# Original Article

# Comparison Between The Effectiveness of Lateral and Posterior Transversus Abdominis Plane Block by Using Bupivacaine After Total Abdominal Hysterectomy.

Md. Miraj Hossain[1], Major Muhammad Nazrul Islam[2], Zannatul Ferdous Happy[3], Md. Moinul Hossain[4], A K M Akhtaruzzaman[5].

## Abstract

***Background:*** *Transversus Abdominis Plane (TAP) block is a regional anaesthetic technique used for postoperative pain management following abdominal surgery. Local anesthetics like bupivacaine can be used in this block and it can be performed in various approaches. Among them ultrasound-guided lateral and posterior approaches are popular.* ***Objective:*** *Aim of this study is to compare the effectiveness of lateral and posterior approaches of ultrasound-guided TAP block using bupivacaine in the management of post-operative pain after total abdominal hysterectomy under subarachnoid anesthesia.* ***Materials and Methods:*** *This randomized clinical trial was carried out in the Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka. Total 90 patients were scheduled for elective total abdominal hysterectomy and assigned into two equal groups, group A and group B received ultrasound guided TAP block in lateral approach and in posterior approach respectively. Then patients were observed for pain intensity at rest and during deep breath by visual analog scale (VAS), after 1 hour, 2 hours, 4 hours, 6 hours, 12 hours and 24 hours of TAP block. The time of first analgesic demand was noted. Statistical analyses of the results were obtained by using window based computer software devised with Statistical Packages for Social Sciences (SPSS-22).* ***Results:*** *The mean pain intensity at rest and during deep breath was statistically significant ($p<0.05$) at 4, 6, 12 and 24 hours after TAP between two groups. The mean duration of first analgesic demand was 5.04±0.54 hours in group A and 6.59±0.69 hours in group B was statistically significant ($p<0.05$) between two groups.* ***Conclusion:*** *TAP block in posterior approach provided considerably effective postoperative analgesia in first 24 hours than lateral approach after total abdominal hysterectomy.*

***Key words:*** *Post operative Analgesia, TAP block, VAS score, Bupivacaine*

***Date of received:*** *15.02.2022*

***Date of acceptance:*** *15.05.2022*

**DOI:** https://doi.org/10.3329/kyamcj.v13i2.61333

***KYAMC Journal. 2022; 13(02): 66-71.***

## Introduction

The surgical procedures are associated with pain which is usually continued in the postoperative ward. In case of lower abdominal surgery with lower transverse incisions such as total abdominal hysterectomy often suffers from severe pain, especially during the first 48 hours of operation.[1-3] Poorly controlled acute pain is associated with many unwanted post-operative complications, causing increased morbidity and prolonged hospital stay. Inadequate management of acute pain leads to chronic pain.[4-6] So, adequate and effective postoperative analgesia is important to facilitate early ambulation and prevention of postoperative morbidity and mortality.

The postoperative pain can be managed with different analgesic agents applying in different methods. Among the analgesics, the opioids are very potent and effective analgesic agent. But the opioids are associated with dose dependent unwanted effects like respiratory depression, itching nausea-vomiting and

1. Assistant Professor, Department of Anaesthesiology, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh.
2. Classified Specialist, Department of Anaesthesiology, Combined Military Hospital, Dhaka, Bangladesh.
3. Ophthalmology Resident, Sir Salimullah Medical College and Mitford Hospital, Dhaka, Bangladesh.
4. Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical university, Shahbag, Dhaka, Bangladesh.
5. Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical university, Shahbag, Dhaka, Bangladesh.

**Corresponding author:** Md. Miraj Hossain, Assistant Professor, Department of Anaesthesiology, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh. Cell Phone: +8801984362643, E-mail: miraj.j15@gmail.com

sedation etc. The multimodal analgesia by combining two or more analgesic agents or methods is becoming very popular as these methods can produce very effective analgesia where in the other hand; it is associated with least complication.

