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Original Research Article

Comparison of Surgical Transversus Abdominis Plane Block and Traditional Postoperative Analgesia Following Caesarean Section: A Prospective Observational Comparative Study

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Abstract

Background: Effective postoperative analgesia following Caesarean section is important for early mobilization, breastfeeding, maternal–newborn bonding, and overall postoperative recovery. Transversus abdominis plane (TAP) block is a regional analgesic technique that provides somatic pain relief by blocking the sensory nerves of the anterior abdominal wall. Surgical TAP block performed under direct vision during Caesarean section may offer effective analgesia while reducing the requirement for systemic analgesics.

Aim: To compare the effectiveness of surgical transversus abdominis plane block with traditional postoperative analgesia in women undergoing Caesarean section.

Materials and Methods: This prospective observational comparative study was conducted at Sri Venkateswaraa Medical College Hospital and Research Institute over a period of Six months. A total of 60 women aged above 18 years undergoing Caesarean section were included. Thirty patients who received surgical TAP block were included in Group A, while 30 patients receiving traditional postoperative analgesia were included in Group B. Postoperative pain was assessed using the Visual Analogue Scale (VAS) at 2, 4, 6, 12, and 24 hours. Time to first rescue analgesia, number of rescue analgesic doses, total analgesic consumption during the first 24 hours, postoperative adverse effects, and patient satisfaction were also compared between the two groups.

Results: The baseline demographic and obstetric characteristics were comparable between the two groups. Mean VAS scores were significantly lower in the TAP block group at 2 hours (2.1 ± 0.8 vs 3.6 ± 1.0), 4 hours (2.4 ± 0.9 vs 4.0 ± 1.1), 6 hours (2.8 ± 1.0 vs 4.2 ± 1.1), and 12 hours (3.1 ± 1.0 vs 3.8 ± 1.1). At 24 hours, the difference was not statistically significant. Rescue analgesia was required in 43.3% of patients in the TAP block group compared with 80.0% in the traditional analgesia group. The mean time to first rescue analgesia was significantly longer in the TAP block group (9.4 ± 3.1 hours vs 5.2 ± 2.4 hours, $p<0.001$). Patient satisfaction was also higher in the TAP block group.

Conclusion: Surgical transversus abdominis plane block provides better early postoperative analgesia following Caesarean section, with lower pain scores, reduced rescue analgesic requirements, prolonged time to first rescue analgesia, and improved patient satisfaction compared with traditional postoperative analgesia. Surgical TAP block may therefore be a useful adjunct to multimodal postoperative pain management after Caesarean delivery.

Keywords: Caesarean Section, Transversus Abdominis Plane Block, TAP Block, Postoperative Analgesia, Postoperative Pain, Rescue Analgesia.

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Introduction

Caesarean section is one of the most frequently performed surgical procedures in obstetric practice. Adequate postoperative analgesia is an essential component of perioperative care following Caesarean delivery, as effective pain control facilitates early mobilization, breastfeeding, maternal–newborn interaction, and overall postoperative recovery [1]. Inadequately controlled acute postoperative pain can cause considerable maternal discomfort, delay functional recovery, and adversely affect the early postpartum experience. Therefore, an analgesic regimen that provides effective pain relief with minimal maternal and neonatal adverse effects is desirable [2]. Pain following Caesarean section is multifactorial and consists of both somatic and visceral components.

Somatic pain originates predominantly from the skin incision and disruption of the anterior abdominal wall, whereas visceral pain results from uterine incision, manipulation, and contraction [3]. Consequently, no single analgesic technique may provide optimal pain relief for all components of post-Caesarean pain, and a multimodal approach is generally preferred [1,2].

Conventional postoperative analgesia commonly involves the administration of paracetamol and non-steroidal anti-inflammatory drugs, supplemented with opioid analgesics when required [1,4]. Although opioids provide effective analgesia, their use may be associated with dose-dependent adverse effects such as nausea, vomiting, pruritus, sedation, dizziness, and respiratory depression [4]. In the postpartum period, excessive sedation and other opioid-related adverse effects are particularly undesirable because mothers are expected to mobilize early, initiate breastfeeding, and actively participate in newborn care. Strategies that reduce opioid and rescue analgesic requirements while maintaining satisfactory pain relief are therefore clinically valuable [1,4]. Regional abdominal wall blocks have increasingly been incorporated into multimodal analgesic protocols for abdominal surgery. The transversus abdominis plane (TAP) block is a regional analgesic technique that targets the sensory nerves supplying the anterior abdominal wall. The landmark-based TAP block was originally described by Rafi [5]. Subsequent anatomical and radiological evaluation by McDonnell et al. demonstrated the anatomical basis of the technique [6]. Local anaesthetic is deposited within the fascial plane between the internal oblique and transversus abdominis muscles, through which branches of the thoracolumbar nerves traverse [5,6]. By blocking these sensory afferents, TAP block primarily reduces the somatic component of pain arising from the abdominal wall incision.

TAP block can be performed using a landmark-based technique, under ultrasound guidance, or through a surgical approach. Ultrasound guidance enables visualization of the abdominal wall layers and local anaesthetic spread. Clinical studies have demonstrated the effectiveness of ultrasound-guided TAP block for postoperative analgesia following Caesarean delivery [7,8].

