https://doi.org/10.29309/TPMJ/2024.31.05.8022

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 05

ORIGINAL ARTICLE

Comparison of intraperitoneal instillation of Bupivacaine vs Normal Saline for postoperative pain relief after laparoscopic cholecystectomy.

Hafiz Ahmad Jalal[1], Mudassar Murtaza[2], Noor Fatima[3], Ayesha Khalid[4]

Article Citation: Jalal HA, Murtaza M, Fatima N, Khalid A. Comparison of intraperitoneal instillation of Bupivacaine vs Normal Saline for postoperative pain relief after laparoscopic cholecystectomy. Professional Med J 2024; 31(05):682-688. https://doi.org/10.29309/TPMJ/2024.31.05.8022

ABSTRACT… Objective: To evaluate whether local irrigation of Bupivacaine reduces post-operative pain after cholecystectomy. **Study Design:** Prospective, Randomized Controlled Trial. **Setting:** Department of Surgery, Government Teaching Hospital, Shahdara Lahore. **Period:** June 2020 to December 2022. **Methods:** For this study, 86 participants were divided into two groups, each containing 43 participants (Bupivacaine vs. no Bupivacaine). The control group (Group A) received an infiltration of 15 ml of 0.5% bupivacaine in the sub-diaphragmatic region on the right side and at port sites, while normal saline was administered to Group B. The Visual Analogue Pain Score Scale was employed to assess pain levels at 0-3, 3-5, 5-7, and above 7-10 hours post-surgery (VAS). **Results:** In this study, the total number of included individuals was 86. Moreover, the overall mean and median ages in months for both groups were 47.7 ± 8.97 and 47 (18-60) respectively, with the majority of patients being male (59 individuals, 68.6%). Furthermore, there was a statistically significant mean difference in pain scores on the visual analogue scale at 0–3 hours, 3–5 hours, 5–7 hours, and 7–10 hours (p-value < 0.05). Similarly, there was a statistically significant mean difference in pain scores on the visual analogue scale after more than three to five hours, more than seven hours, and more than ten hours (p-value < 0.05). **Conclusion:** Consequently, we inferred that intraperitoneal and local infiltration of Bupivacaine following laparoscopic cholecystectomy significantly reduced the level of postoperative discomfort and the requirement for analgesics.

Key words: Bupivacaine, Intraperitoneal, Laparoscopic Cholecystectomy, Non-steroidal Anti-Inflammatory Drugs (NSAIDs).

INTRODUCTION

Cholelithiasis has been detected in a large number of people. It is asymptomatic and leads to different interconnected health complications and morbidity.[1] For benign gallbladder disease, laparoscopic cholecystectomy is regarded as the gold standard of care. A brief hospital stay and an early return to normal activity are its defining characteristics.[2] Laparoscopic approaches to treating the various intraabdominal surgical diseases offer a major advantage over the traditional method.[3] When compared to open cholecystectomy, laparoscopic cholecystectomy had a better surgical outcome in terms of less pain and convalescence.[4] However, the discomfort following surgery is severe. Multiple analgesics and opioid have been used to manage pain, with varying degrees of efficacy.[5] Parietal discomfort is experienced during a traditional cholecystectomy. In the course of a laparoscopic cholecystectomy, pain might result from somatic (incision pain), visceral (deep intraabdominal pain), and visceral (shoulder pain caused by stimulation of the phrenic nerve) sources.[6] In 17% to 41% of the patients, pain is the main cause of prolong hospital stay in case of day care surgery and the primary reason for patients have a longer convalescence.[7] There is considerable pain even after laparoscopic surgeries that's why, specialists suggest an effective analgesic treatment which should be a multimodal support for the patients.[8] This kind of assistance involves building rapport with patients, giving them a sense of security, and describing the process and any potential

1. MBBS, PGR Surgery, Govt Teaching Hospital Shahdra, Lahore.
2. FCPS, Associate Professor Surgery, Central Park Medical College, Lahore.
3. MBBS, MS, PGR Gynae, Sir Ganga Ram Hospital, Lahore.
4. MBBS, Medical Officer Gynae, Lady Wellington Hospital, Lahore.

Correspondence Address:
Dr. Mudassar Murtaza
Department of Surgery
Central Park Medical College, Lahore.
drmudassirmurtaza@gmail.com

Article received on: 29/12/2023
Accepted for publication: 04/03/2024

difficulties.