The Transversus Abdominis Plane (TAP) is a space between internal oblique abdominis and transversus abdominis muscle. The sensory innervations of the anterolateral abdominal wall passes through TAP space and they arises from the anterior division of the thoracolumbar spinal nerves (T6-L1). Thus the TAP provides the space where local anaesthetic like bupivacaine can be given to block myocutaneous sensory nerves. As the vascularity of the TAP is poor, the anaesthetic drugs might remain in the space for prolong period, hence the action is supposed to be prolonged.

The effect of TAP block on multimodal postoperative pain management in lower abdominal surgeries like total abdominal hysterectomy has been reported by many authors.[7-9]

The ultrasound guided TAP block were also performed in different approaches such as lateral and posterior approach with different outcome.[10,11] In lateral approach, local anaesthetic agent is injected along mid axillary line midway between costal margin and iliac crest. In posterior approach local anaesthetic agent is injected along posterior axillary line in the triangle of Petit. Both the approaches have demonstrated different level of efficacy in the immediate postoperative period.[1] The difference in effectiveness of analgesia between the lateral TAP block and the posterior TAP block are still not clear in current literature.
After the total abdominal hysterectomy, a well-planned analgesia plan is needed to provide early mobilization, shorten post-anesthetic care unit, hospital stay, and to ensure adequate patient comfort. Considering the mentioned facts and figures, the present study is aimed to evaluate the post operative analgesia between lateral and posterior transversus abdominis plane block in total abdominal hysterectomy.

## Materials and Methods

This is a randomized clinical trial study was done in 90 patients who underwent elective total abdominal hysterectomy under subarachnoid block in BSMMU, Dhaka. The research protocol was approved by the Institutional Review Board, BSMMU. Inclusion criteria were patients scheduled for total abdominal hysterectomy by pfannensteil incision, with subarachnoid block, age: 30 - 50 years old and ASA physical status I and II.

Infection on the site of block, having psychological disorder, neuropathic pain or coagulopathy, requiring general anaesthesia, addiction to any substance, patient under treatment with anti-depressants and allergic to local anesthetic agent were excluded from the study. All findings were collected in a pre-designed data collection sheet.

**Study Procedure:**
Patients were randomly assigned into two equal groups (45 for each group) by randomly selecting their sealed opaque envelopes. Immediately after operation, the Group -A received ultrasound guided TAP in lateral approach. The Group- B in the same period received ultrasound guided TAP in posterior approach. In both the group, the patients were receiving 20ml of 0.25% plain bupivacaine in each side.

At the day of surgery, subarachnoid block was performed with 25G Quincke spinal needle using 0.5% bupivacaine heavy (0.3mg/kg) in both the groups (group-A and group-B). Immediately after completion of surgery, the target site was identified and disinfected with povidone iodine. Then with the guidance of Ultrasound with high frequency (6-8MHz) linear ultrasound probe, the three muscle layer of abdominal wall was identified and needle was introduced. After aspiration, TAP block was performed with the help of 21G 100mm needle using 20 ml of 0.25% plain bupivacaine solution bilaterally and the solution was injected with intermittent aspiration test to prevent intravascular injection (first 2ml to test easy flow and hypersensitivity). Thereafter, the needle was withdrawn and sterile dressing was placed. In group - A, block was performed in lateral approach where the patient was in supine position. Here ultrasound scanning was done along mid axillary line and needle was introduced in a point between costal margin and iliac spine in mid axillary line. In group B, block was performed in posterior approach, where the patient was turn to the semi-lateral position. A high frequency (6-8 MHz) linear probe was placed along the posterior axillary line and after finding the posterior part of TAP, 20ml of 0.25% bupivacaine was injected in the posterior junction of the transversus abdominis plane through triangle of petit on both side.

