Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i4.5528

STUDY OF EFFICACY OF DEXAMETHASONE AS PREEMPTIVE ANALGESIC IN PATIENTS UNDERGOING TOTAL ABDOMINAL HYSTERECTOMY UNDER SPINAL ANAESTHESIA: PROSPECTIVE OBSERVATIONAL STUDY

Dr. Preeti Jamwal[1*], Dr. Shivani Sharma[2], Dr. Deepika Jamwal[3]

[1*]Senior Resident, Department of Anaesthesia Government Medical College Kathua, India.
[2]Senior Resident, Department of Anaesthesia Government Medical College Jammu, India.
[3]Consultant, Department of gynaecology and obstetrics, Government Medical College Kathua, India.

***Corresponding Author: ***Dr. Preeti Jamwal
*****Senior Resident, Department of Anesthesia Government Medical College Kathua, India.
Email Id: Preetijamwal2712@gmail.Com

Abstract

Background: Spinal anesthesia is widely used in lower abdominal surgeries, as it plays a crucial role in relieving postoperative pain and enabling ambulatory anesthesia. However, the effect of the block tends to be relatively short, prompting the use of various adjuvants to prolong the duration of the sensory block. Aim: To assess the effect of preemptive Dexamethasone on postoperative analgesia in patients undergoing total abdominal hysterectomy under subarachnoid block.

Methods: A profile of eighty patients between the ages of 18 and 60 with ASA I- II classification scheduled for total abdominal hysterectomy surgery under spinal anesthesia using hyperbaric bupivacaine 0.5% were randomly divided into two groups: the dexamethasone group (Group D) and the control Group (Group C), with 40 patients in each group. Before the administration of spinal anesthesia, the Group D received an intravenous infusion of 8 mg dexamethasone in 100 mL normal saline, while the Group C received 100 mL normal saline only. Outcome measures included the total duration of sensory and motor blocks, VAS score, time of first analgesic request, total analgesic consumption within the first 24 h, and the occurrence of any side effects.

Results: The Group D had significantly delayed onset of 2 dermatomes regression ($P < 0.001$) compared to the control group (Group C). Additionally, the Group D had significantly longer duration of both sensory block and motor block ($P < 0.001$). VAS scores at rest and movement, total analgesic dose required were higher in Groups C as compared to group D. Total analgesic dose required were significantly greater in Group C as compared to group D. PONV scores were lower in group D significantly than control Group (C). No any immediate side effects observed among the study population.

Conclusion: Intravenous administration of dexamethasone improved postoperative VAS scores compared to the control group and decreased overall postoperative analgesic consumption. Therefore, it can be considered a valuable addition to postoperative multimodal analgesia strategies, aiming to minimize total analgesic consumption in patients undergoing abdominal hysterectomy to produces better postoperative analgesia with added antiemetic benefit.

Keywords: Postoperative pain, Visual analogue score, PONV, Intravenous, dexamethasone, Spinal anesthesia.

Introduction:

The relief of postoperative pain in surgery represents one of the clinical areas in which precise standardization does not exist despite the enormous mass of data published in literature. Effective management of postoperative pain helps in early recovery, discharge and less postoperative complications [1,2]. The concept of pre-emptive analgesia is now widely accepted. It helps in reducing the need of analgesic requirement in postoperative period, helps in avoidance of potentially deleterious side-effects that may occur with parenteral administration of narcotics. The term pre-emptive analgesia is defined as analgesia given before a painful stimulus is initiated. Pre-emptive analgesia has its origins in the idea that the painful stimuli, if not prevented by administration of preoperative analgesic drugs, could lead to spinal sensitization and neuro plasticity processes, resulting in increased pain intensity and duration after surgery [3-5].

Thus, providing adequate post-operative pain relief is considerably important, as patients need to be discharged on the same day or another day. The main purpose of perioperative pain control in any surgery is to provide an adequate comfort level and acceptable side effects for patients. Effective postoperative analgesia improves patients' outcome as observed by early ambulation, decrease in side effects, and reduce the incidence of postoperative chronic pain.[6-8]

Opioids have been traditionally used for both intra and postoperative analgesia but are associated with unwanted side-effects. These side effects can be reduced with a reduction in the amount of opioid drugs administered.[9]

A multi modal approach to the treatment of pain is now the current and preferred concept of acute and chronic pain management. By combining opioids with other non-opioid adjunct such as gabapentin, pregabalin, ketamine, clonidine, etc., health practitioners seek to reduce the opioid dose by utilizing the additive or synergistic effect of non-opioid substances.[10,11]

Steroids have already been used extensively in patient care for their anti inflammatory actions. They may be given topically, orally or parenterally (IV, SC, Intrabursally, Intraarticularly,Epidurally).