Giving the patient drinks and electrolytes, giving them a non-steroidal anti-inflammatory analgesic one hour prior surgery, and blocking the sensitive aferences by irrigating a local anesthetic into the peritoneal cavity minimizing discomfort in laparoscopic cholecystectomy patients after surgery.[9] In our study, beside use of bupivacaine for pain management, dicloran given as standard analgesia and nalbuphine as a rescuer analgesia for severe pain if patient feels postoperatively.[10]

Our objective was to assess the efficacy of bupivacaine irrigation for the treatment of postoperative pain in patients undergoing laparoscopic cholecystectomy patients.

Secondly we are trying to assess whether this analgesia treatment significantly reduce the postoperative use of NSAID's or not.

METHODS

Null hypothesis was made that after laparoscopic cholecystectomy, there is no difference in post-operative pain scores between those who received Bupivacaine and those who received normal saline.

There is a significant difference in post-operative pain score with bupivacaine versus normal saline in patients after Laparoscopic Cholecystectomy. This Prospective, Randomized Controlled Trial was conducted from June 2020 to December 2022 at Department of Surgery, Government Teaching Hospital, Shahdara Lahore. This study was approved from institutional ethical committee (14.Synopsis-Surgery-MS/FJ/ERC) (6-4-21). This study had 86 participants, who were split into 2 groups, 43 in each group (bupivacaine vs no bupivacaine). The sample size was calculated through the formula (for comparing the means of two normally distributed samples of equal Size using a two-sided test with significance level and power).

$$n = (\sigma^2_1 + \sigma^2_2) * (Z_{1-\alpha/2} + Z_{1-\beta}) / \Delta^2$$

Therefore, to detect a significant difference between two means; considering 15% dropout rate, 95% power, and 95% confidence interval and mean pain score in both groups postoperatively after 8 hours. In bupivacaine and paracetamol, mean and standard deviation pain score was reported 2.63 ± 0.71 and 2.13 ± 0.43 respectively.[9] Simple Random Sampling included; 1: 18-60 years of age of patients 2: Grade I and II(ASA) 3: Chronic cholelithiasis 4: Both Gender. whereas patients with renal failure,Cardiac patients, Acute cholecystitis, ASA Grade 3,4 and Cancer patients were excluded. This study used a sample size of 86 participants, 43 in each of the two groups (bupivacaine vs. no bupivacaine). The random allocation sequence was generated. The allocated treatment was concealed using opaque sequentially numbered sealed envelopes. CONSORT 2010 flowchart for randomized control trial was used. Participants in this study were divided randomly into two groups according to the type of intervention they would receive. After randomization of the patients in two groups (Group A (bupivacaine) and Group B (normal saline), they were shifted to OT and all basic parameters were recorded including pulse rate, blood pressure, SPO2, and RR after general anesthesia. All the patients received similar premedication.

In our study irrigation of bupivacaine at the sub diaphragmatic space, gall bladder fossa and laparoscopic port sites at the end of procedure was done. Two ampoules of 0.5 % bupivacaine can safely be given to the patient with dilution of 20ml n/for Group. In a patient in the Trendelenburg position, 15 ml of 0.5% bupivacaine was injected into the right side sub-diaphragmatic region, and 20 ml more into the port sites at the conclusion of the surgery. 4 ml at the lateral port sites and 6 ml surrounding the midline port sites was injected through the abdominal wall. Normal saline was administered to participants in Group B. The time of arrival in the postoperative unit is defined as 0 h postoperatively. The patient was assessed for postoperative pain by the utilization of VAS. The above parameters were assessed at 10-3, 3-5, 5-7 and 7-10 hours by the duty doctor. VAS score was recorded based on the visual analogue scale. No pain was categorized 0,

mild pain was categorized between 1-3 score, moderate pain between 4- 6, and pain score >7 was categorized as severe. Rescue analgesia nalbuphine, I.V. tramadol 50 mg in 100 ml normal saline and diclofenac sodium as standard, was administered for VAS score ≥7 or in patients complaining of severe pain was recorded. Both groups kept track of any issues such nausea, vomiting, etc. At the times noted above, the heart rate, respiration rate, and blood pressure were also measured. The SPSS version 24 was used for statistical analysis. For normally distributed data, independent t-test was employed, whereas non-normally distributed variables was analysed using Wilcoxon & Mann Whitney U tests. Where applicable, nominal data was evaluated and compared using the Chi-square test or the Fisher exact test. A statistically significant P-value of less than 0.05 was regarded significant. Postoperative pain was assessed at 0-3, 3-5, 5-7, 7-10 hours post-operatively by using the Visual Analogue Pain Score Scale. Instillation of Bupivacaine Versus No Bupivacaine for Postoperative Pain Relief after Laparoscopic Cholecystectomy was considered as effective treatment if he pain score remain ≤ 3 post-operative.

