

## Medical Science

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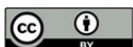
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# Comparison of the efficacy of TAP block, QLB, and subarachnoid opioid blockade in the treatment of postoperative pain after cesarean section, with particular emphasis on the well-being and postpartum mobilization of patients

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## ABSTRACT

Having pain control for postoperative pain after cesarean delivery is important as it improves recovery, mobility, and early bonding with the newborn. Current Enhanced Recovery After Cesarean (ERAC) protocols recommend multimodal, opioid-sparing analgesia to enhance outcomes and minimize adverse effects. This narrative review summarises evidence from randomized trials, meta-analyses and systematic reviews on three analgesic techniques: the Transversus Abdominis Plane (TAP) block, Quadratus Lumborum Block (QLB) and intrathecal morphine (ITM). Key endpoints reported were resting and dynamic pain scores, time to first rescue analgesia, postoperative opioid requirements, side effect occurrence, patient mobilization time and satisfaction with the process. QLB is more efficient in broader, longer-lasting analgesia than TAP block, and dynamic pain control is superior, facilitating earlier recognition and elimination of additional analgesics. This translates into more comfort for patients and faster mobilization. QLB offers similar efficacy in the early phases of pain control relative to intrathecal morphine with significantly fewer opioid adverse events, such as pruritus and postoperative nausea and vomiting. TAP block is still an effective, safe and technically easy method particularly for somatic pain, although its duration is limited to approximately 6–12 hours. Intrathecal morphine continues to be an effective analgesic method for up to 24 hours of visceral and somatic analgesia but requires close monitoring due to its potential side effects. Hence, regional approaches especially QLB should be considered as crucial factors in multimodal analgesia after cesarean section, while opioids should be prescribed in the lowest effective dose with adequate prophylaxis and monitoring.

**Keywords:** Transversus abdominis plane block (TAP block); Quadratus lumborum block (QLB); Intrathecal opioids; Cesarean section; Postoperative pain; Maternal well-being.

## 1. INTRODUCTION

Caesarean section is still one of the most frequently performed operations in obstetrics around the world. Even with the clear progress in surgical practice and anaesthesia over recent years, many women continue to experience considerable pain afterwards. This remains a real clinical challenge and may influence how the mother feels and recovers in the first days after birth. Inadequate control of pain in this area can cause a significant number of complications such as delayed upright positioning of the patients, lactation disorders, difficulty establishing contact with the newborn, and a risk of postpartum depression.

Pain management approaches used for pain after cesarean section were largely provided by opioid drugs. They were administered to patients both systemically and subarachnoidally. The treatment done with this technique is relatively effective though these drugs generally cause side effects such as drowsiness, itching, nausea, and vomiting (PONV), and in worst cases respiratory depression. These criticisms lead to the increasing popularity of regional anesthesia techniques like TAP block (Transversus Abdominal Plane Block) and QLB (Quadratus Lumborum Block), as they give a better analgesic action with fewer side effects and no effects on consciousness.

### Epidemiology

The frequency of cesarean sections differs markedly across countries and regions. In 1985, the World Health Organization (WHO) recommended that the optimal rate of cesarean sections rate should range between 10 and 15%. With the passage of time and the accumulation of data, the WHO changed its guidelines in 2015 (WHO, 2015). It emphasized that there is no single "ideal" rate of cesarean sections and that health beneficial effect in the form of a reduced maternal and neonatal mortality was observed when the rate increases to around 10%, with no additional benefits with further increases.

Recent data show a striking global variation in the frequency of caesarean deliveries. The highest proportions have been reported in countries such as the Dominican Republic (58.1%), Brazil (55.7%), Cyprus (55.3%), Egypt (51.8%) and Turkey (50.8%). At the other end of the spectrum, several sub-Saharan African nations continue to report very low rates, with figures of 1.4% in Chad and Niger, 1.9% in Ethiopia, 2.0% in Madagascar and 2.4% in Cameroon (Betran et al., 2021). The latest studies indicate that the percentage of cesarean sections performed in Poland ranges between 43% and 55% (Michalik et al., 2021; Wladimiroff et al., 2025).

Based on the above information, this indicates that such significant global differences are due, on the one hand, to the problem of excessive medicalization of childbirth and, on the other hand, to inequalities or even insufficient access to perinatal healthcare. This underlines the need to improve postoperative pain management after cesarean section.

### Objective

To evaluate and compare pain relief and tolerability of TAP block, QLB and subarachnoid opioid blockade in postoperative analgesia after cesarean section, with particular emphasis on the impact on the well-being and postpartum mobilization of patients.