However, ultrasound-guided block requires appropriate equipment, expertise, and an additional procedure. During Caesarean section, the transversus abdominis plane may also be accessed surgically, allowing local anaesthetic to be administered under direct intraoperative guidance before completion of abdominal wall closure. Surgical TAP block is therefore a potentially simple and practical technique that can be incorporated into the operative procedure without requiring a separate postoperative regional block. The effectiveness of TAP block following Caesarean delivery is influenced by several factors, including the anaesthetic technique, use of intrathecal or epidural opioids, type and dose of local anaesthetic, block technique, timing of administration, and background multimodal analgesic regimen. Randomized clinical studies have demonstrated reductions in postoperative pain and analgesic requirements following TAP block after Caesarean delivery [9-11]. TAP block predominantly provides somatic analgesia and does not reliably address the visceral component of postoperative pain. It should therefore be regarded as an adjunct to, rather than a replacement for, multimodal postoperative analgesia.

Systematic reviews and meta-analyses have further evaluated the effectiveness of TAP block following Caesarean delivery. Mishriky et al. reported that TAP block was associated with improved postoperative analgesia and reduced opioid consumption, particularly when intrathecal morphine was not administered [12]. Similarly, Abdallah et al. demonstrated that TAP block provided clinically relevant postoperative analgesia following Caesarean delivery performed under spinal anaesthesia, with its benefit influenced by the background neuraxial analgesic regimen [13].

The relative effectiveness of TAP block and intrathecal morphine has also been investigated. Kanazi et al. compared ultrasound-guided TAP block with subarachnoid morphine for post-Caesarean analgesia [14], while Loane et al. similarly compared TAP block with intrathecal morphine [15]. These studies highlight that long-acting neuraxial opioids provide highly effective postoperative analgesia and that the incremental benefit of TAP block may depend on whether neuraxial morphine has already been administered.

This concept is further supported by Costello et al., who reported that TAP block did not provide substantial additional analgesic benefit when incorporated into a multimodal regimen that already included intrathecal morphine [16]. Therefore, TAP block may have its greatest clinical utility when long-acting neuraxial opioids are contraindicated, unavailable, or intentionally avoided. The potential advantages of an effective TAP block include lower postoperative pain intensity, prolonged time to first rescue analgesic requirement, reduced consumption of systemic analgesics, and potentially fewer analgesic-related adverse effects. Mankikar et al. demonstrated effective postoperative analgesia with ultrasound-guided TAP block in women undergoing Caesarean section [17]. Evidence from systematic evaluation has also supported an opioid-sparing role for TAP block following Caesarean delivery [12,13]. More recent evidence has compared TAP block with

other regional analgesic strategies. Sultan et al., in a systematic review and network meta-analysis, evaluated TAP block in comparison with wound infiltration for analgesia following Caesarean delivery and demonstrated the potential role of abdominal wall regional techniques within multimodal analgesic practice [18]. Contemporary recommendations emphasize that postoperative pain following Caesarean delivery should be managed using a multimodal approach. Enhanced recovery recommendations from the Society for Obstetric Anesthesia and Perinatology support multimodal strategies aimed at optimizing maternal recovery while minimizing unnecessary opioid exposure [19]. Similarly, the PROSPECT guideline for elective Caesarean section recommends regular basic analgesics and appropriate neuraxial or regional techniques, with abdominal wall blocks such as TAP block having a role particularly when long-acting neuraxial opioids are not administered [20]. Despite these potential advantages, the clinical effectiveness of surgically administered TAP block compared with traditional postoperative analgesic practice requires evaluation within individual clinical settings. Evidence regarding its effectiveness can assist in determining whether incorporating surgical TAP block into routine multimodal analgesic protocols provides a meaningful improvement in post-Caesarean pain management.

Hence, the present prospective observational comparative study was undertaken at Sri Venkateswaraa Medical College Hospital and Research Institute to compare surgical transversus abdominis plane block with traditional postoperative analgesia among women undergoing Caesarean section. The study primarily aimed to compare postoperative pain scores and rescue analgesic requirements, while also evaluating the time to first rescue analgesia, postoperative adverse effects, and patient satisfaction between the two groups.

Materials and Methods

Study Design: A prospective observational comparative study was conducted to compare postoperative analgesic outcomes between surgical transversus abdominis plane (TAP) block and traditional postoperative analgesia following Caesarean section.

Study Setting: The study was conducted at Sri Venkateswaraa Medical College Hospital and Research Institute among women undergoing Caesarean section.

Study Duration: The study was conducted over a period of six months, from January 2026 to June 2026.

Study Population: The study population consisted of women aged above 18 years undergoing elective or emergency Caesarean section at Sri Venkateswaraa Medical College Hospital and Research Institute during the study period and fulfilling the predefined eligibility criteria.

Sample Size: A total of 60 eligible participants were included in the study. Participants were enrolled prospectively by consecutive sampling during the study period.

Study Groups: The 60 participants were categorized into two groups according to the postoperative analgesic technique received as part of routine clinical care:

Group A – Surgical TAP Block Group (n = 30): Women who received a bilateral surgical transversus abdominis plane block as an adjunct to standard postoperative analgesia following Caesarean section.

Group B – Traditional Postoperative Analgesia Group (n = 30): Women who received traditional postoperative analgesia without a TAP block following Caesarean section.

Sampling Technique: A consecutive sampling technique was used for participant recruitment.

All eligible women aged above 18 years undergoing Caesarean section at Sri Venkateswaraa Medical College Hospital and Research Institute during the three-month study period were screened for eligibility. Women who fulfilled the predefined inclusion and exclusion criteria and provided informed consent were enrolled consecutively until the required sample size of 60 participants was achieved. Participants were subsequently categorized into the surgical TAP block group (n=30) or the traditional postoperative analgesia group (n=30) based on the analgesic technique received as part of routine clinical care.

Inclusion Criteria

1. Women aged above 18 years.
2. Women undergoing elective or emergency Caesarean section at Sri Venkateswaraa Medical College Hospital and Research Institute.
3. Women receiving either surgical TAP block or traditional postoperative analgesia as part of routine clinical care.
4. Women who were able to understand and report postoperative pain using the Visual Analogue Scale (VAS).
5. Women who provided written informed consent to participate in the study.