RESULTS

In this study, a total number of individuals included was 86. Additionally, overall mean and median age in months of both groups were 47.7 ± 8.97 and 47 (18-60), respectively. All the patients were divided into two groups; Group-A (Bupivacaine group) 43 (50.0%) and Group B (normal saline group) 43 (50.0%). majority of the patients were male 59 (68.6%). mean weight of the patients were 71.8 ± 12.4. In addition, the mean body mass index (BMI) was 27.6 ± 9.2. there were no statistical significant difference of demographics factors like; age, sex, weight (kg) and body mass index (kg/m2) with respect to group-A (Bupivacaine group) versus group-B (normal saline group).

In addition, Table-I reported the bifurcation of visual analogue scale pain score with respect to group-A versus group-B in regards to difference time intervals 0-3 hours, above 3 to 5 hours, above 5 to 7 hours and above 7 to 10 hours, respectively. There was statistically significant (p-value ≤.0.05) mean difference of visual analogue scale pain score after 0-3 hours, above 3 to 5 hours, above 5 to 7 hours and above 7 to 10 hours.

In addition, Table-II reported the bifurcation of use of NSAID with respect to group-A versus group-B in regards to difference time intervals 0-3 hours, above 3 to 5 hours, above 5 to 7 hours and above 7 to 10 hours, respectively. There was statistically significant (p-value ≤.0.05) mean difference of visual analogue scale pain score after above 3 to 5 hours, above 5 to 7 hours and above 7 to 10 hours. Therefore, the requirements of NSAID needed is also lesser in group-A as compared to group-B.

At last, mean difference of visual analogue scale pain score with respect to group-A versus group-B after Above 7 to 10 hours were showed in Figure-1.

Variable Categories	Group-A (Bupivacaine) 43 (50.0%)	Group-B (Normal Saline) 43 (50.0%)	P-Value
VAS* pain score (0-3 hours)	0.03		
mean ± SD**	8.13 ± 1.08	8.98 ± 1.17	
VAS* pain score (Above 3 to 5 hours)	0.02		
mean ± SD**	6.40 ± 1.01	7.01 ± 1.11	
VAS* pain score (Above 5 to 7 hours)	0.001		
mean ± SD**	4.75 ± 0.97	6.01 ± 0.91	
VAS* pain score (Above 7 to 10 hours)	0.03		
mean ± SD**	3.64 ± 0.57	4.61 ± 0.99	

Table-I. Bifurcation of visual analogue scale pain score with respect to group-A versus group-B after 0-3 hours, 3-5 hours, 5-7 hours and 7 to 10 hours.

Variable Categories	Group-A (Bupivacaine) 43 (50.0%)	Group-B (Normal saline) 43 (50.0%)	P-Value
Use of Nsaid (0-3 hours)		0.09	
Not needed	39 (51.3)	37 (48.7)	
Needed	4 (40.0)	6 (60.0)	
Use of Nsaid (Above 3 to 5 hours)		0.04	
Not needed	41 (51.2)	39 (48.8)	
Needed	2 (33.3)	4 (66.7)	
Use of Nsaid (Above 5 to 7 hours)		0.01	
Not needed	42 (48.7)	40 (51.3)	
Needed	1 (25.0)	3 (75.0)	
Use of Nsaid (Above 7 to 10 hours)		0.06	
Not needed	43 (51.2)	41 (48.8)	
Needed	-	2 (100.0)	

Table-II. Bifurcation of use of NSAID with respect to group-A versus group-B after above 0-3 hours, above 3-5 hours, above 5-7 hours and above 7 to 10 hours.

