Section: Anesthesiology

Original Research Article

ASSESSING THE ANALGESIC EFFICACY OF TRANSVERSALIS FASCIA PLANE AND TRANSVERSUS ABDOMINIS PLANE BLOCKS IN CESAREAN SECTION DELIVERY A INTERVENTIONAL STUDY

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ABSTRACT

Background: The aim is to assess and compare the analgesic efficacy of Transversalis Fascia Plane block and Transversus Abdominis Plane block in cesarean section delivery.

Materials and Methods: A Prospective Observational Study, was conducted at Narayana Medical College, Nellore. A total of 200 parturients undergoing elective or emergency cesarean section were included after obtaining informed written consent. The study was initiated following approval from the Institutional Human Ethics Committee of Narayana Medical College, Nellore (IEC No: IEC/NMC/15th April 2024/11). The study was conducted from February 2024 to March 2025. A total of 200 parturients aged 18–45 years with ASA physical status II undergoing elective or emergency cesarean section under spinal anesthesia were included in the study. Participants were divided into two groups: Group TAP (n = 100): Received bilateral ultrasound-guided Transversus Abdominis Plane block. Group TAFP (n = 100): Received bilateral ultrasound-guided Transversalis Fascia Plane block. Both blocks were administered using 0.25% levobupivacaine with dexamethasone under ultrasound guidance. Postoperative pain was assessed using the Visual Analogue Scale (VAS) at 1, 2, 4, 6, 12, and 24 hours after surgery.

Results: In the present study, the demographic characteristics and baseline hemodynamic parameters were comparable between the two groups. The TAFP group demonstrated lower VAS pain scores compared to the TAP group at most postoperative intervals. A statistically significant difference in VAS score was observed at 4 hours postoperatively. The time to first rescue analgesia was significantly longer in the TAFP group (463.5 minutes) compared to the TAP group (300.2 minutes). The total postoperative analgesic consumption during 24 hours was similar in both groups. The incidence of postoperative nausea and vomiting was comparable in both groups. Patient comfort scores were similar between the two groups.

Conclusion: Based on this study, both the Transversus Abdominis Plane (TAP) block and the Transversalis Fascia Plane (TFP) block are effective for pain relief after cesarean section. However, the TFP block showed better results, with lower pain scores, longer duration of pain relief, and a delayed need for rescue analgesia. The rates of postoperative nausea and vomiting and overall patient comfort were similar in both groups. Therefore, the ultrasound-guided TFP block can be considered a safe and effective alternative to the TAP block for postoperative analgesia in cesarean section patients.

Keywords: Transversus Abdominis Plane, Transversus Abdominis Plane block, Cesarean section, Visual Analogue Scale, Nausea, Vomiting.

INTRODUCTION

Cesarean section (CS) is one of the most frequently performed surgical procedures worldwide. Despite advances in anesthetic and surgical techniques, postoperative pain following cesarean delivery remains a significant clinical concern.[1] Inadequate pain control can delay ambulation, impair maternal–infant bonding, interfere with breastfeeding, prolong hospital stay, and increase the risk of chronic pain development.

Multimodal analgesia is currently the cornerstone of post-cesarean pain management. Regional anesthesia techniques play a crucial role in reducing opioid consumption and minimizing opioid-related adverse effects such as nausea, vomiting, pruritus, sedation, and respiratory depression.

The Transversus Abdominis Plane (TAP) block is a well-established regional technique that provides somatic analgesia by blocking the thoracolumbar nerves (T6–L1) within the fascial plane between the internal oblique and transversus abdominis muscles.[2]

Rafi first described the Transversus Abdominis Plane (TAP) block in 2001 as a landmark-based technique for providing postoperative analgesia in lower abdominal surgeries.[3] The technique involves the injection of local anesthetic into the fascial plane between the internal oblique and transversus abdominis muscles, thereby blocking the sensory nerves supplying the anterior abdominal wall. By anesthetizing the thoracolumbar nerves (T6–L1), effective somatic pain relief can be achieved.

However, the original landmark-based approach relied on surface anatomical landmarks, which could result in inaccurate needle placement. This occasionally led to incomplete or failed blocks. More importantly, blind needle insertion carried the risk of serious complications, including bowel perforation and liver injury, some of which have been reported as fatal.[4]

With advancements in regional anesthesia, ultrasound-guided TAP block techniques were introduced to enhance safety and accuracy. In particular, the ultrasound-guided subcostal TAP block has been widely adopted for upper abdominal procedures such as laparoscopic cholecystectomy. Ultrasound guidance allows real-time visualization of abdominal wall layers, needle trajectory, and local anesthetic spread, thereby minimizing complications associated with blind techniques and improving the efficacy of postoperative analgesia.[5]

The Transversalis Fascia Plane (TFP) block is a relatively newer technique targeting L1 nerve branches- the iliohypogastric and ilioinguinal nerves more proximally in the transversalis fascia plane where they are between the fascia of the transversus abdominis muscle and the transversalis fascia. It is proposed to provide better coverage of lower abdominal incisions and may offer prolonged and more effective analgesia compared to TAP block.[6,7]

The Transversus Abdominis Plane Block (TAPB) is a widely used regional anesthesia technique that provides effective postoperative analgesia for lower abdominal surgeries, including cesarean section. It involves the deposition of local anesthetic in the fascial plane between the internal oblique and transversus abdominis muscles, thereby blocking the thoracolumbar nerves (T6–L1) supplying the anterior abdominal wall. Although TAPB has been shown to reduce postoperative opioid requirement and improve pain scores, its analgesic coverage may be limited, particularly for lower abdominal incisions. The Transversalis Fascia Plane Block (TAFB), a relatively newer technique, targets the ilioinguinal and iliohypogastric nerves more proximally by depositing local anesthetic between the transversus abdominis muscle and the transversalis fascia. This anatomical advantage may provide more effective analgesia for Pfannenstiel incisions and prolonged postoperative pain relief.