The efficacy of glucocorticoids for reducing pain and inflammation has also recently been explored, Early studies showed glucocorticoids reduced postoperative pain and edema.[12-14]

Dexamethasone is a synthetic glucocorticoid with minimal mineralocorticoid activity. It is a potent anti-inflammatory, with 25-50-fold the activity of hydrocortisone and up to 16-fold higher than prednisolone. It is best known as an intraoperative anti-inflammatory agent that reduces tissue edema due to surgical trauma, and as a proven antiemetic that is given to prevent post operative nausea and vomiting. The mechanism of action is probably due to reduction of circulating inflammatory mediators such as bradykinin, TNF, interleukins 1 and 6and prostaglandins. It is also believed to reduce impulse transmission in C type fibres.

Numerous studies have investigated the potential analgesic benefit of a single perioperative dose of dexamethasone but the results have so far been inconsistent.[15-21]

This study is being undertaken to evaluate the analgesic properties of dexamethasone as an adjuvant in patients scheduled for total abdominal hysterectomy surgery under spinal anesthesia.

Methods:

This prospective observational study was conducted in the department of anesthesiology Government medical college Kathua from April 2023 to March 2024 among eighty patients of (ASA) physical status of I-II , aged between 18 and 60 years, equally divided in to two groups, Group D (n=40), Group and group C (n=40), scheduled for total abdominal hysterectomy surgery under spinal anesthesia.

After getting approval from Institutional Ethical Committee, written informed consent was obtained from all the patients before surgery. Patients with any moderate to severe systemic disorders, patients unwilling to accept regional anesthesia, patients with any contraindication for spinal anesthesia or study drug were excluded from the study. Baseline measurements of systolic, diastolic and mean

arterial pressure, using a cuff on the right arm, and heart rate were recorded in the operating room. After preloading with 1000ml of ringer lactate solution patients were randomly assigned into two groups according to computer generated random numbers. Spinal anesthesia was administrated in the sitting position using midline approach.

The intravenous drug solutions for the study were prepared by an independent researcher and placed in coded envelopes according to the randomization order. The attending anesthesiologist then opened the envelopes just before the infusion began.

During the preoperative visit, we collected demographic data from all patients. Additionally, we provided training on how to evaluate their postoperative pain using the Visual Analogue Scale (VAS) score. The VAS involves using a ruler numbered from 0 to 10, where 0 represents no pain, 1–3 indicates mild pain, 4–6 represents moderate pain, and 7–10 indicates severe pain. [22]

In the operating room, the standard monitors were placed and an 18 gauge peripheral IV cannula was inserted. The Group D received an IV infusion of 8 mg dexamethasone in 100 mL normal saline, while the control group (Group C) received 100 mL normal saline only. After this, an aseptic technique was used to perform an intrathecal injection of 18 mg bupivacaine 0.5% by inserting a 27-G Quinckes spinal needle intrathecally at the L4-5 or L3-4 interspace, with the patient in a seated position. The correct intrathecal positioning was confirmed by observing the flow of cerebrospinal fluid through the needle. After completing the intrathecal injection, the patient was turned to a supine position. Then, the sensory level (determined by the absence of sensation to pinprick) and motor level (evaluated using the modified Bromage score) [23] were assessed every two minutes. The surgery began once a satisfactory spinal block level (T8) was achieved. Following the completion of the surgery, patients were transferred to the post-anesthesia care unit (PACU).

Visual Analogue Scale (VAS) score, time of the first analgesic request, total analgesic consumption within the first 24 h, and the occurrence of side effects such as hypotension, bradycardia, nausea, vomiting, and headache were noted and managed accordingly.

STATISTICAL ANALYSIS

The recorded data was compiled and entered in a spreadsheet (Microsoft Excel) and then exported to data editor of Statistical Package for the Social Sciences (SPSS) version 20.0 (SPSS Inc., Chicago, Illinois, USA). Statistical software SPSS (version 20.0) and Microsoft Excel were used to carry out the statistical analysis of data. Continuous variables were expressed as mean±SD and categorical variables were summarised as percentages. Analysis of Variance (ANOVA) was employed for inter group analysis of data and for multiple comparisons, Least Significant Difference (LSD) test was applied. Chi-square test or Fisher's-exact test, whichever appropriate, was used for comparison of categorical variables. A p-value <0.05 was considered statistically significant. All p-values were two tailed.

