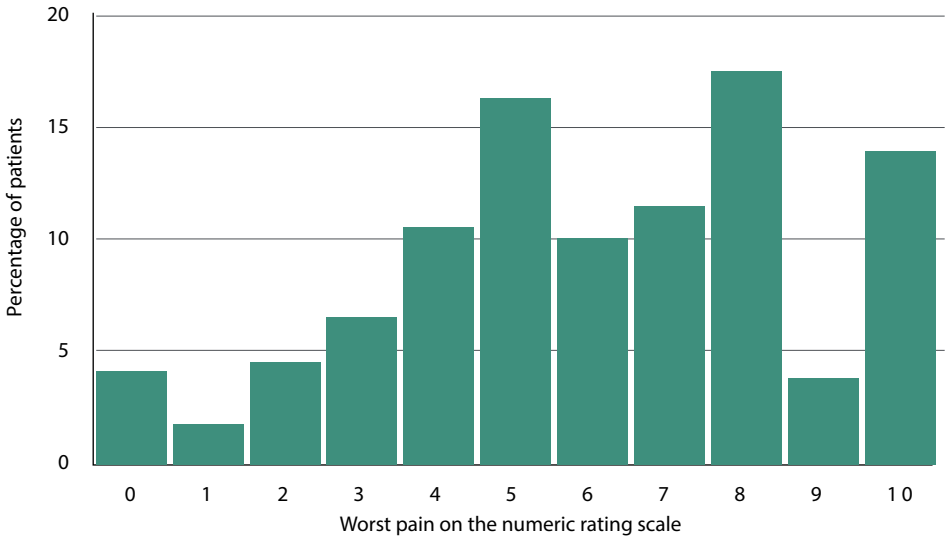

Figure 2: Percentage of patients versus intensity of worst pain on the numeric rating scale

they experienced than for the worst pain they experienced, according to the PAIN OUT guidelines for analysis. Two patients who did not complete the outcomes questionnaire were excluded. This gave a sample size of 339 patients.

Patient characteristics

The mean age was 33 years (SD 5.87), with a median body mass index (BMI) of 34 kg/m^2 (IQR 28–41). Non-South Africans comprised 4.23% of the participants. Most questionnaires were completed in English (247), with Afrikaans (45) and isiXhosa (44) following as the languages of choice. Comorbidities like hypertensive, cardiovascular, and gastrointestinal disorders, diabetes, and asthma, which could be contraindications to NSAIDs, were present in 30.9% of patients. A median period of 22.0 hours (IQR 17.6–24.5) elapsed between the time of surgery and the survey.

Prevalence and pain intensity

Regarding pain categories, 16.8% of patients reported no or mild pain (NRS 0–3), 36.6% moderate pain (NRS 4–6), and 46.6% severe pain (NRS 7–10). This gave an 83.2% prevalence of moderate-to-severe pain (95% CI 79.2% to 87.2%). The median intensity for worst pain was 6 (IQR 4–8). Figure 2 depicts the percentage of patients plotted against their respective worst pain scores.

Utilisation of pre-emptive intraoperative analgesia

Most patients received IV paracetamol (88%), 73% received systemic morphine (mean dose 7.7 mg, SD 2.4 mg), and 23% received intrathecal morphine (mean dose 0.05 mg). LA infiltration by the surgeon was given to 39% of patients, and 33% received NSAIDs (IV or suppository). Dexamethasone was administered to 6% of patients, and 2% received ketamine. The utilisation of the different analgesic modalities is presented in Figure 3.

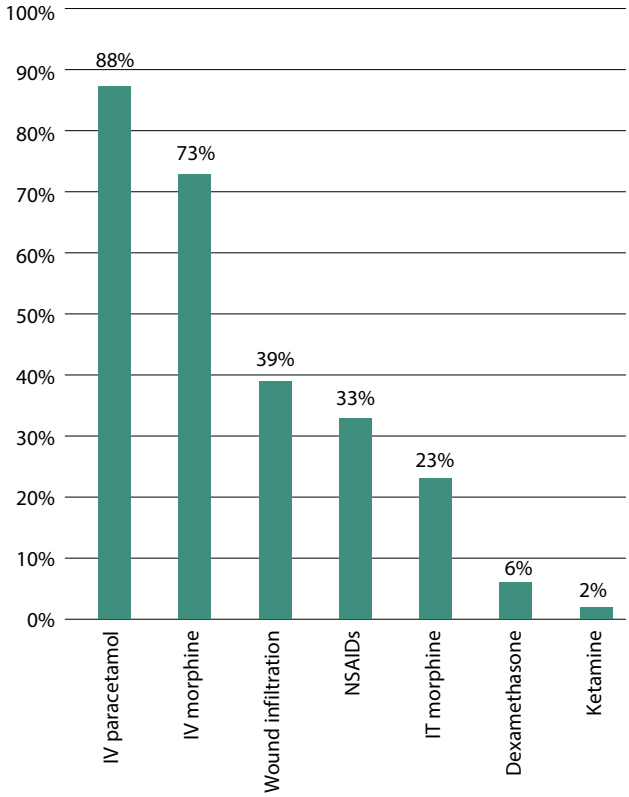

Figure 3: Percentage of patients receiving specific pre-emptive intraoperative analgesics
NSAIDs – nonsteroidal anti-inflammatory drugs, IT – intrathecal, IV – intravenous