Given these considerations, comparative evaluation of TAPB and TAFB in cesarean section is clinically relevant to optimize postoperative analgesic strategies. Although both techniques are increasingly utilized in clinical practice, limited data exist comparing their relative efficacy in cesarean section patients. Hence, this study aims to compare the analgesic efficacy, opioid consumption, and patient satisfaction between TAPB and TAFB blocks in parturients undergoing cesarean delivery.

Aim and Objectives

Aim: To assess and compare the analgesic efficacy of Transversalis Fascia Plane block and Transversus Abdominis Plane block in cesarean section delivery.

Objectives:

1. To compare postoperative pain scores at rest and during movement between Transversalis Fascia Plane Block (TFPB) and Transversus Abdominis Plane Block (TAPB) within the first 24 hours after cesarean section.
2. To compare the time to first rescue analgesia and total analgesic consumption in the first 24 hours postoperatively between the two groups.
3. To assess patient satisfaction at 24 hours following surgery.
4. To evaluate hemodynamic parameters and compare the incidence of postoperative nausea, vomiting, and block-related complications between the two groups.

MATERIALS AND METHODS

Study setting: A Hospital based Study, Narayana Medical College, Nellore.

Study area: Department of Anesthesiology, Narayana Medical College, Nellore

Study design: A Interventional study.

Sample size: 200 parturient, 100 each for TAPB and TAFB

Sampling method: Convenient sampling method.

Study subjects: Parturient undergoing elective or emergency cesarean section who meet the inclusion criteria.

Inclusion criteria:

1. Age 18–45 years
2. ASA Physical Status II
3. Undergoing elective or emergency cesarean section under spinal anesthesia
4. Willing to provide informed consent

Exclusion criteria:

1. Patient refusal
2. ASA Physical Status III and IV
3. Allergy to local anesthetics
4. Coagulopathy or bleeding disorders
5. Infection at injection site

Study tool & Instruments: Data was collected through interview method by using a pre-tested, semi-structured questionnaire which includes

Tools to be used in the study:

- Sterile disposable syringes: 10ml ,20ml
- Sterile gauze pieces and disposable gloves.
- 23G Quincke's sterile needle.
- i.v cannula 18, 20G
- USG machine.
- Drugs – 0.25% Levo-bupivacaine

Data collection procedure:

- All study participants will be visited preoperatively and the patients will be subjected for detailed pre-anaesthetic evaluation which includes clinical examination and detailed laboratory investigations.
- The written, informed consent will be taken.
- Patient will be connected to multi-channel monitors, baseline heart rate, Non-invasive BP, Spo2, ECG will be recorded.
- Patients will be pre-medicated with intravenous ondansetron, preloaded with 500ml of ringer lactate.
- All the patients will receive standardized spinal anaesthesia.
- Patient's haemodynamic parameters will be monitored continuously intraoperatively.
- After the procedure completes, the patients will be divided into two groups,
- All patients will be visited preoperatively and the patients will be subjected for detailed pre-anaesthetic evaluation which includes clinical examination and detailed laboratory investigations.
- The written, informed consent will be taken.
- Patient will be connected to multi channel monitors, baseline heart rate, Non invasive BP, Spo2, ECG will be recorded.
- Patients will be pre-medicated with intravenous ondansetron, preloaded with 500ml of ringer lactate.
- All the patients will receive standardized spinal anaesthesia.
- Patient's haemodynamic parameters will be monitored continously intraoperatively.

After the procedure completes, Patients will receive either:

Group TFP

- Bilateral ultrasound-guided Transversalis Fascia Plane block
- 0.25% Levobupivacaine + 8 mg dexamethasone
- 30 ml on each side

Group TAP

- Bilateral ultrasound-guided Transversus Abdominis Plane block
- 0.25% Levobupivacaine + 8 mg dexamethasone
- 30 ml on each side
- After completion of surgery, TAPB and TAFB blocks will be performed under the guidance of a ultrasound machine with a linear 5–12 MHz ultrasound transducer.

TAPB procedure: The Transversus Abdominis Plane Block will be performed under strict aseptic precautions using ultrasound guidance at the end of surgery.

With the patient in the supine position, a high-frequency linear ultrasound probe will be placed in the axial plane between the iliac crest and the costal margin along the mid-axillary line. The three muscle layers of the abdominal wall — external oblique, internal oblique, and transversus abdominis — will be identified.