Exclusion Criteria

1. Women with a known allergy or contraindication to the local anaesthetic or analgesic drugs used in the study.
2. Women with infection at or near the site of TAP block administration.
3. Women with significant coagulation abnormalities or bleeding disorders.
4. Women with chronic pain or a history of long-term analgesic/opioid use.
5. Women who developed major intraoperative or postoperative complications requiring intensive care or prolonged ventilatory support.

Preoperative Assessment: All eligible participants underwent a detailed preoperative assessment before Caesarean section, including demographic details such as age, height, weight and body mass index (BMI), along with obstetric history including gravidity, parity, gestational age, previous Caesarean section and indication for the current procedure. Relevant medical history, comorbidities, previous surgical and anaesthetic history, drug allergies, baseline vital parameters and routine laboratory investigations were documented. Participants were also familiarized with the Visual Analogue Scale (VAS; 0–10) for postoperative pain assessment, where 0 represented no pain and 10 represented the worst imaginable pain.

Anaesthesia and Operative Management: All patients underwent Caesarean section under the anaesthetic technique considered appropriate by the attending anaesthesiologist according to the patient's clinical condition and institutional protocol. Standard intraoperative monitoring, including heart rate, blood pressure, oxygen saturation and respiratory parameters, was performed throughout the procedure. Caesarean section was carried out using the standard surgical technique followed at the institution. Intraoperative anaesthetic agents, analgesics and other medications were administered as clinically indicated and documented. Following completion of the surgical procedure, patients received either surgical transversus abdominis plane (TAP) block or traditional postoperative analgesia according to routine clinical practice and were subsequently monitored in the postoperative recovery area.

Surgical Transversus Abdominis Plane Block: In patients receiving the surgical transversus abdominis plane (TAP) block, the block was performed bilaterally under direct surgical visualization before completion of abdominal wall closure. The fascial plane between the internal oblique and transversus abdominis muscles was identified, and the prescribed local anaesthetic solution was carefully deposited into the transversus abdominis plane on both sides after ensuring correct placement. The total dose of local anaesthetic was maintained within the recommended weight-based safety limits. Following administration of the block, abdominal wall closure was completed using the standard surgical technique, and patients were monitored postoperatively for analgesic efficacy and any block- or local anaesthetic-related complications.

Traditional Postoperative Analgesia: Patients in the traditional postoperative analgesia group received the standard analgesic regimen routinely followed at the institution without a transversus abdominis plane (TAP) block. Postoperative analgesics, including paracetamol, non-steroidal anti-inflammatory drugs and rescue analgesics when clinically indicated, were administered according to institutional protocol. Pain intensity was assessed at predefined postoperative intervals using the Visual Analogue Scale (VAS), and additional rescue analgesia was provided when required. The type, dose and frequency of analgesics, time to first rescue analgesia, total analgesic consumption and any analgesia-related adverse effects were documented during the first 24 postoperative hours.

Traditional Postoperative Analgesia: Patients in the traditional postoperative analgesia group received the standard analgesic regimen routinely followed at the institution without a transversus abdominis plane (TAP) block. Postoperative analgesics, including paracetamol, non-steroidal anti-inflammatory drugs and rescue analgesics when clinically indicated, were administered according to institutional protocol. Pain intensity was assessed at predefined postoperative intervals using the Visual Analogue Scale (VAS), and additional rescue analgesia was provided when required. The type, dose and frequency of analgesics, time to first rescue analgesia, total analgesic consumption and any analgesia-related adverse effects were documented during the first 24 postoperative hours.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants before enrolment after explaining the purpose and procedures of the study. Participation was voluntary, and confidentiality of patient information was maintained throughout the study. No additional intervention was performed solely for research purposes, and all participants received appropriate treatment according to routine institutional clinical protocols. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Statistical Analysis: The collected data were entered into Microsoft Excel and analysed using IBM SPSS Statistics for Windows, Version 26.0

(IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage.

Continuous variables between the two groups were compared using the independent Student's t-test or Mann–Whitney U test, as appropriate. Categorical variables were compared using the Chi-square test or Fisher's exact test. Postoperative VAS scores recorded at different time intervals were analysed using an appropriate repeated-measures analysis. All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

Results

A total of 60 women undergoing Caesarean section were included in the study, with 30 participants in the surgical transversus abdominis plane (TAP) block group and 30 participants in the traditional postoperative analgesia group. All included participants completed the 24-hour postoperative assessment.

Baseline Characteristics: The baseline demographic, obstetric, and operative characteristics of the study participants are summarized in Table 1. The mean age of participants was 27.8 ± 4.1 years in the surgical TAP block group and 28.3 ± 4.4 years in the traditional postoperative analgesia group. The mean BMI was 27.1 ± 2.9 kg/m² and 27.6 ± 3.1 kg/m², respectively. Both groups were also comparable with respect to gestational age, parity, type of Caesarean section, and duration of surgery. There were no statistically significant differences in any of the baseline characteristics between the two groups (p>0.05), indicating that the groups were comparable at baseline.