## 2. REVIEW METHODS

This paper presents the latest evidence on postoperative pain management options post-cesarean section. The analysis was done on scientific reports from 2020 through 2025 in reputable databases such as PubMed, Embase, the National Library of Medicine, and Google Scholar.

Moreover, international organizations such as the World Health Organization (2015), the Healthy Newborn Network, and leading obstetric and anesthesiology societies provided epidemiological information and clinical recommendations. The study selection process is presented in Figure 1. The inclusion criteria focused on source reliability, up-to-date data and clinical relevance to obstetric anaesthesia.

## 3. RESULT AND DISCUSSION

The new research reports evidence that the Quadratus Lumborum Block (QLB) in contrast to the Transversus Abdominis Plane (TAP) block provides a prolonged and complete analgesia, which results in a decrease in opioid use and good maternal comfort. The TAP block is technically safe and relatively simple and has short duration and lower visceral coverage. Intrathecal morphine is known to offer intense long-lasting analgesia, albeit a high likelihood of side effects such as pruritus or nausea. These findings reinforce the value of regional strategies to multimodal postoperative pain management in cesarean delivery. QLB is a compromise between efficacy and

safety, so can be recommended as a preferred component of Enhanced Recovery After Cesarean (ERAC) protocols. The comparative summary of analyzed analgesic techniques is presented in Table 1.

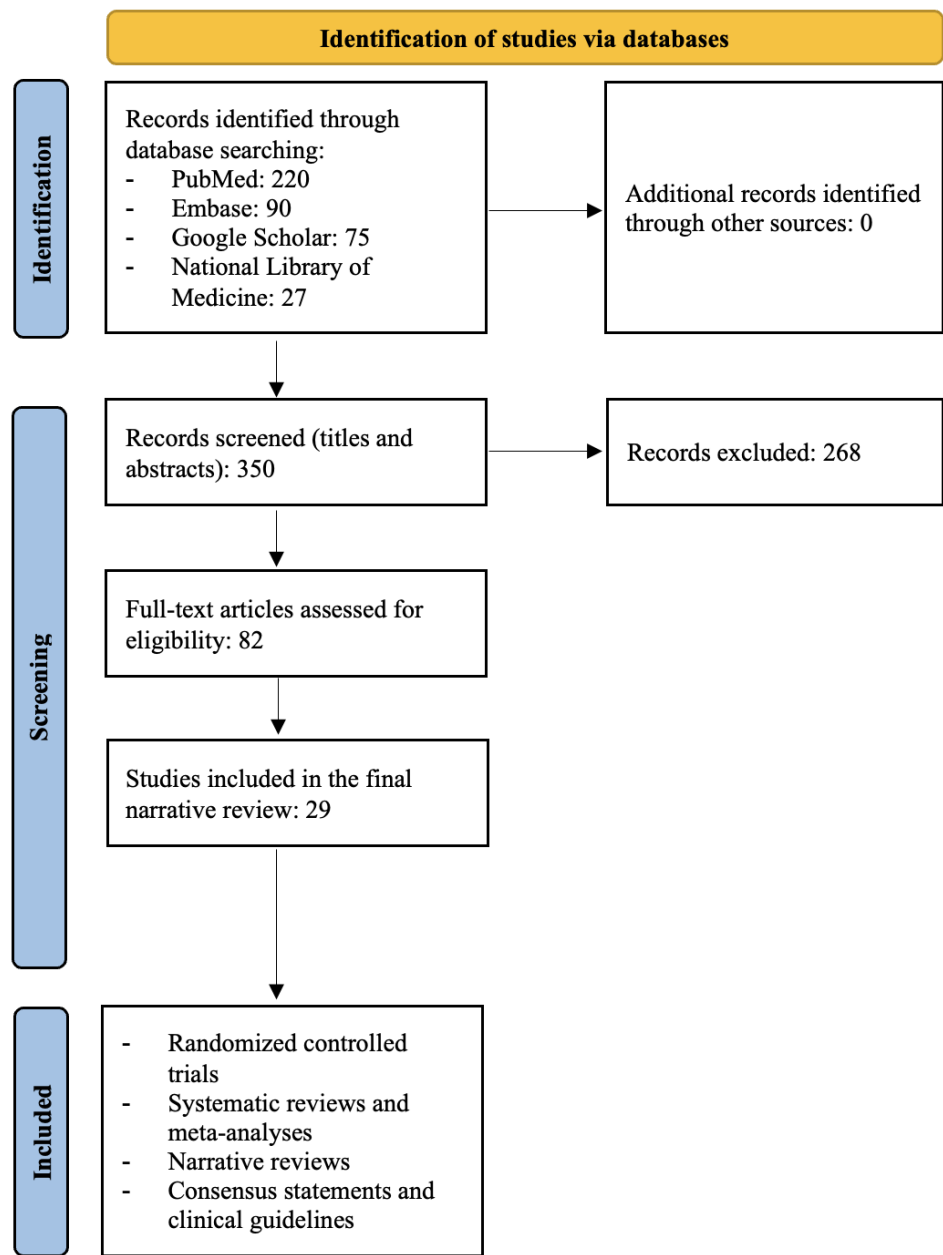


Figure 1. PRISMA flow diagram illustrating the study selection process

Table 1. Summary of analgesic techniques used after cesarean delivery.