Using an in-plane technique, a 22G block needle will be advanced under real-time ultrasound visualization into the fascial plane between the internal oblique and transversus abdominis muscles. After negative aspiration, the appropriate volume of local anesthetic solution (0.25% levobupivacaine with adjuvant, as per study protocol) will be injected. Proper spread of the drug in the transversus abdominis plane will be confirmed sonographically. The procedure will be repeated on the opposite side to achieve bilateral block.

TAFB procedure:

The Transversalis Fascia Plane Block will also be performed under ultrasound guidance with strict aseptic precautions.

With the patient in the supine position, the linear ultrasound probe will be placed just medial and superior to the anterior superior iliac spine (ASIS). The abdominal wall layers will be identified, focusing on the transversus abdominis muscle and the underlying transversalis fascia.

Using an in-plane approach, a 22G needle will be advanced through the abdominal wall muscles to reach the plane between the transversus abdominis muscle and the transversalis fascia. After careful negative aspiration, the study drug (0.25% levobupivacaine with adjuvant) will be injected. Correct placement will be confirmed by visualization of separation between the transversus abdominis muscle and the transversalis fascia. The block will be performed bilaterally.

- The patients will be observed for 15minutes and then shifted to post-anaesthesia care unit. Patient

will be monitored every 15mins for 1 hr, every half an hour for next 2 hours in postoperative room and then at 4,6,12, 24 hours postoperatively for VAS score, vitals and side effects of the drug.

- The primary observation is to compare grade of postoperative analgesia (visual analogue score from 0 to 10).
- According to VAS score no pain (0-4mm), mild pain (5-44 mm),moderate pain (45-74mm),and severe pain is (75-100mm)
- If VAS score is 5 i.e., minimal pain then rescue analgesia in the form of intravenous Diclofenac 0.3mg per kg will be given, for moderate pain, intravenous Ketorolac 0.5mg per kg will be given and for severe pain, intravenous Fentanyl 1-2mcg per kg will be given.
- Additional observations Time to first rescue analgesia,Total paracetamol consumption in 24 hours,Incidence of PONV, Signs of local anesthetic toxicity, Patient satisfaction using Bruggemann Comfort Scale
- The observed data during postoperative period will be tabulated and results were concluded.

Data analysis: The data will be entered into MS Excel version and further analyzed using SPSS (version 20.0;SPSSInc.,ChicagoIL,USA).

- For descriptive analysis, the categorical variables will be analyzed by using percentages and the continuous variables will be analyzed by calculating mean ± Standard Deviation.
- For inferential analysis, tests such as 't' test, Chi square test etc, will be applied and $p < 0.05$ will be considered as statistically significant.

Ethical issues & Ethical clearance: The study was taken up after getting the approval from Institutional Human Ethics Committee, Narayana Medical college, Nellore.

During the study, the purpose of the study was explained to all participants in their language and was interviewed after taking their consent. Each person will be given one identification number. The name & identity will not be disclosed. Thus the personal data about every subject will be kept confidentially.

Study period & Duration: The study was conducted from November 2023 to March 2025 (18 months).

RESULTS

Table 1: Age distribution among the study participants

Age distribution	Frequency	Percentage
18-21 years	28	14
22-26 years	35	17.5
27-31 years	39	19.5
32-35 years	24	12
36-40 years	30	15
>40 years	44	22

The majority of the participants belonged to the 27–31 years age group (19.5%), followed by 22–26 years (17.5%) and 36–40 years (15%). Participants aged 18–21 years accounted for 14%, while 32–35 years constituted 12% of the study population. A notable proportion of participants (22%) were aged above 40 years. This distribution indicates that most parturients undergoing cesarean section in the present study were in the young to middle reproductive age group, which is typical for obstetric populations.

Table 2: Type of C-section among the study participants

Type of C-section	Frequency	Percentage
Elective	100	50
Emergency	100	50

Among the 200 participants included in the study, 100 (50%) underwent elective cesarean section, while 100 (50%) underwent emergency cesareansection. The equal distribution ensured balanced representation of both surgical categories, minimizing potential bias related to surgical urgency

Table 3: Baseline hemodynamic parameters among the study participants

Baseline hemodynamic parameters	Mean	SD
Baseline Heart rate (beats/min)	89.27	11.49
SBP (mm of Hg)	120.31	11.76
DBP (mm of Hg)	71.19	10.09
MAP (mm of Hg)	87.56	7.99
SPO2 (%)	97.99	1.28

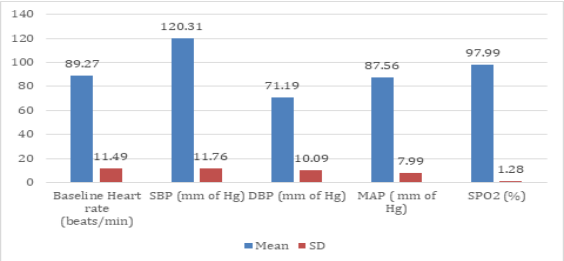

Figure 1: Baseline hemodynamic parameters among the study participants

The mean baseline heart rate was 89.27 ± 11.49 beats per minute, indicating stable cardiovascular status among participants. The mean systolic blood pressure was 120.31 ± 11.76 mmHg, while the mean diastolic blood pressure was 71.19 ± 10.09 mmHg. The mean arterial pressure was 87.56 ± 7.99 mmHg, and the mean oxygen saturation (SpO_2) was 97.99 ± 1.28%. These values indicate that the participants were hemodynamically stable prior to anesthesia, with parameters within normal physiological ranges.