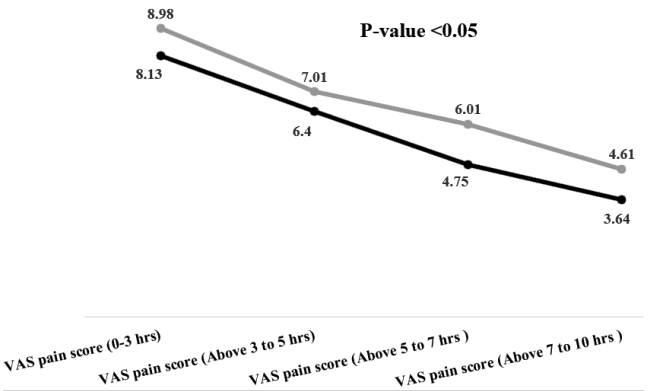

Figure-1

DISCUSSION

In the late 1980s, laparoscopic cholecystectomy surgery was initially performed. According to multiple studies, a 20% rise in cholecystectomy rates was observed after the development of this novel procedure. As a result, even minor modifications to the cholecystectomy criteria might have a significant influence on health care expenses. Since the introduction of laparoscopic cholecystectomy, numerous studies have studied and emphasized the significance of using the right surgical technique to improve the outcomes and timeliness of operation. There have also been comparisons made to open cholecystectomy, with or without a small incision.[11]

Laparoscopic cholecystectomy, the gold standard treatment for gall stones and the most frequently done laparoscopic procedure worldwide, has virtually supplanted open cholecystectomy in the treatment of gall bladder disease. The majority of patients are released the day of their day surgery or on their first postoperative day.[12] However, pain is the primary factor in 17% to 41% of patients' overnight hospital stays on the day of surgery.[3] In 58–70% of patients, injectable analgesics may be needed for postoperative pain.[13] Pain following surgery may be brief or may linger for up to three days.

The origin of pain after LC is multifactorial: 1) Somatic pain that results from incision locations, Mainly abdominal pain emanating from the gallbladder bed. The primary cause of shoulder pain is the diaphragm being irritated by the leftover CO2.[14] According to several research, a significant portion of early postoperative discomfort is visceral pain. Others contend that the abdominal pain experienced during cholecystectomy and pneumoperitoneum is mostly caused by the incisional sites. The etiology of pain after LC is complex. Somatic discomfort develops at the locations of incision. The presence of mostly visceral pain in the gallbladder bed Remaining CO2 irritates the diaphragm, which is the main cause of shoulder pain. According to several research, early postoperative pain is mostly visceral in nature. Others contend that incisional sites, following pneumoperitoneum and cholecystectomy, are the primary contributors to the significant component of overall abdominal pain. Studies showing

that local anaesthetic infiltration of trocar sites does not result in considerable local analgesia dispute this pain's component sequence. After laparoscopic surgeries, 35% to 63% of patients report shoulder pain, however the exact origin of this pain is still unknown. Some of the postulated mechanisms for partial injury to the phrenic nerve include neuropraxia, diaphragm irritation from pneumoperitoneum fibers stretching, and peritoneal damage from chemical, ischemic, or traumatic injury.[14]

After 0-10 hours, while most parietal and visceral pain has subsided, shoulder pain may still be an issue. In this study, we aimed to assess the effectiveness of the patient's total pain management at several time points, but not the different types and intensities of pain. Numerous techniques, including as local anaesthetic infiltration, gasless method, low pressure pneumoperitoneum, saline washout, and the injection of a local anaesthetic agent in the sub diaphragmatic area, have been utilised to reduce postoperative pain.[15] numerous studies have examined the effectiveness of injecting a local anaesthetic at the trocar sites and in the subdiaphragmatic region as a strategy for pain management. In seven out of nine trials, intraperitoneal local anaesthesia was advantageous, according to Yari Ahn et al's comprehensive analysis of the use of local anaesthesia in LC in thirteen trials.[16-19]

Gurusamy et al[16], however, included 12 randomised in their Cochrane database evaluation, they included controlled studies on the use of intraperitoneal local anesthetics in patients having elective laparoscopic cholecystectomy. No trial reported a high quality of life, an early return to regular activity, or an early return to employment, they discovered. All comparison trials revealed imprecise differences in the percentage of patients who were discharged the same day as surgery and the length of hospital stay. On the visual analogue scale (1 to 10 cm), there were only minor differences in the pain scores, but they were neither reliable nor resistant to sensitivity analysis or meta-analysis comparing fixed effects to random effects. There is disagreement over the local anaesthetic that ought to be injected locally into the peritoneum. Ropivacaine nebulization before or after surgery reduced postoperative pain and decreased the need for morphine, according to Ingelmo et al.[20] According to Khan el al[21], lignocaine and bupivacaine are both secure and similarly efficient at reducing postoperative pain following LC.