| Technique            | Analgesia Duration | Pain Coverage      | Opioid Use | Adverse Effects | Remarks             |
|----------------------|--------------------|--------------------|------------|-----------------|---------------------|
| TAP Block            | 6-12 h             | Somatic only       | Moderate   | Minimal         | Simple, safe        |
| QLB                  | 18-24 h            | Somatic + visceral | Low        | Rare            | Superior comfort    |
| Intrathecal Morphine | ~ 24 h             | Somatic + visceral | -          | Frequent        | Requires monitoring |

### Characteristics of analgesia techniques with scientific evidence

The treatment of postoperative pain after cesarean section is a key component of comprehensive postpartum care. Adequate pain control not only significantly improves the comfort of the woman in labor and allows for earlier mobilization and promotes the establishment of a proper relationship between the mother and the newborn. Faster recovery also reduces the incidence of complications such as postpartum depression, lactation disorders, and venous thrombosis.

Contemporary postoperative analgesia options are based not only on pharmacotherapy and include regional techniques, which are becoming increasingly popular every year. Among the methods for peripheral and fascial nerve block, it is essential to focus on the transverse abdominis plane (TAP) block and the quadratus lumborum (QLB) block. In principle, both methods aim to reduce pain conduction in the anterior-lateral wall of the abdominal cavity; however, they differ in their range and effectiveness in providing pain relief.

Opioids remain a supplement and alternative. They can be administered systemically (intravenously or orally) or neuroaxially, i.e., as part of subarachnoid and epidural anesthesia. The following sections provide an overview of the research and comparative analysis of the three most used strategies for treating postpartum pain following a cesarean section: TAP block, QLB, and opioid-based therapy.

#### Transversus Abdominis Plane (TAP) Block

The Transversus Abdominis Plane (TAP) Block is a regional analgesia technique involving the administration of a locally acting anesthetic (e.g., ropivacaine or bupivacaine) into the neurofascial space, more precisely between the internal oblique muscle and the transverse abdominal muscle. The administration of anesthetics blocks the anterior spinal nerves Th7-L1, which are responsible for conducting pain from the somatic structures of the anterior-lateral abdominal wall.

The entire procedure is usually carried out with strict ultrasound guidance, which effectively ensures its high safety and precision and eliminates some side effects. The TAP block can be performed in various variants: lateral, posterior, or subcostal, selected according to the type of surgery and the expected analgetic coverage. TAP block is viewed as an easy-to-learn and relatively simple technique to perform, making it a popular choice in anesthesiology practice for both experienced and less experienced operators.

Nevertheless, it is important to recognize that the desired analgesic effect of this method is mainly limited to somatic pain. This is because the analgesic does not spread to the paravertebral space. This anaesthesia technique does not cover visceral structures. The anaesthesia lasts for approximately 6 to 12 hours. This may not be sufficient in the context of 24-hour postoperative care. A growing body of literature suggests that the TAP block can provide solid and relatively safe pain control by targeting the nerves responsible for postoperative discomfort in the abdominal area following a cesarean section.

In a study conducted by Innamorato et al., (2023), bilateral TAP II was associated with a noticeable decrease in pain scores (NRS) both at rest and during movement within the first 6 hours after surgery. Interestingly, after 12 hours the effect was mainly maintained for movement-related pain rather than pain at rest. In a study by Innamorato et al., (2023), bilateral TAP II was linked to a clear drop in pain scores (NRS) at rest and during movement in the first 6 hours after surgery. After 12 hours, the effect was mostly noticeable for pain on movement, with little change in pain at rest.

However, based on the available data, TAP block may be less effective in postoperative mobilization of patients. A meta-analysis by Tan et al., (2020) and a study by Ferguson et al., (2024) reported higher pain scores during movement in patients who received TAP block compared with those after QLB. Comparable results have been reported elsewhere in other clinical trials, and functional analgesia was not adequately maximized with the block. Limited analgesia was correlated with the administration of additional opioid doses for adequate comfort and pain in patients. However, it has its limitations as well. It is a component of a multimodal approach used for alleviating postoperative pain. It can therefore be a crucial resource in helping decrease the overall opioid use as well as improving the well-being and satisfaction of patients under the treatment plan.