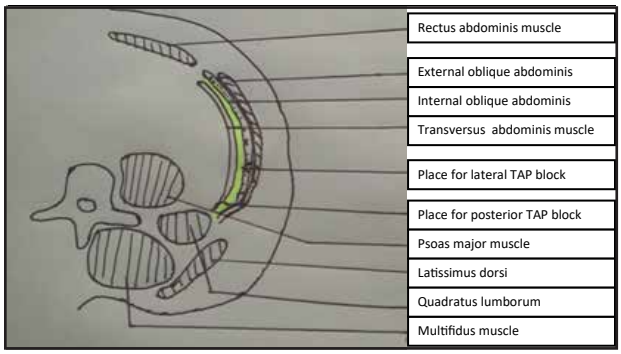



**Figure 1:** Cross section though the abdomen and site of injection for lateral and posterior TAP block

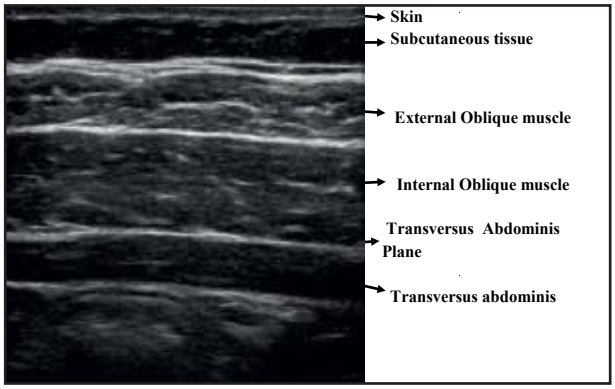



**Figure 2:** Sonological anatomy of TAP block

In the postoperative room, rescue analgesia may or may not be required. If required, it was maintained in both groups with intravenous Inj. morphine through PCA device. The PCA device was programmed in the following order-Initial loading dose infusion of (60 mcg/kg) and preset dose of 20 mcg/kg per demand with lockout interval of 10 minutes and 1 hour dose limit 4mg. All patients was taken into Post Anesthesia Care Unit (PACU) and observed after 1, 2, 4, 6, 12 and 24 postoperative hour. Pain intensity was measured by Visual Analog Score (VAS) at rest and during deep breath.

Patients was observed for the time of first rescue analgesic requirement (time from completion of injection of drug), when pain reported visual analogue scale (VAS) score more than 4. The study outcomes were recorded 1, 2, 4, 6, 12, 24 hours after TAP block.

**Figure 3**: Site of Lateral TAP block along mid axillary line

**Figure 4:** Site of posterior TAP block in triangle of petit


**Figure 5:** Visual Analogue Scale (VAS)

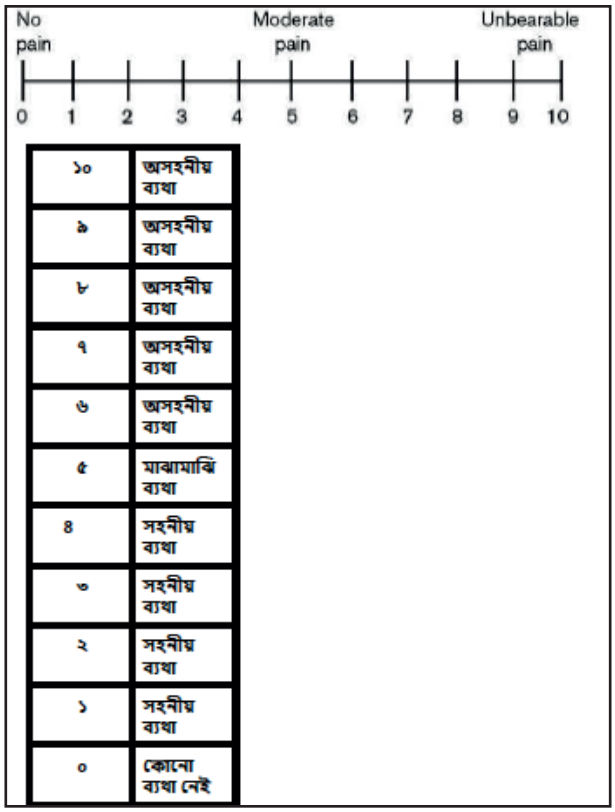



**Figure 6:** Visual Analog Scale in Bangla (Validated by Arifina4)

## Statistical analysis

A statistical analysis was carried out by using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Qualitative variables of this study were expressed as percentage. Quantitative variables were expressed as mean± standard deviation. Student t-test was used to compare continuous variables at different interval. The results were presented in tables, figures, and diagrams etc. A "p" value <0.05 was considered as significant