Recovery room analgesics

A further 18.3% of patients received supplementary opioids in the recovery room in the form of IV or IM morphine or oral immediate-release tramadol. Thirteen per cent of patients received IV or IM morphine, and 8% received oral immediate-release tramadol.

Associations between pain and patient characteristics

No significant association was found between pain and age ($p = 0.47$) or BMI ($p = 0.73$). There were no significant differences

in pain scores between South Africans and foreigners ($p = 0.44$) or between patients completing the questionnaires in three languages ($p = 0.44$). Time from procedure to survey did not show any association with the worst pain recorded (r = -0.02).

Physical and emotional consequences associated with increased pain

A higher NRS for maximum pain was moderately associated with interference with activities in bed, such as changing position (r = 0.49; $p < 0.001$), as well as interfering with or preventing activities out of bed, such as standing or walking (r = 0.42; $p < 0.001$). Increased pain had a weak association with feelings of anxiety, helplessness, and insomnia (r = 0.34, 0.28, and 0.35, respectively; $p < 0.001$).

Patient satisfaction

The median satisfaction with pain treatment was 8/10 (IQR 6–10). The mean maximum pain score was 6.6 (95% CI 6.2 to 7.0) for patients who indicated they would have liked more pain treatment. In comparison, those who did not want more treatment had a mean pain score of 5.5 (95% CI 5.1 to 5.9; $p < 0.001$).

Correlation between maximum pain and specific intraoperative pre-emptive analgesics

We could not demonstrate any statistically significant association between maximum pain and using specific pre-emptive analgesic strategies. Patients who received intrathecal morphine had a mean NRS of 5.6 compared to 6.2 of those who did not receive it ($p = 0.07$). Those who received NSAIDs scored 5.7, while those who did not scored 6.2 ($p = 0.07$). Wound infiltration scored 5.9 versus 6.1 ($p = 0.45$), systemic morphine 6.1 versus 5.8 ($p = 0.29$), and dexamethasone 6.8 versus 6.0 ($p = 0.21$).

Comparison of results with the previous study

Patient characteristics and survey timing

The patients in this study had a mean age of 33 years compared to 29 in the previous study ($p < 0.001$). The median time from the procedure to the survey was 22.0 hours (IQR 17.7–24.5) compared to 23.0 (IQR 21.0–25.0) in the previous study.

Prevalence of moderate-to-severe pain

In the previous study, 77/84 (91.7%, 95% CI 83.8% to 95.9%) spinal CS patients reported moderate-to-severe pain, compared to 282/339 (83.2%, 95% CI 79.2% to 87.2%) patients in the current study ($p = 0.052$).

Comparison of the three different pain categories between the two studies

Considering the three categories of pain separately (Figure 4), the current prevalence of severe pain was 46.6% (95% CI 41.4% to 51.9%) compared to 65.5% (95% CI 54.83% to 74.7%) in the previous study ($p = 0.002$). There was an 18.9% reduction in severe pain, with an increase in moderate and no/mild pain of 10.4% and 8.5%, respectively.

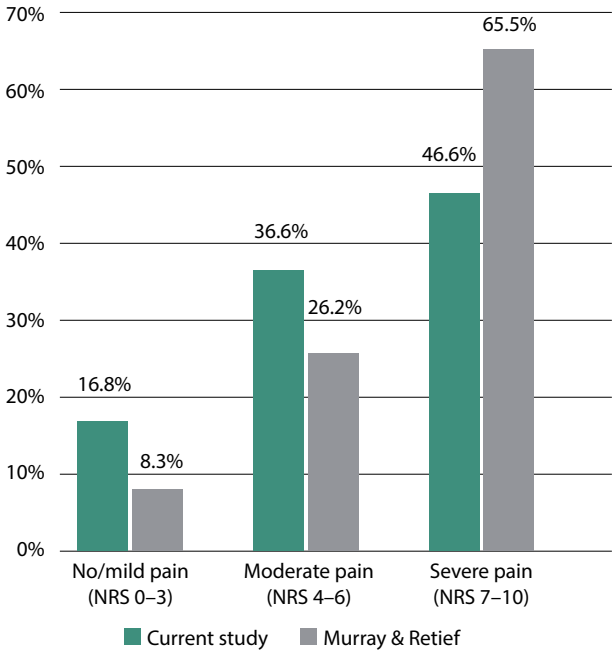

Figure 4: Comparison of the different pain categories between PAIN OUT SA data and the previous study by Murray & Retief [4]
NRS – numeric rating scale