Table 1: Comparison of Baseline Characteristics between the Study Groups

Baseline characteristic	Surgical TAP Block (n=30)	Traditional Analgesia (n=30)	p-value
Age (years), mean ± SD	27.8 ± 4.1	28.3 ± 4.4	0.650
BMI (kg/m²), mean ± SD	27.1 ± 2.9	27.6 ± 3.1	0.521
Gestational age (weeks), mean ± SD	38.2 ± 1.1	38.0 ± 1.2	0.504
Primigravida, n (%)	14 (46.7)	13 (43.3)	0.795
Multigravida, n (%)	16 (53.3)	17 (56.7)	-
Elective Caesarean section, n (%)	17 (56.7)	16 (53.3)	0.795
Emergency Caesarean section, n (%)	13 (43.3)	14 (46.7)	-
Duration of surgery (minutes), mean ± SD	48.6 ± 7.8	50.1 ± 8.2	0.471

Table notes: Data are presented as mean ± standard deviation (SD) for continuous variables and as frequency (percentage) for categorical variables. Continuous variables were compared using the independent Student's t-test, while categorical variables were compared using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

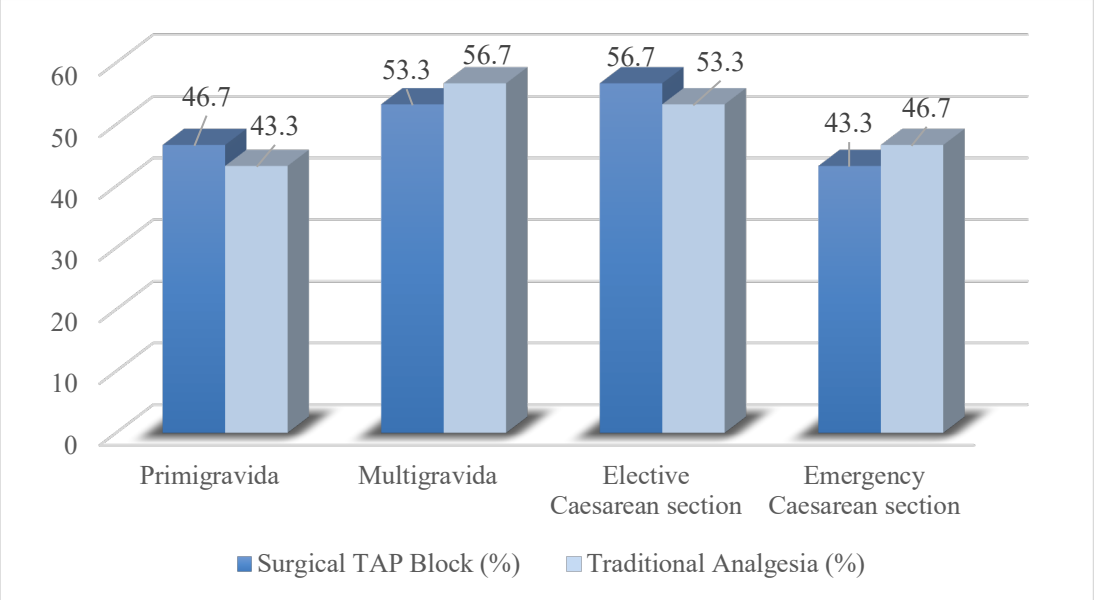

Figure 1: Comparison of Baseline Obstetric Characteristics between the Surgical TAP Block and Traditional Analgesia Groups

Figure Notes: Data are presented as percentages (%). Each study group consisted of 30 participants. The bars represent the proportion of participants who were primigravida or multigravida and those who underwent elective or emergency Caesarean section. No statistically significant differences were observed between the two groups for parity or type of Caesarean section ($p>0.05$).

Postoperative Pain Scores: Postoperative pain intensity was assessed using the Visual Analogue Scale (VAS) at 2, 4, 6, 12, and 24 hours after Caesarean section.

The comparison of postoperative VAS scores between the two study groups is presented in Table 2. Patients who received surgical TAP block had significantly lower mean VAS scores than those receiving traditional postoperative analgesia at 2 hours (2.1 ± 0.8 vs. 3.6 ± 1.0; $p<0.001$), 4 hours (2.4 ± 0.9 vs. 4.0 ± 1.1; $p<0.001$), 6 hours (2.8 ± 1.0 vs. 4.2 ± 1.1; $p<0.001$), and 12 hours (3.1 ± 1.0 vs. 3.8 ± 1.1; $p=0.013$).

At 24 hours, the mean VAS score was 2.6 ± 0.9 in the surgical TAP block group and 2.9 ± 1.0 in the traditional analgesia group; however, this difference was not statistically significant ($p=0.227$). These findings demonstrate that surgical TAP block was associated with significantly better pain control, particularly during the first 12 postoperative hours.

Table 2: Comparison of Postoperative Visual Analogue Scale Pain Scores between the Study Groups

Postoperative time	Surgical TAP Block (n=30), Mean ± SD	Traditional Analgesia (n=30), Mean ± SD	p-value
2 hours	2.1 ± 0.8	3.6 ± 1.0	<0.001*
4 hours	2.4 ± 0.9	4.0 ± 1.1	<0.001*
6 hours	2.8 ± 1.0	4.2 ± 1.1	<0.001*
12 hours	3.1 ± 1.0	3.8 ± 1.1	0.013*
24 hours	2.6 ± 0.9	2.9 ± 1.0	0.227

Table Notes: Data are presented as mean ± standard deviation (SD). Postoperative pain was assessed using the Visual Analogue Scale (VAS), ranging from 0 to 10, where 0 indicated no pain and 10 indicated the worst imaginable pain. Between-group comparisons at each postoperative time point were performed using the appropriate test for continuous data. Repeated postoperative pain measurements should additionally be assessed using a repeated-measures analysis when reporting the final statistical model. *$p<0.05$ was considered statistically significant.

Abbreviations: VAS, Visual Analogue Scale; TAP, Transversus Abdominis Plane; SD, Standard Deviation.