# Results

The mean age was found 45.58±3.09 years and 45.24±3.28 years in group A and group B respectively. The mean weight was 60.51±4.63 kg in group A and 59.49±5.57 kg in group B. The mean age and weight were not statistically significant (p>0.05) between two groups.

Table I shows patients from both groups had demographic parameters including age, weight but among them no significant difference.

**Table I:** Distribution of the study patients by demographic variable (n=90)

| Study group | Age (in years) | Weight ( Kg) |
|---|---|---|
| **Group A (n=45)** | 45.58±3.09 | 60.51±4.63 |
| **Group B (n=45)** | 45.24±3.28 | 59.49±5.57 |
| **p value** | 0.537$^{ns}$ | 0.374$^{ns}$ |

ns = not significant
Values are expressed as mean ±SD

Group A= TAP block in lateral approach
Group B= TAP block in posterior approach

Statistical analysis was done by student's t-test. P value ($p<0.05$) is statistically significant.

**Table II:** Distribution of the study patients by pain intensity (VAS ) at rest (cm) (n=90)

| Pain intensity (VAS ) at rest (cm) | Group-I (n=45) | Group-II (n=45) | P value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| 1 Hours after TAP | 0.71±0.72 | 0.73±0.65 | 0.890$^{ns}$ |
| Range (Min-max) | 0-3 | 0-2 | |
| 2 Hours after TAP | 1.74±0.66 | 1.16±0.8 | 0.001$^{s}$ |
| Range (Min-max) | 0-3 | 0-2.2 | |
| 4 Hours after TAP | 3.48±0.27 | 3.08±0.44 | 0.001$^{s}$ |
| Range (Min-max) | 2.8-3.9 | 1.9-3.9 | |
| 6 Hours after TAP | 4.22±0.34 | 3.8±0.17 | 0.001$^{s}$ |
| Range (Min-max) | 4-5 | 3.5-4 | |
| 12 Hours after TAP | 3.87±0.23 | 3.5±0.16 | 0.001$^{s}$ |
| Range (Min-max) | 3-4.1 | 3-3.9 | |
| 24 Hours after TAP | 3.61±0.21 | 2.56±0.41 | 0.001$^{s}$ |
| Range (Min-max) | 3-4 | 2-3 | |

s = significant
ns = not significant
p value reached from Unpaired t-test
P value ($p<0.05$) is considered as statistically significant

Table II shows distribution of study patient by pain intensity (VAS) at rest where after 4, 6, 12 and 24 hours VAS at rest were statistically significant ($p<0.05$) between two groups.

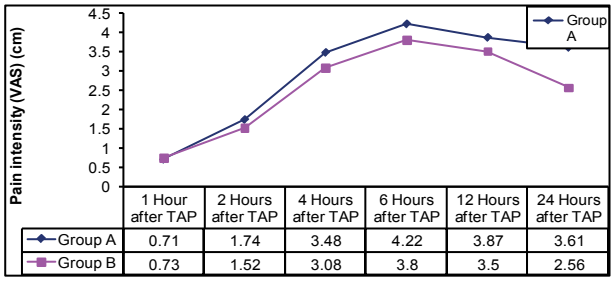
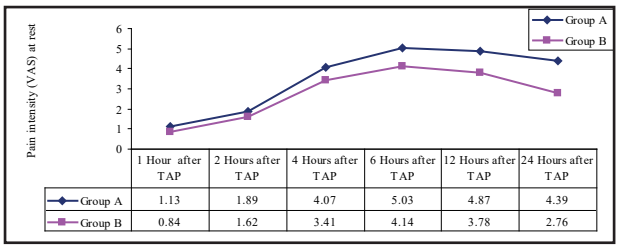