Table 4: Postoperative pain assessment (VAS Score) among the study participants

Time interval	Mean	SD
1 hour	3.47	1.03
2 hours	3.71	1.04
4 hours	3.93	1.22
6 hours	4.29	1.19
12 hours	4.49	1.28
24 hours	4.74	1.38

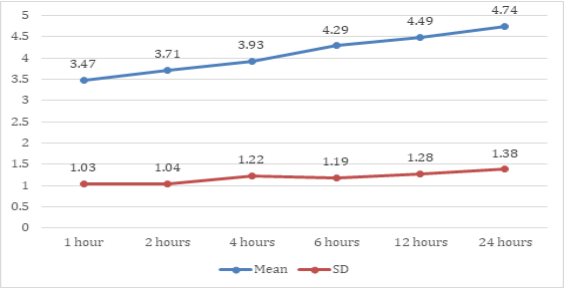

Figure 2: Postoperative pain assessment (VAS Score) among the study participants

The mean VAS score increased gradually over time, indicating progressive postoperative pain as the effect of regional anesthesia diminished. The mean VAS score was 3.47 ± 1.03 at 1 hour, 3.71 ± 1.04 at 2 hours, 3.93 ± 1.22 at 4 hours, 4.29 ± 1.19 at 6 hours, 4.49 ± 1.28 at 12 hours, and 4.74 ± 1.38 at 24 hours. These findings suggest that pain intensity increased gradually during the first 24 hours after surgery, emphasizing the importance of effective postoperative analgesia.

Table 5: Time to first rescue analgesia (min) among the study participants

Variable	Mean	SD
Time to first rescue analgesia (min)	382	166

The mean time to first rescue analgesia was 382 ± 166 minutes. This indicates that the administered regional block provided adequate analgesia for approximately 6 hours on average before additional analgesic medication was required.

Table 6: Postoperative Analgesic Consumption (24hr_mg) among the study participants

Variable	Mean	SD
Postoperative Analgesic Consumption	1755	551

The mean postoperative analgesic consumption during the first 24 hours was 1755 ± 551 mg. This suggests a moderate requirement of additional analgesic medication during the postoperative period, reflecting the partial analgesic effect provided by the regional block.

Table 7: postoperative nausea and vomiting (PONV) Incidence among the study participants

PONV Incidence	Frequency	%
Yes	52	26
No	148	74

Among the study participants, 52 patients (26%) experienced postoperative nausea and vomiting, while 148 patients (74%) did not report PONV. This indicates that the overall incidence of PONV in the study population was relatively low, suggesting good perioperative management and effective antiemetic prophylaxis

Table 8: Patient comfort assessment (Bruggemann Comfort Scores) among the study participants

Bruggemann Comfort Scores	Frequency	%
Score 1	52	26
Score 2	48	24
Score 3	49	24.5
Score 4	51	25.5

Patient comfort scores were fairly evenly distributed among the four categories. Score 1 was observed in 26% of patients, Score 2 in 24%, Score 3 in 24.5%, and Score 4 in 25.5%. This distribution indicates moderate to good patient comfort levels during the postoperative period.

Comparison of baseline characteristics among the two groups

Table 9: Comparison of Age distribution among the two groups

Age distribution	TAP		TAFP	
	Frequency	%	Frequency	%
18-21 years	12	12	16	16
22-26 years	16	16	19	19
27-31 years	17	17	22	22
32-35 years	15	15	9	9
36-40 years	17	17	13	13
>40 years	23	23	21	21

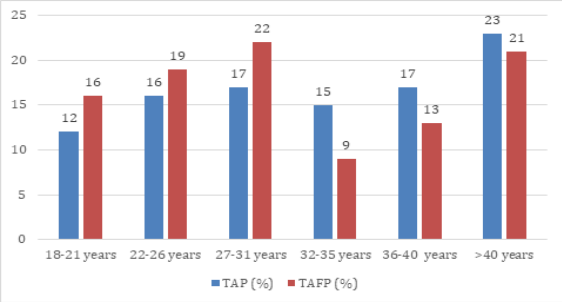

Figure 3: Comparison of Age distribution among the two groups

The age distribution between the TAP and TAFP groups was comparable across all age categories. The highest proportion of patients in both groups belonged to the 27–31 years age group. Since the distribution was similar between groups, age was unlikely to act as a confounding factor in the comparison of analgesic outcomes.

Table 10: Comparison of Type of C-section among the two groups

Type of C-section	TAP		TAFP		pvalue
	Frequency	%	Frequency	%	
Elective	52	52	48	48	0.572
Emergency	48	48	52	52	

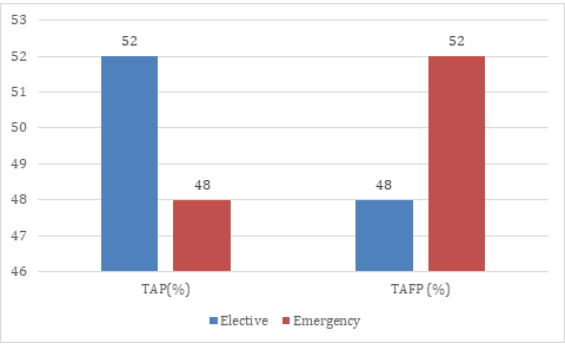

Figure 4: Comparison of Type of C-section among the two groups

In the TAP group, 52% of patients underwent elective cesarean section and 48% underwent emergency procedures. In the TAFP group, 48% underwent elective and 52% emergency cesarean section. The difference was not statistically significant (p = 0.572), indicating that both groups were comparable in terms of surgical category.