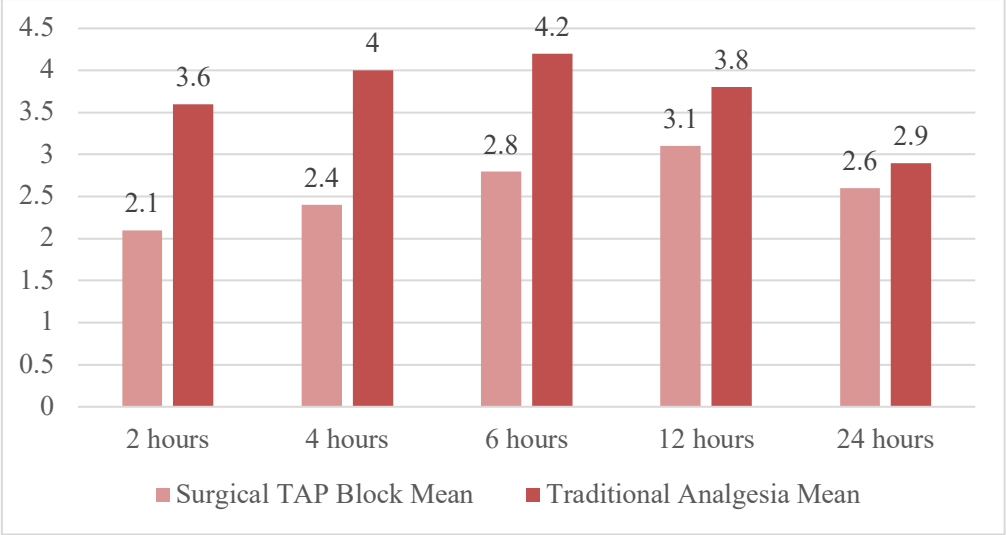

Figure 2A: Comparison of Mean Postoperative VAS Pain Scores between the Study Groups

Figure 2A notes: Values represent the mean Visual Analogue Scale (VAS) pain scores recorded at 2, 4, 6, 12, and 24 hours after Caesarean section. Mean VAS scores were significantly lower in the surgical TAP block group at 2, 4, 6, and 12 hours ($p<0.05$). The difference at 24 hours was not statistically significant ($p=0.227$).

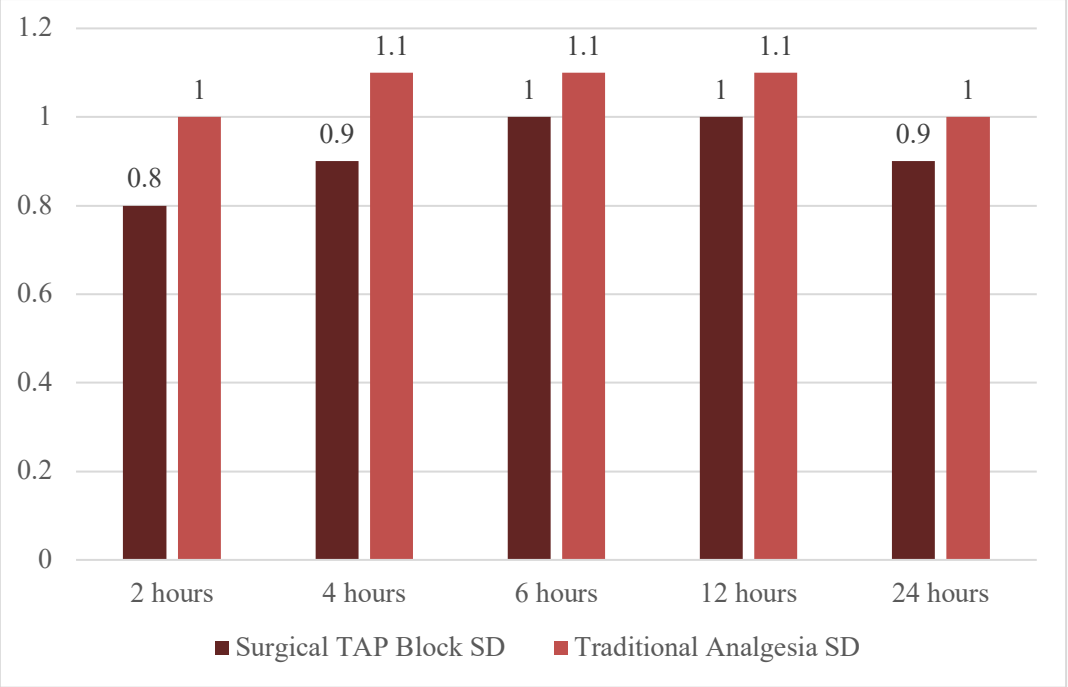

Figure 2B: Standard Deviation of Postoperative VAS Pain Scores Between the Study Groups

Figure 2B Notes: Values represent the standard deviation (SD) corresponding to the mean postoperative VAS pain scores at each assessment time point. SD values indicate the variability of pain scores within each study group and may be used as error bars in the mean VAS chart.

Abbreviations: VAS, Visual Analogue Scale; TAP, Transversus Abdominis Plane; SD, Standard Deviation.

Rescue Analgesic Requirement: The requirement for rescue analgesia during the first 24 postoperative hours was significantly lower among patients who received surgical TAP block compared with those who received traditional postoperative analgesia. As shown in Table 3, rescue analgesia was required in 13 (43.3%) patients in the surgical TAP block group compared with 24 (80.0%) patients in the traditional analgesia group (p=0.003).

The mean time to first rescue analgesic administration was significantly longer in the TAP block group (9.4 ± 3.1 hours) than in the traditional analgesia group (5.2 ± 2.4 hours; p<0.001).

Furthermore, patients receiving surgical TAP block required fewer rescue analgesic doses during the first 24 hours (0.7 ± 0.7 vs. 1.6 ± 0.8; p<0.001). These findings indicate a significantly lower requirement for additional postoperative analgesia and a longer duration of effective analgesia in the surgical TAP block group.