**Figure VII:** Line chart showing distribution of the study patients by pain intensity (VAS) at rest in different time interval between two groups.

| Pain intensity (VAS ) during deep breath (cm) | Group-I (n=45) | Group-II (n=45) | P value |
|---|---|---|---|
| | Mean ± SD | Mean ± SD | |
| 1 Hours after TAP | 1.13±0.66 | 0.84±0.74 | 0.052$^{ns}$ |
| Range (Min-max) | 0-2 | 0-2 | |
| 2 Hours after TAP | 1.89±0.75 | 1.59±0.81 | 0.071$^{ns}$ |
| Range (Min-max) | 0-3.5 | 0-3 | |
| 4 Hours after TAP | 4.07±0.29 | 3.41±0.35 | 0.001$^{s}$ |
| Range (Min-max) | 3.14.5 | 2.5-4 | |
| 6 Hours after TAP | 5.03±0.38 | 4.14±0.23 | 0.001$^{s}$ |
| Range (Min-max) | 4.5-6 | 3.8-4.5 | |
| 12 Hours after TAP | 4.87±0.25 | 3.78±0.17 | 0.001$^{s}$ |
| Range (Min-max) | 4.5-5.5 | 3.4-4 | |
| 24 Hours after TAP | 4.39±0.46 | 2.76±0.36 | 0.001$^{s}$ |
| Range (Min-max) | 4-5 | 2.1-3.2 | |

Range (Min-max) 4-5 2.1-3.2
s = significant, ns = not significant,
Statistical analysis was done by student's t-test
P value ($p<0.05$) is considered as statistically significant

Table III shows distribution of study patient by pain intensity (VAS) during deep breath ,where after 4, 6, 12 and 24 hours VAS during deep breath were statistically significant ($p<0.05$) between two groups.




| | 1 Hour after TAP | 2 Hours after TAP | 4 Hours after TAP | 6 Hours after TAP | 12 Hours after TAP | 24 Hours after TAP |
|---|---|---|---|---|---|---|
| Group A | 1.13 | 1.89 | 4.07 | 5.03 | 4.87 | 4.39 |
| Group B | 0.84 | 1.62 | 3.41 | 4.14 | 3.78 | 2.76 |

**Figure VIII:** Line chart showing distribution of the study patients by pain intensity (VAS) during deep breath in different time interval between two groups.

The mean duration of first analgesic demand was 5.04±0.54 hours in group A and 6.59±0.69 hours in group B. The mean duration of first analgesic demand difference were statistically significant (p<0.05) between two groups

Table IV shows distribution of the study patients by time for first analgesic demand

The difference was statistically significant (p<0.05) between two groups.

**Table IV:** Distribution of the study patients by time after first analgesic demand (n= 90)

| Study group | Time after first analgesic requirement ( in hours) | P-value |
|---|---|---|
| **Group A** | 5.04±0.54 | |
| **(n=45)** | | |
| **Group B** | | < 0.001 s |
| | 6.59±0.69 | |
| **(n=45)** | | |

Value expressed mean ± SD
s = significant
Statistical analysis was done by student's t-test
P value (p<0.05) is considered as statistically significant

## Discussion

Postoperative pain management is necessary to reduce postoperative morbidity and mortality. TAP block is very effective in the management of postoperative pain after total abdominal hysterectomy which is reported by many authors. The results of present study showed that ultrasound guided TAP block in posterior approach is better than lateral approach in management of postoperative pain. The demographic variables in this study have imparted no statistical significance (p value > 0.05) between the two approaches of TAP block patients.

In this study, the mean pain intensity (VAS) at rest in first few hours of TAP block is not statistical significant (p value > 0.05) between two groups. But after 4, 6, 12 and 24 hours of TAP VAS at rest was statistically significant (p<0.05) between posterior and lateral approach.