#### Quadratus Lumborum Block (QLB)

Quadratus Lumborum Block (QLB) is an advanced regional analgesia technique aimed at achieving a more effective and longer-lasting analgesic effect compared to the previously discussed TAP Block. The procedure takes place in the vicinity of the quadratus lumborum muscle, with the anesthetic agent deposited in the fascial spaces: superficial (QLB 1), posterior (QLB 2), anterior/transmuscular (QLB 3), and intramuscular (QLB 4). Since the anesthetic spreads in the paravertebral space, the QLB method works not only by blocking somatic nerves, but also sympathetic and visceral fibers (El-Boghdady et al., 2023; Uppal et al., 2021).

Thanks to this mechanism, QLB provides an extended analgesic effect, covering both somatic and visceral pain. It is also worth noting the duration of this type of anesthesia, which is significantly longer than that of the TAP Block. One study showed that QLB 2 reduces the use of opioid drugs for up to 36 hours after a cesarean section. The time to reduction in pain intensity after surgery is up to 24 hours (Qin et al., 2024). This translates into measurable benefits in terms of early recovery after cesarean section. It facilitates the efficient mobilization of the patient and a more comfortable start to breastfeeding.

Agameya et al., (2024) reported a significantly prolonged time to the administration of the rescue drug nalbuphine in patients anesthetized with the Quadratus Lumborum Block method. Furthermore, the amount consumed in the first postoperative day overall of opioid drugs was markedly decreased (0.6 mg vs. 8.4 mg). Patients with QLB blockade also had immediate mobility restoration following surgery and reported an improvement in pain compliance.

It can also be noted that comparable analgesic efficacy can be obtained for this method compared with neuroaxial opioids, such as morphine intrathecally administered. At the same time, there is a lower risk of adverse effects such as pruritus, nausea, urinary retention, or respiratory depression (de Araújo et al., 2022). This finding is supported by a randomized study conducted by Dost et al., (2025). The study compared the effect of QLB 2 with the administration of 100 µg of morphine intrathecally in 60 patients after cesarean section. The analysis found no discrepancies in postoperative pain intensity, total opioid use, or time to first rescue dose. The QLB group had a much lower number of adverse events. Patients reported that they experienced increased comfort and greater postoperative pain control satisfaction.

In a systematic review published in *Anaesthesia*, El-Boghdadly et al., (2021) reported that the quadratus lumborum block (QLB) can noticeably ease postoperative pain, especially when the patient begins to move around. Better comfort during early mobilization may help women recover more quickly and support an earlier start to breastfeeding. One aspect that many women value about this block is its long duration of pain relief, often lasting beyond the first full day after the procedure. As a result, pain management remains effective throughout the initial 24 hours, a period that is particularly important for recovery and for establishing the first contact and bond with the newborn (Uppal et al., 2021).

The prolonged duration of analgesia is frequently highlighted as a major advantage of this approach, as it can extend well over 24 hours. This makes QLB a valuable option for maintaining adequate pain relief throughout the critical first day following delivery (Uppal et al., 2021).

Although QLB is a highly effective technique, it is also more technically demanding and requires both high quality ultrasound imaging and operator experience. Because the target structures lie deeper, the procedure carries a certain risk of complications, including haematoma formation or potential nerve injury (El-Boghdadly et al., 2021a). Even so, an increasing number of studies, along with guidance from international bodies such as the European Society of Regional Anaesthesia (ESRA), suggest that this technique has an important role in contemporary postoperative pain management (Uppal et al., 2021).

### **Intrathecal opioids**

Opioids remain a key component of postoperative pain management and continue to play an important role in obstetric anaesthesia. When intrathecal morphine (ITM) is used within spinal anaesthesia, it usually provides a strong and fairly long-lasting pain relief for both somatic and visceral discomfort, often covering the first 18–24 hours after surgery. In most cases, relatively small doses (100–150 µg) are enough to keep pain well controlled and limit the need for additional systemic opioids. However, some women may experience side effects such as itching, nausea or difficulty passing urine. In a review published by Liu et al., (2023), the authors pointed out that pain relief following ITM may, in some cases, extend up to 36 hours. They also stressed that this duration still needs to be confirmed in future studies (Hatter et al., 2025; Gibson et al., 2025).