Table 3: Comparison of Rescue Analgesic Requirements between the Study Groups

Parameter	Surgical TAP Block (n=30)	Traditional Analgesia (n=30)	p-value
Rescue analgesia required, n (%)	13 (43.3)	24 (80.0)	0.003*
Rescue analgesia not required, n (%)	17 (56.7)	6 (20.0)	—
Time to first rescue analgesia (hours), mean ± SD	9.4 ± 3.1	5.2 ± 2.4	<0.001*
Number of rescue doses within 24 hours, mean ± SD	0.7 ± 0.7	1.6 ± 0.8	<0.001*

Table Notes: Data are presented as mean ± standard deviation (SD) or frequency (percentage), as appropriate.

The proportion of patients requiring rescue analgesia was compared using the Chi-square test or Fisher's exact test, as appropriate.

Continuous variables were compared using the independent Student's t-test or Mann–Whitney U test, depending on data distribution. *p<0.05 was considered statistically significant.

Abbreviations: TAP, Transversus Abdominis Plane; SD, Standard Deviation.

Postoperative Adverse Effects: The incidence of postoperative adverse effects was assessed during the first 24 hours following Caesarean section. As presented in Table 4, nausea was observed in 3 (10.0%) patients in the surgical TAP block group

compared with 8 (26.7%) patients in the traditional analgesia group (p=0.095).

Vomiting occurred in 1 (3.3%) and 5 (16.7%) patients, respectively (p=0.195), while sedation was observed in 1 (3.3%) patient in the TAP block group and 4 (13.3%) patients in the traditional analgesia group (p=0.353). Pruritus was not observed in the TAP block group but occurred in 2 (6.7%) patients receiving traditional analgesia (p=0.492).

Although postoperative adverse effects were numerically less frequent in the surgical TAP block group, none of the between-group differences reached statistical significance (p>0.05). No TAP block-related complications or clinical features suggestive of local anaesthetic systemic toxicity were observed.

Table 4: Comparison of Postoperative Adverse Effects between the Study Groups

Adverse effect	Surgical TAP Block (n=30), n (%)	Traditional Analgesia (n=30), n (%)	p-value
Nausea	3 (10.0)	8 (26.7)	0.095
Vomiting	1 (3.3)	5 (16.7)	0.195
Sedation	1 (3.3)	4 (13.3)	0.353
Pruritus	0 (0.0)	2 (6.7)	0.492
TAP block-related complications	0 (0.0)	Not applicable	—
Local anaesthetic systemic toxicity	0 (0.0)	Not applicable	—

Table notes: Data are presented as frequency (percentage). Between-group comparisons of categorical variables were performed using the Chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant. No statistically significant difference in the incidence of individual postoperative adverse effects was observed between the groups.

Abbreviations: TAP, Transversus Abdominis Plane; NA, Not Applicable.

Patient Satisfaction: Patient satisfaction with postoperative pain management was assessed at 24 hours using a 5-point Likert scale, ranging from 1 (very dissatisfied) to 5 (very satisfied). As shown in Table 5, the mean satisfaction score was significantly higher in the surgical TAP block group compared with the traditional postoperative analgesia group (4.3 ± 0.6 vs. 3.6 ± 0.8; p<0.001). In addition, 27 (90.0%) patients in the surgical TAP block group were satisfied or very satisfied with postoperative pain management compared with 20 (66.7%) patients in the traditional analgesia group (p=0.028).

Thus, patients receiving surgical TAP block demonstrated significantly greater satisfaction with postoperative analgesia.

Table 5: Comparison of Patient Satisfaction between the Study Groups

Patient satisfaction parameter	Surgical TAP Block (n=30)	Traditional Analgesia (n=30)	p-value
Satisfaction score, mean ± SD	4.3 ± 0.6	3.6 ± 0.8	<0.001*
Satisfied/very satisfied, n (%)	27 (90.0)	20 (66.7)	0.028*
Not satisfied/neutral, n (%)	3 (10.0)	10 (33.3)	—

Table Notes: Data are presented as mean ± standard deviation (SD) or frequency (percentage), as appropriate. Patient satisfaction was assessed using a 5-point Likert scale: 1 = very dissatisfied, 2 = dissatisfied, 3 = neutral, 4 = satisfied, and 5 = very satisfied. Scores of 4 and 5 were categorized as satisfied/very satisfied.

Continuous satisfaction scores were compared using the independent Student's t-test or Mann–Whitney U test, as appropriate, while categorical satisfaction levels were compared using the Chi-square test or Fisher's exact test. *p<0.05 was considered statistically significant.

Abbreviations: TAP, Transversus Abdominis Plane; SD, Standard Deviation.