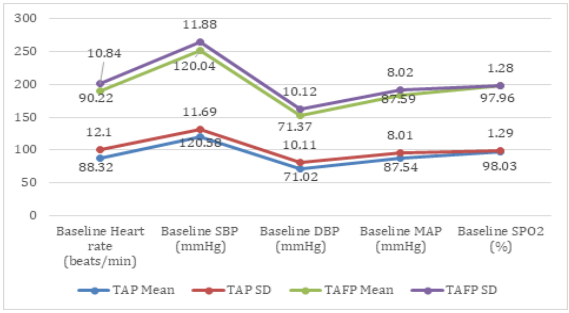

Figure 5: Comparison of baseline hemodynamic parameters among the two groups

Baseline heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, and oxygen saturation were similar in both groups, and none of the parameters showed statistically significant differences (p > 0.05). This confirms that the two groups were hemodynamically comparable before intervention, ensuring reliable comparison of analgesic outcomes.

Table 12: Comparison of baseline hemodynamic parameters among the two groups

Hemodynamic parameters	TAP		TAFP		P value
	Mean	SD	Mean	SD	
Baseline Heart rate (beats/min)	88.32	12.10	90.22	10.84	0.07
Baseline SBP (mmHg)	120.58	11.69	120.04	11.88	0.74
Baseline DBP (mmHg)	71.02	10.11	71.37	10.12	0.98
Baseline MAP (mmHg)	87.54	8.01	87.59	8.02	0.69

Baseline SPO2 (%)	98.03	1.29	97.96	1.28	0.97

Table 13: Comparison of Mean VAS scores among the two groups

Mean VAS scores	TAP		TAFP		P value
	Mean	SD	Mean	SD	
1 hour	3.94	0.96	3.00	0.88	0.41
2 hours	4.20	0.92	3.22	0.92	0.73
4 hours	4.43	1.2	3.43	1.02	0.04*
6 hours	4.66	1.19	3.91	1.08	0.45
12 hours	4.84	1.25	4.14	1.22	0.83
24 hours	5.21	1.27	4.28	1.34	0.69

Table 14: Comparison of Time to rescue analgesic among two groups

Variable	TAP		TAFP		P value
	Mean	SD	Mean	SD	
Time to rescue analgesic (in min)	300.2	109.7	463.5	172.7	0.001*

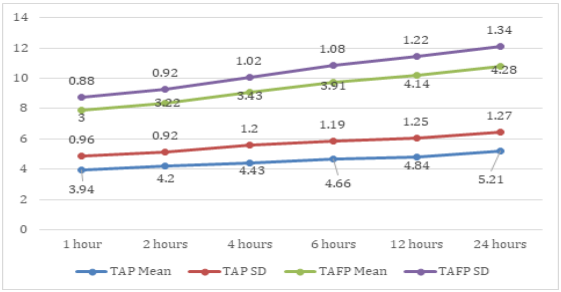

Figure 6: Comparison of Mean VAS scores among the two groups

The TAFP group demonstrated consistently lower VAS scores compared to the TAP group at most postoperative time intervals. A statistically significant difference was observed at 4 hours postoperatively (p = 0.04). Although other time points did not show statistical significance, the overall trend suggests that TAFP block provided better postoperative analgesia compared to TAP block.

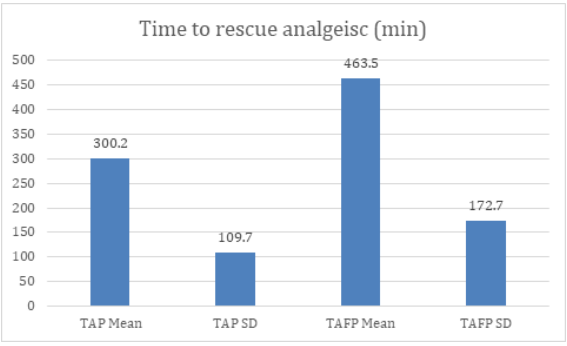

Figure 7: Comparison of Time to rescue analgesic among two groups

The mean time to rescue analgesia was significantly longer in the TAFP group (463.5 ± 172.7 minutes) compared to the TAP group (300.2 ± 109.7 minutes). This difference was statistically significant (p = 0.001), indicating that the TAFP block provided a longer duration of postoperative analgesia.

Table 15: Comparison of post-operative analgesic consumption among two groups

Variable	TAP		TAFP		P value
	Mean	SD	Mean	SD	
Post-operative analgesic consumption (mg)	1690	544.85	1820	552.86	0.803

Table 16: Comparison of incidence of postoperative nausea and vomiting (PONV) among two groups.