While intrathecal morphine is known to offer strong postoperative pain relief, its use is often limited by several side effects. Patients frequently report itching (45–70%), nausea and vomiting (20–40%), and difficulties with urination (10–20%). Respiratory depression may also occur, and the risk appears to increase with higher doses, particularly above 0.3 mg. All percentages represented represent the average results of three existing analyses conducted by Renard et al., (2024), O'Keefe et al., (2025) and Gibson et al., (2025). The clinical correlations and dose frequency and the information extracted from the original source publications show good clinical correlates.

There is growing interest in postpartum recovery time and the well-being of the mother. The adverse effects described in the above paragraph may negatively affect the mother's general well-being, hinder early bonding with the newborn and delay her mobilization. Regional approaches are increasingly being popularized because they allow for a more optimal control of pain and at the same time



avoid side effects in the case of opioid treatment. The TAP and QLB blocks discussed in this paper merit special reference. Many of these approaches eliminate or reduce the requirement for further injection of opioids.

According to the suggestions by international communities like the American College of Obstetricians and Gynecologists (ACOG), the Society for Obstetric Anesthesia and Perinatology (SOAP), PROSPECT (Procedure-specific Postoperative Pain Management; ESRA Working Group) etc., pain management after cesarean section should adopt a multimodal strategy. This would be achieved through administration of a combination of modes of action, low doses of intrathecal opioids (50-100 µg morphine), regional treatments (such as TAP Block or QLB) and frequent non-opioid use (paracetamol, NSAIDs). Opioids, particularly higher potency opioids, are best for use when the other methods are inadequate. Such an approach may be beneficial in terms of management of pain and improvement of the patient's overall quality of life (American College of Obstetricians and Gynecologists, 2021; Bollag et al., 2021; Roofthoof et al., 2021).

### Comparative review of scientific evidence

An analysis of current scientific reports on methods of treating pain after cesarean section shows varying effectiveness and impact on patient comfort depending on the method of perinatal analgesia used. A noticeable contrast can be seen when comparing regional blocks with spinal anaesthesia that includes opioids. Although the TAP block provides relief from somatic pain, its effect is more limited in terms of the area it covers, and the duration of analgesia is generally shorter than with other available techniques. In many cases, somatic opioids need to be administered to ensure the desired pain control (Dost et al., 2025; Innamorato et al., 2023; Ferguson et al., 2024)

However, this is one element of how different the Quadratus Lumborum Block will be: its posterior form, QLB 2 provides a wider anesthetic range that also includes visceral structures. As a result, pain relief tends to last longer and women usually need fewer opioids after the surgery (El-Boghdady et al., 2021b). Several studies also point to high levels of patient satisfaction with QLB, earlier mobilisation and lower rates of nausea and vomiting when compared with spinal opioid techniques (Salama, 2020; Mieszkowski et al., 2021; Hu et al., 2023). For visceral analgesia, intrathecal morphine, 100-150 µg, provides potent and long-lasting effects. Yet this carries a high risk of pruritus, nausea, urinary retention, and respiratory depression (Liu et al., 2023).

A systematic review by Du et al. (2024) demonstrates that blockade of QLB significantly decreased VAS scores and decreased opioid requirements within the first 24 hours of operation after cesarean section due to QLB blockade and a favorable safety profile (Du et al., 2024). Hatter et al., (2025) reported similar observations (2025), that include subarachnoid opioids even at small doses in the multimodal analgesia strategy can relieve pain with minimal side-effects. Similar findings were shown by Anyaehie et al., (2022) in a qualitative study (2022), where, among other things, the implementation of an opioid-sparing strategy following an emergency cesarean section led to a decrease in opioid use and analgesia consumption. In turn, Kianian et al., (2024) identified the advantages of using both pharmacological and regional methods, which improves the analgesic effect while attenuating side-effects.

## 4. CONCLUSION

The evidence reviewed in this paper shows that the Transversus Abdominis Plane (TAP) block, the Quadratus Lumborum Block (QLB) and intrathecal morphine are all effective in managing pain after caesarean section. Among these methods, QLB generally provides broader and longer-lasting relief, especially when the patient begins to move after surgery. The TAP block remains a safe and simple option, although its effect is mostly limited to somatic pain. Intrathecal morphine offers pain control of similar duration to QLB, but a higher likelihood of side effects constrains its use. Taking these findings into account, QLB appears to offer the most favorable balance between effectiveness and tolerability.

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### Author contributions

All authors are contributed equally. All authors have read and agreed with the final published version of the manuscript.

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**Conflict of interest**

The authors declare that they have no conflicts of interests, competing financial interests or personal relationships that could have influenced the work reported in this paper.

**Data and materials availability**

All data associated with this study will be available based on the reasonable request to corresponding author.

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