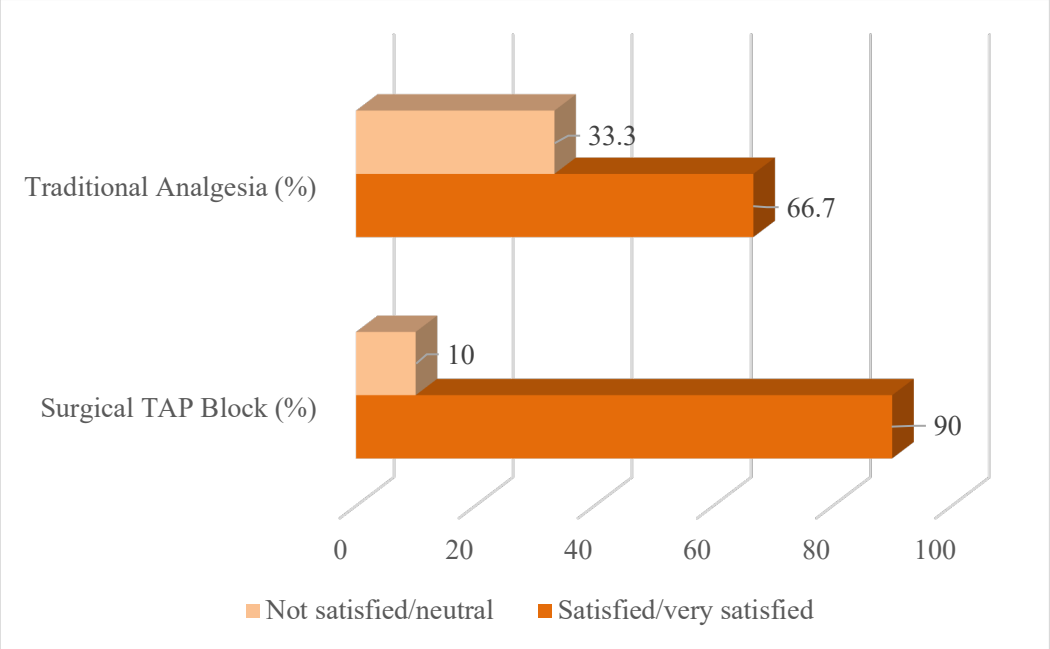

Figure 3: Comparison of Rescue Analgesic Requirement between the Surgical TAP Block and Traditional Analgesia Groups

Figure notes: Data are presented as percentages. Rescue analgesia was required in 43.3% of participants in the surgical TAP block group compared with 80.0% in the traditional analgesia group. The difference in rescue analgesic requirement between the groups was statistically significant (p=0.003), indicating a lower requirement for additional postoperative analgesia in the surgical TAP block group.

Abbreviation: TAP, Transversus Abdominis Plane.

Discussion

Adequate postoperative analgesia following Caesarean section is essential for maternal comfort, early mobilization, breastfeeding, maternal–newborn bonding, and overall postoperative recovery [1-3]. The present prospective observational comparative study evaluated the effectiveness of surgical transversus abdominis plane (TAP) block compared with traditional postoperative analgesia in 60 women undergoing Caesarean section. The principal findings were that surgical TAP block was associated with lower postoperative pain scores during the early postoperative period, reduced rescue analgesic requirements, prolonged time to first rescue analgesia, and greater patient satisfaction.

The baseline demographic and obstetric characteristics of the two groups were comparable. No statistically significant differences were observed with respect to age, body mass index, gestational age, parity, type of Caesarean section, or duration of surgery. The comparability of these characteristics reduces the likelihood that the observed differences in postoperative analgesic outcomes were attributable to major baseline differences between the groups.

Postoperative pain intensity was significantly lower in the surgical TAP block group at 2, 4, 6, and 12 hours following Caesarean section. The mean VAS scores at 2, 4, 6, and 12 hours were 2.1, 2.4, 2.8, and 3.1, respectively, in the TAP block group compared with 3.6, 4.0, 4.2, and 3.8 in the traditional analgesia group. At 24 hours, however, the difference in pain scores was no longer statistically significant. These findings suggest that the principal analgesic benefit of surgical TAP block was observed during the early postoperative period and gradually diminished with time. Similar improvements in early postoperative analgesia following TAP block after Caesarean delivery have been demonstrated in randomized controlled studies [4-6].

The analgesic effect of TAP block can be explained by its anatomical mechanism. The technique was originally described as an abdominal field block using the lumbar triangle [7]. Subsequent anatomical and radiological evaluation demonstrated that deposition of local anaesthetic within the fascial plane between the internal oblique and transversus abdominis muscles can block the thoracolumbar sensory nerves supplying the anterior abdominal wall [8]. TAP block therefore predominantly targets the somatic component of pain arising from the abdominal surgical incision. However, TAP block has a limited effect on the visceral component of post-Caesarean pain. It should therefore be regarded as an adjunct to multimodal postoperative analgesia

rather than as a sole analgesic technique. Systematic reviews evaluating TAP block following Caesarean delivery have similarly emphasized its role as part of a multimodal postoperative analgesic strategy [9,10].

The present study also demonstrated a significant reduction in rescue analgesic requirements. Rescue analgesia was required in 43.3% of women receiving surgical TAP block compared with 80.0% of women receiving traditional postoperative analgesia. Furthermore, the mean number of rescue analgesic doses required during the first 24 postoperative hours was significantly lower in the TAP block group. These findings indicate an analgesic-sparing effect of surgical TAP block. Similar reductions in postoperative analgesic consumption have been demonstrated in clinical studies evaluating TAP block following Caesarean delivery [11,12].

Another clinically relevant finding was the prolongation of the time to first rescue analgesic requirement. The mean time to first rescue analgesia was 9.4 ± 3.1 hours in the surgical TAP block group compared with 5.2 ± 2.4 hours in the traditional analgesia group. A longer period of effective analgesia during the immediate postoperative period may facilitate maternal mobilization, breastfeeding, and newborn care. Previous clinical studies have also demonstrated delayed requirement for additional postoperative analgesia following TAP block [13].

The effectiveness of TAP block depends considerably on the background anaesthetic and analgesic regimen. Evidence suggests that its analgesic benefit is particularly apparent when long-acting neuraxial opioids are not administered. In contrast, when intrathecal morphine is already included in a multimodal regimen, the additional benefit provided by TAP block may be limited [14].