Incidence of postoperative nausea and vomiting	TAP		TAFP		pvalue
	Frequency	%	Frequency	%	
Yes	26	26	26	26	1.00
No	74	74	74	74	

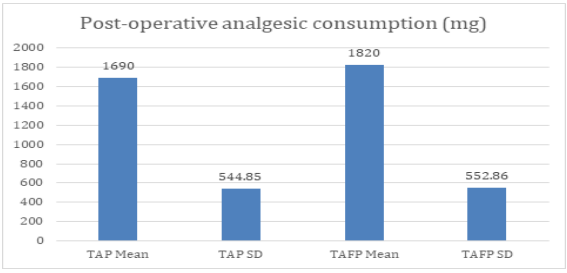

Figure 8: Comparison of post-operative analgesic consumption among two groups

The mean postoperative analgesic consumption was 1690 ± 544.85 mg in the TAP group and 1820 ± 552.86 mg in the TAFP group. The difference was not statistically significant (p = 0.803), suggesting that both groups required a similar amount of additional analgesic medication during the first 24 hours.

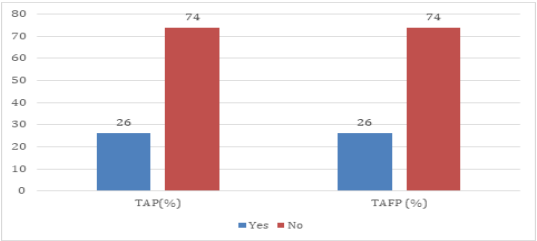

Figure 9: Comparison of incidence of postoperative nausea and vomiting (PONV) among two groups.

The incidence of PONV was identical in both groups, with 26% of patients experiencing nausea or vomiting and 74% remaining symptom-free. The difference between groups was not statistically significant (p = 1.00), indicating that the type of block did not influence the occurrence of postoperative nausea and vomiting.

Table 17: Comparison of Bruggemann comfort scores among two groups.

Bruggemann comfort scores	TAP		TAFP		pvalue
	Frequency	%	Frequency	%	
Score 1	26	26	26	26	0.151
Score 2	22	22	26	26	
Score 3	20	20	29	29	
Score 4	32	32	19	19	

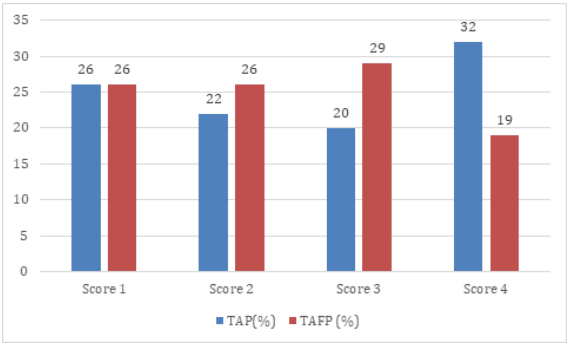

Figure 10: Comparison of Bruggemann comfort scores among two groups.

The distribution of comfort scores was comparable between the two groups. Although slightly more patients in the TAP group reported Score 4, and more patients in the TAFP group reported Score 3, the difference was not statistically significant (p = 0.151). This suggests that patient comfort levels were similar with both analgesic techniques.

DISCUSSION

Effective postoperative analgesia following cesarean section is essential for early mobilization, improved maternal comfort, early initiation of breastfeeding, and prevention of postoperative complications. Regional analgesic techniques such as the TAP block and Transversalis Fascia Plane (TFP) block have gained increasing popularity for postoperative pain control after lower abdominal surgeries including cesarean section. A total of 200 parturient were included and equally divided into TAP (n=100) and TAFP (n=100) groups.

Demographic Characteristics: Majority belonged to 27–31 years (19.5%), followed by 22–26 years (17.5%) and 36–40 years (15%). The mean age of study participants in TAPB and TFPB groups was 32.63 ± 7.98 and 31.06 ± 8.63 respectively. The comparison between TAPB and TFPB groups showed non-significant difference in age distribution, 2 groups were demographically comparable.

In the present study, 50% of patients underwent elective cesarean section and 50% underwent emergency cesarean section. The distribution between the TAP and TAFP groups was also similar, with no statistically significant difference (p = 0.572). This balanced distribution ensures that surgical urgency did not bias postoperative pain outcomes, as emergency cesarean sections may sometimes be associated with greater postoperative pain due to prolonged labor or tissue trauma.

Postoperative Pain Assessment (VAS Score): Pain intensity assessed by Visual Analogue Scale/ VAS) at multiple postoperative intervals. Demonstrated that VAS scores gradually increased over time,with mean values rising from 3.47 at 1 hour to 4.74 at 24 hours postoperatively. This trend reflects the gradual wearing off of regional analgesic effects over time.

When comparing the two groups, the TAFP group consistently showed lower VAS scores compared to the TAP group, suggesting better analgesic efficacy of the transversalis fascia plane block. A significant difference seen at the 4-hour interval (p=0.04).

In contrast to current study findings Akyol D et al,[8] (2023) was a prospective randomized, single-blinded trial in which the patients (and likely the postoperative pain assessor) were blinded, while the anesthesiologist performing the block was not.