Results:

Both study groups were homogenous with reference to age, weight, height, Body Mass Index (BMI), duration of surgery. There was no statistically significant difference with respect to ASA grading and duration of surgery among the study groups (p-value >0.05) [Table 1].

Table 1: Demographic profile of the study population

Variables	Group D (Mean±SD)	Group C (Mean±SD)	P Value
Age (years)	52.2±6.76	51.5±5.86	0.251*
Weight (kg)	58.90±7.40	61.89±5.30	0.303*
Body mass index (kg/m^2)	25.07±2.89	24.31±3.21	0.675*
ASA I/II	24/16	22/18	0.813*

Duration of surgery (min)	119.8±26.78	116.6±28.87	0.257*

Both study groups did not show any significant differences as regard the onset of maximum sensory level (31.60 ± 2.89 vs. 31.70 ± 2.61 min; P > 0.5). However, the Group D demonstrated a significantly delayed onset of 2 dermatomes regression (92.55 ± 8.45 vs. 86.89 ± 6.91 min; P < 0.001) compared to the control group. Additionally, the Group D had a significantly longer duration of sensory block (132.46 ± 76.87 vs. 99.77 ± 14.34 min; P = 0.01) and motor block (231.88 ± 34.87 vs. 167.76 ± 34.43 min; P < 0.001) [Table 2].

Table 2: Block characteristics among the study groups

Variables	Group D (Mean±SD)	Group C (Mean±SD)	P Value
Onset to maximum sensory level (minute)	31.60 ± 2.89	31.70 ± 2.61	>0.05
Onset to regression of 2nd dermatome (minute)	92.55 ± 8.45	86.89 ± 6.91	<0.05
Duration of sensory block(minute)	132.46 ± 76.87	99.77 ± 14.34	<0.05
Duration of motor block (minute)	231.88 ± 34.87	167.76 ± 34.43	<0.05

The Group D demonstrated a significantly longer duration until the first postoperative analgesic request (4.85 ± 1.59 vs. 3.90 ± 1.55 h; P < 0.001) and lower total analgesic consumption in the first postoperative 24 h (46.30 ± 21.85 vs. 58.56 ± 19.80 mg; P < 0.001) compared to the control group [Table 3].

Table 3: Time to 1st analgesia and total dose among the study groups

Variables	Group D (Mean±SD)	Group C (Mean±SD)	P Value
Time to 1st analgesia (hour)	4.85 ± 1.59	3.90 ± 1.55	>0.05
Total analgesic in 1st 24 h (mg)	46.30 ± 21.85	58.56 ± 19.80	<0.05

Additionally, the Group D had significantly lower VAS at different time intervals postoperatively (P < 0.001) [Fig 1].

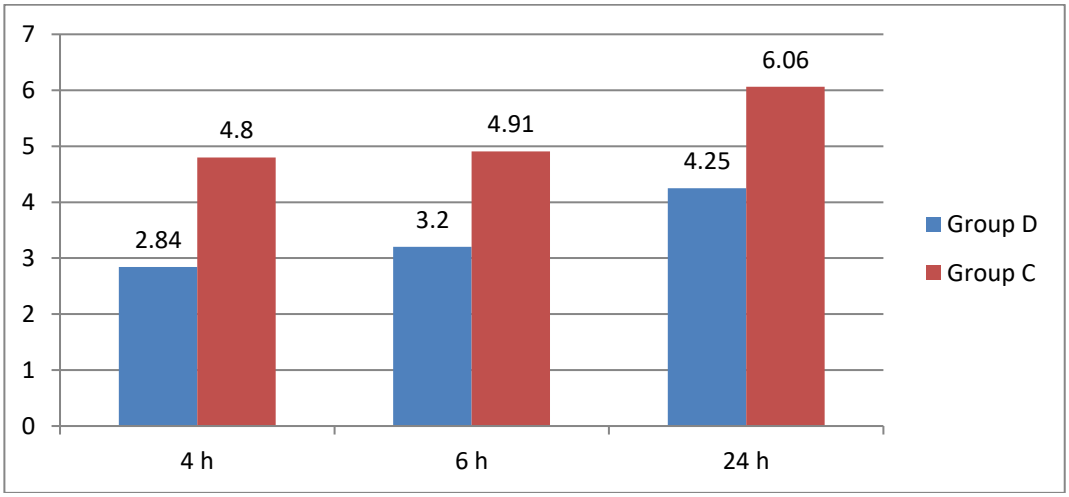

Fig 1. The control group reported a higher incidence of side effects compared to the Group D. The Group D had significantly lower rates of headache, nausea and vomiting (P < 0.001) compared to the control group [Fig2].