Jabbar, Abdul, et al[22] indicated that intraperitoneal local anesthetics administered earlier than those administered at the conclusion of surgery had a higher ability to reduce postoperative discomfort. The reasons for the variations in observations are due to the timing, dosage, and delivery methods of the medicine. According to other publications, the majority of patients were unable to get adequate pain relief since intraperitoneal inflow limited the drug's contact time.

One of the main goals of intraperitoneal bupivacaine injection is to increase the drug's plasma concentration because of the peritoneum's better ability for systemic absorption. Vijayaraghavalu S. et al.[23] reported an increase in plasma concentration of bupivacaine beyond the threshold value of 2mg/L following intraperitoneal administration of 50ml of 0.25% bupivacaine during laparoscopic cholecystectomy. Although substantial respiratory function decline and recurrent hypoxemia episodes (SpO92%) were found in these patients during the postoperative period, this was not the main issue. No patient in our trial reported experiencing any postoperative respiratory, neurogenic, or cardiac issues. This may be because the safest intraperitoneal bupivacaine dose was used. However, we did not determine the precise level of bupivacaine in plasma during our study.

The effects of various medications added to an intra-peritoneal bupivacaine regimen on pain management have been investigated by certain writers. According to Shaker et al, intraperitoneal administration of bupivacaine or tramadol, or a combination of the two, is an effective method for managing pain following laparoscopic cholecystectomy. They also found that this method significantly reduced the need for postoperative analgesic and antiemetic medications.[24]

CONCLUSION

We concluded that after laparoscopic cholecystectomy, severity of postoperative discomfort and the requirement for analgesics are significantly reduced by intraperitoneal and local infiltration of bupivacaine. Additionally, there is a decrease in the NSAID need.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Tehniyat W, Fahim M, Khatoon A, Khan JS, Khan MM, Hasan H. **Effect of injection bupivacaine instillation in gall bladder fossa on post-op pain relief after laparoscopic cholecystectomy.** J Rawal Med Coll. 2014; 18(1):230-3.

2. Wills V.L and Hunt D.R, Bri Jo Surg, **Pain after laproscopic cholecystectomy.** 2006; 87: 273-84.

3. Souto MM, Radaelli E, Giordani AE, Savaris A, BassolsGF. **Effectiveness of local anesthetics in laparoscopic cholecystectomy: A randomized clinical trial.** Surg Laparosc endosc percutan Tech. 2015; 25(4):317-20.

4. Choi GJ, Kang H, Baek CW, Jung YH, Kim DR. **Effect of intraperitoneal local anesthetic on pain characteristics after laparoscopic cholecystectomy.** World J Gastroenterol. 2015; 21(47):13386-95.

5. Shehbaz L, Ahmed B, Kamlaish, Basar S, Ali A. **Role and Effectiveness of Intraperitoneal bupivacaine in post-operative pain management after laparoscopic cholecystectomy.** 2015; 9(4):180-3.

6. Protic, M., Veljkovic, R., Bilchik, A.J., Popovic, A., Kresoja, M., Nissan, A., et al. **Prospective randomized controlled trial comparing standard analgesia with a combined intraoperative cystic plate and port-site local anesthesia for postoperative pain management in elective laparoscopic cholecystectomy.** Surg Endosc. 2017; 31:704-13.

7. Mushtaq M, Kema AR, Khanday SA, Bache UQ, **Difficult laparoscopic Cholecystectomy and postoperative requirement of analgesics: An observational study.** Saudi J Laprosc [Serial online] 2019 [cited 2021 Apr 2]; 4:24-B 92.

8. Gul A, Khan I, Faraz A, Ali IS, et al. **Laparoscopic cholecystectomy: The effect of intraperitoneal installation of bupivacaine on the mean post-operative pain scores.** Professional Med J. 2014; 21(4):593-600. DOI: https://doi.org/10.29309/TPMJ/2014.21.04.2414

9. A, Qadir I, Rahim K, et al. **Local infiltration of bupivacaine for pain relief after laparoscopic cholecystectomy.** PAK Armed Forces Med J. 2018; 68(3):510-14.