Studies directly comparing TAP block with intrathecal morphine have also demonstrated important differences between these analgesic approaches. Intrathecal morphine generally provides effective and prolonged post-Caesarean analgesia, whereas TAP block may provide a useful alternative when neuraxial opioids are contraindicated, undesirable, or not administered [15,16]. Consequently, the role of TAP block should be interpreted according to the complete perioperative analgesic strategy rather than in isolation.

Postoperative adverse effects such as nausea, vomiting, sedation, and pruritus were numerically less frequent in the surgical TAP block group in the present study. However, the differences between the groups were not statistically significant. The lower frequency of these adverse effects may be related to reduce systemic rescue analgesic requirements. Nevertheless, because statistical significance was not achieved, a definite reduction in postoperative adverse effects attributable to TAP block cannot be established from the present study.

No complications related to the surgical TAP block or clinical evidence of local anaesthetic systemic toxicity were observed. Although this suggests that the technique was well tolerated in the present study population, the relatively small sample size is insufficient to establish the safety of the technique with respect to uncommon complications. Accurate anatomical placement, adherence to recommended weight-based local anaesthetic doses, and appropriate monitoring remain essential.

Patient satisfaction was significantly higher in the surgical TAP block group. The mean satisfaction score was 4.3 ± 0.6 compared with 3.6 ± 0.8 in the traditional analgesia group. Furthermore, 90.0% of women receiving surgical TAP block were satisfied or very satisfied with postoperative pain management compared with 66.7% in the traditional analgesia group. Improved early postoperative pain control, reduced requirement for additional analgesics, and prolonged time to rescue medication may have contributed to the greater patient satisfaction observed in the TAP block group.

The surgical approach to TAP block has potential practical advantages because the block can be performed intraoperatively under direct surgical guidance before abdominal wall closure. This may eliminate the need for a separate postoperative regional anaesthetic procedure and may be particularly useful where ultrasound equipment or expertise in ultrasound-guided regional anaesthesia is limited. Nevertheless, the clinical effectiveness of TAP block may be influenced by the local anaesthetic agent, concentration and volume, accuracy of deposition, anaesthetic technique, use of neuraxial opioids, and accompanying multimodal analgesic regimen.

Various modifications of TAP block have been investigated to improve the quality and duration of postoperative analgesia. The addition of analgesic adjuncts to local anaesthetic has also been evaluated following Caesarean delivery, indicating that the duration and quality of TAP analgesia may depend partly on the pharmacological regimen employed [17].

More recent systematic reviews and meta-analyses have further supported the analgesic role of TAP block following Caesarean delivery. These analyses suggest that TAP block can reduce postoperative pain and systemic analgesic requirements in appropriately selected patients, although its relative

benefit varies according to the comparator technique and the presence or absence of neuraxial opioids [18].

Current recommendations for post-Caesarean pain management emphasize a multimodal approach combining non-opioid systemic analgesics with appropriate neuraxial or regional techniques. Regular paracetamol and non-steroidal anti-inflammatory drugs form important components of this strategy, while systemic opioids are generally reserved for rescue analgesia. When long-acting neuraxial opioids are not administered, abdominal wall blocks such as TAP block may be considered as part of the postoperative analgesic regimen [19].

Evidence from contemporary systematic evaluation also indicates that TAP block remains an effective regional analgesic option following Caesarean delivery, particularly for reducing early postoperative pain and analgesic consumption in appropriately selected patients [20]. However, differences in block technique, local anaesthetic regimen, background analgesia, and study methodology should be considered when comparing results across studies.

The present study has certain limitations. First, the relatively small sample size of 60 participants may limit the statistical power to identify differences in less frequent outcomes, particularly postoperative adverse effects. Second, the study was conducted at a single centre over Six months, which may limit the generalizability of the findings. Third, the observational design and absence of randomization introduce the possibility of selection bias and residual confounding. Fourth, postoperative pain is subjective and may be influenced by individual differences in pain perception. Finally, postoperative outcomes were assessed only during the first 24 hours, and longer-term pain, functional recovery, breastfeeding outcomes, and length of hospital stay were not evaluated.

Despite these limitations, the present findings suggest that surgical TAP block is a useful adjunct to multimodal analgesia following Caesarean section. Surgical TAP block was associated with better early postoperative pain control, reduced rescue analgesic requirements, prolonged time to first rescue analgesia, and greater patient satisfaction compared with traditional postoperative analgesia. Larger randomized controlled trials using standardized anaesthetic and postoperative analgesic protocols and longer follow-up are warranted to confirm these findings and further define the role of surgical TAP block in post-Caesarean analgesia.

Limitations

The present study has several limitations. First, the relatively small sample size of 60 participants may limit the statistical power and generalizability of the findings. Second, this was a single-centre observational study, and the absence of randomization may have introduced selection bias and residual confounding. Third, the study duration was limited to Six months, and postoperative outcomes were assessed only during the first 24 hours. Fourth, pain assessment using the Visual Analogue Scale (VAS) is subjective and may be influenced by individual variations in pain perception. Finally, variations in anaesthetic technique, analgesic requirements, and other perioperative factors may have influenced postoperative outcomes. Larger multicentre randomized controlled studies with standardized analgesic protocols and longer follow-up are recommended to validate these findings.

Conclusion

Surgical transversus abdominis plane (TAP) block was associated with better early postoperative analgesia compared with traditional postoperative analgesia following Caesarean section. Patients receiving surgical TAP block demonstrated lower postoperative pain scores during the first 12 hours, a reduced requirement for rescue analgesia, a longer time to first rescue analgesic administration, and greater patient satisfaction. Although postoperative adverse effects were less frequently observed in the TAP block group, the differences were not statistically significant. These findings suggest that surgical TAP block may be a useful and feasible adjunct to multimodal analgesia following Caesarean section. However, larger randomized controlled studies with standardized analgesic protocols are required to confirm these findings.

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