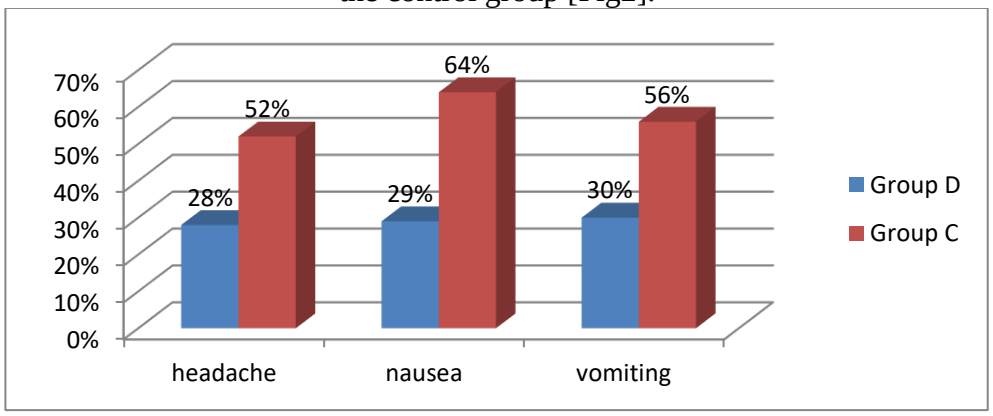

Fig 2.

Discussion:

Acute postoperative pain can delay functional recovery for patients undergoing surgical procedures. Pre-emptive analgesia has been used as an important strategy to mitigate postoperative pain.

The main finding of this study was that pre-emptive use of intravenous dexamethasone reduces acute early and late postoperative pain in Group D. A better pain relief was observed with pre-emptive use of intravenous dexamethasone 8mg, both in terms of VAS score and rescue analgesia consumption.

Systemic administration of dexamethasone has an analgesic action and is due to inhibition of production of inflammatory mediators. It acts by inhibiting cyclooxygenase enzyme activity and also inhibits the same chain reactions that degrade phospholipids released by surgically injured cell membranes, leading to the production of important pro-inflammatory mediators [24]. Dexamethasone reduces the levels of prostaglandin E2, and is effective in controlling inflammation and postoperative pain [25]. Pain and inflammation are consequences of the release of chemical mediators produced after tissue trauma, therefore it would be reasonable to conclude that pre-emptive medication contributes to lowering the concentration of these mediators in tissue, and the presence of the drug in the blood stream inhibits their initial production. As a result, the lower the tissue concentration of these mediators the lower will be inflammatory response [26,27]. This may explain the significantly less pain score (VAS score) in patients who had received intravenous dexamethasone as compared to control group.

There are studies by José at al,[28] Jun Koh et al, [29] where they evaluated the timing of first rescue analgesic and total analgesic requirement for longer duration postoperatively. Their results during first 24 hours match with our results. The meta-analysis by De Oliveria et al, [30] and N. Waldron et al,[31] also support our findings.

Mathisen et al,[32] studied the effect of preoperative administration of Pregabalin and Dexamethasone in combination with Paracetamol for postoperative pain control after abdominal hysterectomy on one hundred and sixteen patients randomly assigned to either group A (Paracetamol + placebo), group B (Paracetamol + Pregabalin + placebo) or group C (Paracetamol + Pregabalin + Dexamethasone). The 24-h Morphine consumption and pain score, both at rest and during mobilization, were not significantly different between treatment groups. These results are different from our results.

In a study by Kaur H et al., [33] it was found that the addition of intrathecal dexamethasone to hyper-baric bupivacaine resulted in a longer duration of sensory block (311.43 ± 13.59 min) compared to the use of intravenous dexamethasone in this study, intrathecal dexamethasone also provided a similar duration of postoperative analgesia (391 ± 25.51 min) as the IV dexamethasone. Some authors suggest that the analgesic effects of intrathecal corticosteroids are due to their systemic anti-inflammatory effects [34], while others believe that corticosteroids prolong the action of local

anesthetics by acting locally on nerve fibers [35]. Further studies are needed to directly compare the effects of IV and intrathecal dexamethasone on sensory duration and the time of first postoperative analgesic request after spinal anesthesia with hyperbaric bupivacaine in the same study.