10. Cohen M, Quintner J, van Rysewyk S. **Reconsidering the IASP definition of pain.** PAIN Reports. 2018.

11. Ryan JM, O'Connell E, Rogers AC, Sorensen J, McNamara DA. **Systematic review and meta-analysis of factors which reduce the length of stay associated with elective laparoscopic cholecystectomy.** HPB. 2021 Feb 1; 23(2):161-72.

12. Dhaker NK, Bunkar SK, Sharma DK, Om H. **Pre and post incisional local infiltration of the levobupivacaine in conventional laparoscopic cholecystectomy.** EJMCM. 2022 Apr 19; 9(3):2285-93.

13. Ahmad A, Faridi S, Siddiqui F, Edhi MM, Khan M. **Effect of bupivacaine soaked gauze in postoperative pain relief in laparoscopic cholecystectomy: A prospective observational controlled trial in 120 patients.** Patient Safety in Surgery. 2015 Dec; 9(1):1-5.

14. Jain S, Nazir N, Singh S, Sharma S. **A prospective randomised controlled study for evaluation of high-volume low-concentration intraperitoneal bupivacaine for post laparoscopic cholecystectomy analgesia.** Indian J. Anaesth. 2018 Feb 1; 62(2):109-14.

15. Yari M, Rooshani B, Golfam P, Nazari N. **Intraperitoneal bupivacaine effect on postoperative nausea and vomiting following laparoscopic cholecystectomy.** Reg Anesth Pain Med. 2014 Aug; 4(3).

16. Suragul, Wikran, et al. **Effect of local anaesthetic infiltration on postoperative pain after laparoscopic cholecystectomy: Randomized clinical trial.** BJS Open. 2022 Jun; 6(3):zrac066.

17. Thapa AS, Yadav RK. **Efficacy of Pregabalin as preemptive analgesic in laparoscopic cholecystectomy.** BJHS. 2020 Dec 30; 5(3):1166-70.

18. Putta PG, Pasupuleti H, Samantaray A, Natham H, Rao MH. **A comparative evaluation of pre-emptive versus post-surgery intraperitoneal local anaesthetic instillation for postoperative pain relief after laparoscopic cholecystectomy: A prospective, randomised, double blind and placebo controlled study.** Indian J. Anaesth. 2019 Mar; 63(3):205.

19. Gurusamy KS, Nagendran M, Toon CD, Guerrini GP, Zinnuroglu M, Davidson BR. **Methods of intraperitoneal local anaesthetic instillation for laparoscopic cholecystectomy.** Cochrane Database of Systematic Reviews. 2014(3):107.

20. Ingelmo, P. M., et al. **Intraperitoneal nebulization of ropivacaine for pain control after laparoscopic cholecystectomy: A double-blind, randomized, placebo-controlled trial.** BJA. 2013 May 1; 110(5):800-6.

21. Khan, Muhammad Rizwan, et al. **Intraperitoneal lignocaine (lidocaine) versus bupivacaine after laparoscopic cholecystectomy: Results of a randomized controlled trial.** J. Surg. Res. 2012 Dec 1; 178(2):662-9.

22. Jabbar A, Butt MQ, Qadir I, Rahim K, Sheen SN. **Intraperitoneal and local infiltration of bupivacaine for pain relief after laparoscopic cholecystectomy.** PAFMJ. 2018 Jun; 1(3):510-4.

23. Vijayaraghavalu S, Sekar EB. **A comparative study on the postoperative analgesic effects of the intraperitoneal instillation of bupivacaine versus normal saline following laparoscopic cholecystectomy.** Cureus. 2021 Mar 27; 13(3).

24. Shaker EH, Soliman MS, Hanafy A, Elsabeeny WY. **Comparative study between early versus late intraperitoneal administration of either bupivacaine/ tramadol or bupivacaine/dexmedetomidine for perioperative analgesia in abdominal laparoscopic cancer surgeries: A prospective randomized study.** J. Pain Res. 2022 Jan 1:3233-43.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Hafiz Ahmad Jalal	Drafting manuscript and data collection.	
2	Mudassar Murtaza	Supervising all research, Critical approval and article writing, Discussion.	
3	Noor Fatima	Data analysis.	
4	Ayesha Khalid	Statistics.	