Postoperative pain was assessed using the Visual Analog Scale (VAS) ranging from 0 to 10, where 0 represents no pain and 10 represents the worst imaginable pain, with scores recorded at multiple intervals during the first 24 hours after surgery. In both groups, ultrasound-guided bilateral blocks were performed using 0.25% bupivacaine. The results demonstrated that the transversalis fascia plane block (TFPB) provided significantly lower VAS pain scores compared to the transversus abdominis plane block (TAPB), particularly in the early postoperative period. Reported VAS scores at T1 is zero in both groups, at T2, T3 VAS values were lower in TFPB group than TAPB group and at T4 VAS values were similar in both the groups.[21]

The study by Rahimzadeh P et al,[9] (2018) was a randomized clinical trial comparing ultrasound-guided transversalis fascia plane (TFP) block and transversus abdominis plane (TAP) block for postoperative pain relief in elective caesarean section. Blinding details were not clearly specified, suggesting it was not a fully doubleblinded study. Both blocks were performed using local anesthetics such as bupivacaine (commonly around 0.25%). Postoperative pain was assessed using the

Visual Analog Scale (VAS) at multiple time intervals. The results showed no significant

difference in VAS pain scores, time to first analgesic request, or total analgesic consumption between the two groups, indicating that both TFP and TAP blocks provided comparable and effective postoperative analgesia.

Time to First Rescue Analgesia: The duration of effective analgesia was evaluated by measuring the time to the first requirement for rescue analgesia. In the current investigation, the mean time to rescue analgesia was significantly longer in the TFPB group (463.5 minutes) compared to the TAPB group (300.2 minutes), and this difference was statistically significant (p = 0.001).

This finding indicates that the TFPB block provides a longer duration of postoperative analgesia than the TAPB block. The time to first rescue analgesia was found to be prolonged in the infiltration group (Group I) (4.060 ± 0.682 hours) compared with the TAP group (Group T) (3.302 ± 0.519 hours). However, the requirement for a second rescue analgesic dose was lower in the TAP group, suggesting a more sustained analgesic effect with TAP block over time.

In the study by Kosem A et al,[10] (2024) the time to first rescue analgesia was not measured at fixed intervals but was recorded as the actual time from completion of surgery or block administration until the patient first required additional analgesia. The results showed that the transversalis fascia plane (TFP) block group had a longer time to first rescue analgesia compared to the transversus abdominis plane (TAP) block group, indicating a prolonged duration of postoperative analgesia with TFP block. Similarly, the time of first analgesic requirement was longer in TFPB than TAPB in the study done by Akyol D et al,[8] (2023). They used 0.25% bupivacaine, postoperative pain was assessed at fixed intervals of 1, 2, 4, 8, 12, and 24 hours. The time to first rescue analgesia was not measured at a preset interval; rather, it was recorded continuously as the exact time from block administration (or end of surgery) until the patient first requested analgesia.[8]

Postoperative Analgesic Consumption: The amount of analgesics used overall during the first 24 hours following surgery was assessed. The TAP group consumed 1690 mg of analgesics on average, while the TAFP group consumed 1820 mg. This difference was not statistically significant (p = 0.803).

Although the TFP block provided a longer duration of initial analgesia, the overall analgesic requirement during the entire 24-hour period remained comparable between groups. This may be due to the standardized multimodal analgesic protocol followed postoperatively.

Kosem A et al. (2024) Postoperative analgesic consumption was lower in the TFPB group, with values around 60–70 mg tramadol equivalent, compared toapproximately 80–90 mg in the TAPB group, supporting the superior analgesic profile of TFPB.

Patient Comfort (Bruggemann Comfort Score): Patient comfort was evaluated using the Bruggemann Comfort Scale, which reflects the patient's overall postoperative experience. In the present study, the distribution of comfort scores was relatively uniform across all categories, and no statistically significant difference was observed between the two groups (p=0.151). Although slightly more patients in the TAFP group reported better comfort scores, the difference was not statistically significant.

Patients satisfaction score comparison with other studies: Kosem A et al,[10]observed that 95% patients in TFPB group very well satisfied with pain control and 72.5% in TAPB group were excellently satisfied with pain controls. These finding were much higher than current study patient satisfaction score. In the study by Rahimzadeh P et al. (2018),[9] patient comfort score was not evaluated, so no numerical values are available. The study reported outcomes mainly in terms of VAS pain scores, time to first rescue analgesia, and total analgesic consumption, but did not include any separate patient comfort scoring system. The patient satisfaction scores were very good in 39.3% and 42.9% TAPB and TFPB group respectively which is comparable to the present study findings.

Postoperative Nausea and Vomiting (PONV): Postoperative nausea and vomiting are common complications following cesarean section and may be influenced by analgesic drugs and anesthetic techniques. In the present study, 26% of patients experienced PONV, while 74% did not report any symptoms. The incidence of PONV was identical in both groups (26%), and no statistically significant difference was observed. This suggests that the type of regional block did not significantly influence the occurrence of postoperative nausea and vomiting.

Kosem A et al,[10] (2024): PONV incidence was lower in the TFP block group compared to the TAP block group, consistent with reduced postoperative analgesic requirement, though the difference was not statistically significant. PONV among both groups in the present study was similar and much higher when compared to other studies mentioned above table.

Hemodynamic parameters:

Heart Rate: In the present study, HR trends were almost similar between the TABP and TFPB groups at baseline and immediately after induction, showing similar preoperative hemodynamic status.