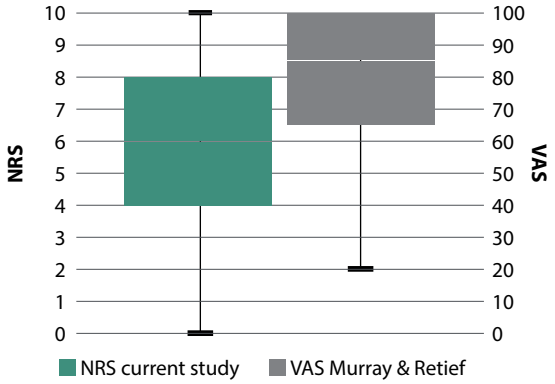

Figure 5: Comparison of median and IQR of pain intensity between PAIN OUT SA data and the previous study by Murray & Retief [4]
IQR – interquartile range, NRS – numeric rating scale, VAS – Visual Analogue Scale

Comparison of pain intensity

The median intensity of worst pain in our study was lower, with the NRS at 6.0 (IQR 4–8) compared to a median VAS of 85 (IQR 66–100) in the previous study ($p < 0.001$) (Figure 5).

Discussion

This study reveals a high prevalence of 83.2% (95% CI 79.2% to 87.2%) of moderate-to-severe pain (NRS ≥ 4) after spinal CS and does not confirm a significant decrease from the 91.7% (95% CI 83.8% to 95.9%) found in the previous study before implementing new CS analgesia guidelines ($p = 0.052$). While the prevalence of moderate-to-severe pain remains unacceptably high, the percentage of patients experiencing severe pain decreased significantly by 18.9% ($p = 0.002$) from 65.5% (95% CI 54.83% to 74.7%) to 46.6% (95% CI 41.4% to 51.9%). Also, the median pain intensity declined from a VAS of 85/100 to a NRS of 6/10 ($p < 0.001$). Therefore, it may be concluded that implementing the new guidelines successfully prevented severe

pain in many patients but not moderate pain. This postoperative pain reduction after introducing protocolised care for CS patients is also evidenced by a meta-analysis.[16]

It may be asked if the decrease in pain intensity between the two studies makes a difference from the patient's point of view. In the acute postoperative pain setting, the minimal clinically important difference (MCID) is 10 mm on the VAS, meaning that analgesic efforts that result in a reduction of more than 10 mm, or 1/10 on the NRS, are meaningful for patients.[17] Thus, the decrease in pain intensity noted between the two studies indicates a clinically significant improvement.

Giving analgesia to eliminate all postoperative pain would be an unrealistic target and lead to increased complications from analgesic drugs, such as sedation, nausea, pruritus, and respiratory depression. The Patient Acceptable Symptom State is a more reasonable goal, with a VAS of 33/100 or NRS of 3/10 in the acute pain setting.[13,17] Therefore, scores of ≤ 33 on the VAS and ≤ 3 on the NRS signify acceptable pain control after surgery. Compared to the literature, our population seemed satisfied at a higher NRS. Patients who wanted more pain treatment in our setting had a mean NRS of 6.6, compared to the 5.5 of those who did not. The NRS difference between these patient groups is 1.1 (95% CI 0.5 to 1.7 units), including but not confirming a MCID. The median NRS of 6 in this study revealed that most patients need more analgesia than what is currently provided to reach a Patient Acceptable Symptom State.

Compliance with departmental guidelines

Healthcare workers are trusted to follow clinical guidelines when implemented. In practice, though, guidelines are sometimes not well disseminated or completely followed in the busy clinical routine.[18,19] In our analysis of intraoperative analgesics administered, we noted that full compliance with the guidelines was lacking. Only 23% of patients received intrathecal morphine, which is the gold standard in the absence of contraindications. Most, but not all, patients received IV paracetamol. About 68% of patients did not receive NSAIDs, while only 30.9% of patients had comorbidities that could have contraindicated its use. This leaves a potential 37% of patients that might have benefited from these drugs, provided haemorrhage from the CS was not a concern. The guidelines advocate that LA wound infiltration benefits patients who did not receive neuraxial morphine. Wound infiltration was given to 38% of patients, out of a potential of 77% who had not received neuraxial morphine.