Total abdominal hysterectomy was done under subarachnoid block. The effect of subarachnoid block may persist 2-3 hours after operation.[12] So there was less or no pain in first few hours of TAP block. May be this is the cause why there was no statistical significant differences found in VAS at rest between two groups of TAP block. After 3-4 hours after subarachnoid block, generally there were no persisting effects of nerve block, but the TAP blocks already started to work, and effectiveness of TAP block was evident. VAS score at rest in patients having posterior TAP block was lesser than lateral TAP.

The result of current study was consistent with Faiz et al.[13] They compares analgesic effects of ultrasound-guided posterior and lateral TAP block in patients undergoing caesarean section under subarachnoid anesthesia and found Numerical Analog Scale (NAS) score at rest was significantly lower in the posterior block group after 6, 12 and 24 hours operation but the mean values of NAS during coughing was significant only 12 hours after block between groups.

In case of caesarean section, pregnant patients having high level of oestrogen and progesterone, which increases pain thresh hold level[14] so that patient could not feel minute pain. This may be the cause that before 6 hours postoperatively they could not found any significant differences between lateral and the posterior approach of TAP block. This may also the cause for not finding difference of NAS scores after 12 hours of postoperative period. Using TAP block for pain reduction after hysterectomy improved the recovery of these patients.[9,10] They emphasized that ultrasound-guided posterior TAP block compared with the lateral TAP block was more effective in pain control after abdominal surgery.

In a meta analysis study by Abdallah et al.[7] reveals, compared with the control, posterior TAP block technique reduces the rest pain VAS score by 17 mm at 12 h (P < 0.00001), by 13 mm at 24 h (P = 0.005), by18mm (p <0.00001) at 36 hour. When a TAP block was performed using the lateral technique, rest pain VAS scores were reduced by 5 mm at 12 h (P < 0.0001), but there is no differences in rest pain scores at 24 and 36 postoperatively between lateral and control groups. But they could not compare lateral and posterior of TAP blocks directly.

In the current study, the differences of mean pain intensity (VAS) during deep breath were not statistically significant (p > 0.05) in first few postoperative hours of TAP block between two groups. But after 4, 6, 12 and 24 hours, VAS during deep was significantly (p < 0.05) lower in posterior TAP than lateral TAP group of patients.

During deep breath when the diaphragm goes down there is increase in intra-abdominal pressure and stretching of abdominal wall. So patients who underwent total abdominal hysterectomy operation may felt increase in pain during deep breath. No study found comparing posterior and lateral TAP block regarding VAS score in deep breath. Abdallah et al.[7] found compared with control, the posterior TAP block technique reduced dynamic pain VAS scores by 16 mm at 12 h ( P< 0.00001), by 22 mm at 24 h ( P<0.0001), by 12 mm (P= 0.0006) at 36 h postoperatively . According to their study performing the lateral TAP block technique did not produce a difference in dynamic pain compared with control at 12, 24, 36, and 48 h postopera

tively. In this meta analysis, studies are done comparing with the control groups, so they showed theoretical differences between lateral and posterior approaches of TAP block, but they could not directly find any differences between two approaches.

In this study the mean time after first analgesic demand was lower inpatients having posterior TAP block than lateral and difference was statistically significant ($p<0.05$) between two groups. Result of current study was consistent with Faiz et al.[13] where they found, mean time for first analgesic demand was longer in posterior TAP (13.3 hours) than lateral TAP (6.73 hours) and the difference is statistically significant ($p <0.001$ ). The plane between transverses abdominis and external oblique muscle that is TAP is less vascular so when plain bupivacaine is injected here, it is accumulated here for long period. So there is so delay in absorption of bupivacaine occurs and it may cause delay in requirement in first rescue analgesics. In posterior TAP there is less branching of ventral rami of spinal nerves than that of lateral TAP area. So posterior TAP block may provides prolonged analgesia than lateral TAP block. This may cause more time requires for demand of first rescue analgesics.