However, HR was significantly decreased among the study subjects who received TABP when compared to TFBP during 15 minutes to 6 hours after induction which indicates a more profound attenuation of the stress response perioperatively.

This reduction in HR among TABP group explained by effective analgesia and reduced sympathetic stimulation, which in turn reduces tachycardiac responses to surgical stimuli. At 12 and 24 hours, the differences between the groups were nolonger

statistically significant, indicating that the effect of both techniques becomes comparable in the late postoperative phase.

In consistent with the current study findings, recent systematic reviews and meta-analyses have also shown that TAPB blocks are associated with attenuation of perioperative stress responses and improved cardiovascular stability.[11,12]

Systolic Blood Pressure: The baseline and immediately after induction SBP values were comparable between the TABP and TFPB groups. There was no statistically significant differences in SBP values were observed during the period from 15 minutes to 4 hours after induction between the two groups, suggesting that both blocks provide comparable control of SBP during the early and intermediate phases.

However, at 6 hours after induction, SBP was significantly decreased in the TABP group compared to TFPB ($p = 0.0006$), which indicates delayed hemodynamic benefit of TABP. At 12 and 24 hours, SBP values were again comparable.

The above findings were similar to the findings of recent literature; they stated that TAP blocks provide improved perioperative hemodynamic control when compared to other regional anaesthesia.

Diastolic Blood pressure: In the present study, DBP values were significantly lower from 15 minutes up to 4 hours in the TABP group compared to TFPB ($p < 0.05$ at all time points), indicating hypotensive effect with TABP.

This decrease in DBP among TABP group might be due to its profound sympathetic blockade and vasodilatory effect, leading to decreased peripheral vascular resistance.

In contrast, TFPB group maintained relatively higher and consistent DBP values, which shows better preservation of hemodynamic stability and vascular tone during this period. Similar trends of lower diastolic pressures were observed in patients undergoing abdominal surgeries receiving TAP blocks.[11]

Mean Arterial Pressure: In the present study, at 15 minutes, MAP was significantly lower in the TABP group ($p = 0.011$), more pronounced at 30 minutes, where MAP was markedly lower in TABP compared to TFPB ($p = 0.0001$). This indicates a sustained reduction in MAP with TABP, reflecting a more profound attenuation of the surgical stress response. In contrast, MAP values were relatively higher among TFPB group after induction suggesting better of maintenance hemodynamic stability and vascular tone.

These findings were in line with the observations of recent systematic reviews and meta-analyses have showed that transversus abdominis plane (TAP) blocks are associated with reduced perioperative stress response, decreased catecholamine release, and improved analgesia, which collectively contribute to lower blood pressure values, including MAP.[12-14]

SPO2: Both TABP and TFPB maintain adequate and comparable oxygen saturation throughout the intraoperative and postoperative periods. Although occasional statistically significant differences are observed, these are not clinically meaningful, as SpO values remain within normal limits in both groups. This indicates that neither technique adversely affects oxygenation.

Recent clinical studies evaluating TAP blocks in abdominal and laparoscopic surgeries have reported stable SpO values across perioperative periods, supporting their safety with respect to respiratory function.[15,16]

Safety is an important consideration when performing regional blocks. To date, local anesthetic systemic toxicity related to TAP block is extremely rare, and no such complications were observed in the present study. However, a few case reports have described complications such as liver laceration associated with TAP block, including one case that occurred even under ultrasound guidance.

There have also been rare reports of seizures following TAP block, which were attributed either to inadvertent intramuscular injection of local anesthetic or systemic absorption of the anesthetic solution.

In the present study, no such complications were observed, indicating that ultrasound-guided TAP block can be performed safely when proper technique and precautions are followed.

Overall, the available literature supports the role of TAP block as an effective and relatively safe technique for postoperative analgesia in cesarean section, particularly when incorporated into a multimodal analgesic strategy.

Overall Interpretation of Findings: The findings of the present study suggest that both TAP block and TFP block are effective techniques for postoperative analgesia following cesarean section. However, the Transversalis Fascia Plane block demonstrated certain advantages, including:

- Lower postoperative pain scores
- Longer duration of analgesia
- Delayed requirement for rescue analgesia

These results indicate that the TFP block may be a more effective regional analgesic technique compared to TAP block in cesarean section patients.

Clinical Implications: The findings of this study highlight the clinical utility of ultrasound-guided Transversalis Fascia Plane block as an effective postoperative analgesic technique for cesarean section.

The technique may contribute to:

- Improved postoperative pain control
- Reduced need for rescue analgesics
- Enhanced maternal comfort
- Earlier mobilization

Thus, TFP block may serve as a valuable alternative to TAP block in multimodal analgesia protocols for cesarean delivery.

CONCLUSION

Based on this study, both the Transversus Abdominis Plane (TAP) block and the Transversalis Fascia Plane (TFP) block are effective for pain relief after cesarean section. However, the TFP block showed better results, with lower pain scores, longer duration of pain relief, and a delayed need for rescue analgesia. The rates of postoperative nausea and vomiting and overall patient comfort were similar in both groups. Therefore, the ultrasound-guided TFP block can be considered a safe and effective alternative to the TAP block for postoperative analgesia in cesarean section patients.

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