A mere 6% of patients received dexamethasone. Reasons for this might include the association of dexamethasone with nausea prophylaxis rather than with analgesia or fear of immune suppression with perioperative sepsis. The omission of dexamethasone is significant. A meta-analysis looking at the effect of IV dexamethasone on postoperative pain after spinal anaesthesia found that its use was associated with a significant reduction in morphine consumption in the first 24 hours after surgery.[20] The authors reported high-level evidence that it improves postoperative analgesia after spinal anaesthesia. Furthermore, intraoperative IV dexamethasone after delivery is a grade A recommendation of the PROSPECT guidelines.

Most patients received some of the interventions recommended in the guidelines; 96% received at least IV or intrathecal opioids, and 88% received IV paracetamol. This partial compliance with the guidelines may explain why it was sufficient to decrease the prevalence of severe but not moderate pain.

Guidelines must be clear, simple to follow, and advertised like a product, as physicians cannot adhere to guidelines of which they are unaware. At Tygerberg Hospital, the guidelines were printed on A4 paper and inserted in a plastic sleeve on the theatre wall. A bigger poster might improve visibility. An academic presentation on the evidence for the guidelines and continued education to keep new staff informed may contribute to adherence.

Study limitations

Despite implementing new analgesia guidelines, the study revealed partial adherence to these guidelines, which may have impacted the results and effectiveness of the pain management strategies. In addition, the study was conducted at a single institution, possibly limiting the generalisability of the findings to other settings or populations.

We compared NRS scores to the VAS scores of a previous study. A literature review done in 2011 compared the Verbal Rating Scale, NRS, and VAS as tools to measure acute postoperative pain.[14] The review included 54 papers, with several using both the NRS and VAS to assess acute pain in each study participant. Overall, NRS and VAS scores corresponded excellently, and the mean values on the two scales correlated with the efficacy of analgesic treatment. Another study, looking at the correlation levels between the VAS, NRS, and Faces Pain Scale – Revised in acute postoperative pain, although not specific to the obstetric population, found that the intraclass correlation coefficient (ICC) between the VAS and NRS was the highest.[15] The ICC between the VAS and NRS at two separate time points were 0.917 and 0.945, respectively, indicating excellent agreement. Thus, it is reasonable to compare patients' NRS scores in the PAIN OUT SA database to the VAS scores used in a previous audit, as NRS and VAS scores correspond in the setting of acute postoperative pain and in measuring analgesic response.

Recruitment for the PAIN OUT SA database was done before surgery, whereas the previous audit recruited patients after their surgery. Our sample did not include consecutive CS patients during the data collection period since not all patients were included in the PAIN OUT SA database. Emergency and elective CS were included in both studies. We are not aware of any reason for bias in inclusion. Data collection for the PAIN OUT SA database was done by junior doctors from the anaesthesia department who were not involved in the cases, compared to a single study nurse in the previous audit. However, in both cases, the patients completed the pain scores without any interference from the data collector.

The age difference between the two studies is likely due to a difference in inclusion criteria, since the study by Murray & Retief included patients from the age of 12 years compared to 18 years in the PAIN OUT SA database. Because the comparison was done retrospectively, other population characteristics from the previous audit were unavailable for comparison.

No associations between pain and specific analgesic modalities were detected with sufficient statistical significance. While intrathecal morphine can last up to 30 hours, this is dose-dependent. A dose of 50 µg has a shorter duration and would likely have worn off by the time of assessment. The low dose may explain the small difference between those who received and those who did not receive intrathecal morphine. However, these were secondary outcomes for which the study was not powered and should only be considered hypothesis-generating at best.

Conclusion

We conclude that the prevalence of moderate-to-severe rebound pain after spinal CS at Tygerberg Hospital remains unacceptably high. Nonetheless, a statistically and clinically significant decrease in the prevalence of severe rebound pain and median pain intensity is evident after implementing the 2020 guidelines. The limited effect on moderate pain may be because the analgesic options recommended in the guidelines were only partially utilised. Staff should be educated that compliance with analgesia guidelines is critical for making a difference in patients' outcomes. Departmental guidelines should be visible, easy to follow, and convincingly advocated to have the optimal effect, a subject for future research at Tygerberg Hospital and elsewhere.

Conflict of interest

The authors declare no conflict of interest.

Funding source

Funding for the PAIN OUT database:

- European Community's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 223590.
- Unrestricted educational grant for a quality improvement study from Pfizer Global Medical Grants.

Ethical approval

Approval was obtained from the Human Research Ethics Committee of Stellenbosch University (S22/06/109). Informed, written consent was obtained from all patients for inclusion in the database used in this study. No additional informed consent was required for this audit as no new data was collected, and consent for the PAIN OUT database includes data analysis and publication.

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