## Conclusion

This study showed in first two hours of postoperative period, there was no significant difference in effectiveness of postoperative analgesia between ultrasound guided lateral and posterior approach of TAP block after total abdominal hysterectomy under subarachnoid anaesthesia. But after that, TAP block by posterior approach provided better postoperative analgesia than lateral approach.

## Acknowledgment

We are grateful to all the doctors, nurses and other medical stuffs of the Department of Gynecology and Obstetrics and the Department of Anaesthesia, Analgesia and Intensive care Medicine, BSMMU. We are also grateful to the patients and the authority of BSMMU.

## References

1. Angle PJ, Halpern SH, Leighton BL, Szalai JP, Gnanendran K, Kronberg JE. A randomized controlled trial examining the effect of naproxen on analgesia during the second day after Cesarean Delivery. Anesthesia & Analgesia. 2002;95(3):741–745.

2. Wiffen P. Shorten G, Carr D, harmon D, et al.. postoperative pain management: An evidence-based guide to practice. Philadelphia: Saunders, 2006. Evidence-Based Medicine. 2007;12(2):60

3. Findlay JM, Ashraf SQ, Congahan P. Transversus abdominis plane (TAP) blocks-a review. The surgeon : journal of the Royal Colleges of Surgeons of Edinburgh and Ireland. 2012;10(6):361-367.

4. Arifina R.. Validation and Application of Selected Tools to Evaluate the Patients' Satisfaction in Emergency, Post-operative and Chronic pain. MD Thesis. BSMMU. 2017

5. Jankovic ZB, du Feu FM, McConnell P. An anatomical study of the transversus abdominis plane block: location of the lumbar triangle of Petit and adjacent nerves. Anesthesia and analgesia. 2009;109(3):981-985.

6. Patel SS. Transversus abdominis plane block for postoperative analgesia after cesarean delivery. Matern Fetal Neonatal Med 2012; 25: 2270–2273

7. Abdallah, F.W., Laffey, J.G., Halpern, S.H. and Brull, R., 2013. Duration of analgesic effectiveness after the posterior and lateral transversus abdominis plane block techniques for transverse lower abdominal incisions: a meta-analysis. British journal of anaesthesia, 111(5), 721-735

8. Atim A, Bilgin F, Kilickaya O, Purtuloglu T, Alanbay I, Orhan ME, et al. The efficacy of ultrasound-guided transversus abdominis plane block in patients undergoing hysterectomy. Anaesthesia and Intensive Care. 2011;39(4):630–634.

9. Kehlet H, Dahl JB. The value of "multimodal" or "balanced analgesia" in postoperative pain treatment. Anesthesia and Analgesia 1993; 77: 1048–1056.

10. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesth Analg 2008; 107: 2056–2060.

11. Hebbard P, Fujiwara Y, Shibata Y, Royse C. Ultrasound-guided transversus abdominis plane (TAP) block. Anaesthesia and intensive care. 2007; 35(4):616-617.

12. Morgan, GE, Mikhail, MS, Murray, MJ, Larson, CP, Local anaesthetics, In: Morgan GE, Mikhail MS and Murray MJ, Clinical Anaesthesiology, 5th ed, McGraw-Hill, United States of America, 2013; 263-276.

13. Faiz SHR, Alebouyeh MR, Derakhshan P, Imani F, Rahimzadeh P, Ashtiani MG 'Comparison of ultrasound-guided posterior transversus abdominis plane block and lateral transversus abdominis plane block for postoperative pain management in patientsundergoing cesarean section: a randomized double-blind clinical trial study' Journal of Pain Research 2018:11: 5-9

14. Vincent K, Stagg CJ, Warnaby CE, Moore J, Kennedy S, Tracey I. "luteal analgesia": Progesterone dissociates pain intensity and unpleasantness by influencing Emotion Regulation Networks. Frontiers in Endocrinology. 2018;9