Although the time to the first request for analgesics was not much prolonged in this study, the dexamethasone group exhibited lower VAS scores and consumed less analgesics compared to the control group. Results align with previous studies demonstrating that intravenous dexamethasone provides superior pain relief after surgery [36,37]. Furthermore, intravenous doses have shown to reduce the incidence of postoperative nausea and vomiting without increasing the occurrence of postoperative headache or dizziness [38]. The antiemetic effect of dexamethasone is stems from its central inhibition of prostaglandin synthesis, decreased 5-HT activity, or alternation of blood-brain barrier permeability [39]. Additionally, the anti-inflammatory effect of dexamethasone and its ability to enhance endorphin synthesis in the body may contribute to the prevention of postoperative nausea and vomiting [40]. Consistent with these findings IV dexamethasone in our study significantly reduced the occurrence of postoperative nausea and vomiting.

Conclusion:

Intravenous administration of dexamethasone improved postoperative VAS scores compared to the control group and decreased overall postoperative analgesic consumption. Therefore, it can be considered a valuable addition to postoperative multimodal analgesia strategies, aiming to minimize total analgesic consumption in patients undergoing abdominal hysterectomy to produces better postoperative analgesia with added antiemetic benefit.

Conflict of interest: Nil

Funding: Nil

References:

1. Sivrikaya GU. Multimodal Analgesia for postoperative pain management. In: Racz G, Neo C (ed.) Pain Management-Current Issues and Opinions. Croatia: Intech; 2012: 177-202.
2. Bujedo BM, Santos SG, Azpiazu AU, Noriega AR, Salazar DG, AnduezaMA.Multimodal analgesia for the management of postoperative pain. In: G. Racz(ed). Pain and Treatment. Croatia: Intech; 2015:132-72.
3. Wick EC, Grant MC, Wu CL. Postoperative multimodal analgesia pain management with non opioid analgesics and techniques: A review. JAMA Surgery. 2017;152(7):691-97.
4. Buvanendran A, Kroin JS. Multimodal analgesia for controlling acute postoperative pain. Current Opinions in Anaesthesiology. 2009;22(5):588-93.
5. Young A, Buvanendran A. Recent advances in multimodal Analgesia. Anaesthesiology Clinics. 2012;30(1):91-100.
6. Guignard B1, Bossard AE, Coste C, Sessler DI, Lebrault C, Alfonsi P, Fletcher D, Chauvin M. Acute opioid tolerance: intraoperative remifentanil increases postoperative pain and morphine requirement. Anesthesiology. 2000;93(2):409-17.
7. Gu X, Wu X, Liu Y, Cui S, Ma Z. Tyrosine phosphorylation of the N-Methyl-D-Aspartate receptor 2B subunit in spinal cord contributes to remifentanil-induced postoperative hyperalgesia: the preventive effect of ketamine. Molecular pain 2009;5:76.
8. Wewers M, Lowe N. A critical review of visual analogue scales in the measurement of clinical phenomena. Research in Nursing & Health. 1990; 13 (4): 227-236.PubMed PMID: 2197679.
9. Gousheh SM, Nesioonpour S, JavaherForoosh F, Akhondzadeh R, Sahafi SA, Alizadeh Z. Intravenous paracetamol for postoperative analgesia in laparoscopic cholecystectomy. Anesth Pain Med. 2013; 3(1):214–8.

10. Benitez-Rosario MA, Salinas-Martin A, Gonzalez-Guillermo T, Feria A strategy for conversion from subcutaneous to oral ketamine in cancer pain patients: effect of a 1:1 ratio. J Pain Symptom Manage. 2011; 41(6):1098–105.
11. Salerno A, Hermann R. Efficacy and safety of steroid use for postoperative pain relief. Update and review of the medical literature. J Bone Joint Surg Am 2006;88:1361-72.
12. Hench PS, Kendall EC, Slocumb CH, Polley HF. The effect of a hormone of the adrenal cortex and of pituitary adrenocorticotropic hormone on rheumatoid arthritis. Proc Staff Meet Mayo Clin. 1949;24:181–97.
13. Rhen T, Cidlowski JA. Antiinflammatory action of glucocorticoids – new mechanisms for old drugs. N Engl J Med. 2005;353:1711–23.
14. Bracken MB, Shepard MJ, Collins WF, et al. A randomized controlled trial of methylprednisolone or naloxone in the treatment of acute spinal-cord injury. N Engl J Med. 1990;20:1405–11.
15. Holte K, Kehlet H. Perioperative single-dose glucocorticoid administration: pathophysiologic effects and clinical implications. J Am CollSurg 2002; 195: 694-712.
16. Sam TS, Chan SW, Rudd JA, Yeung JH. Action of glucocorticoids to antagonise cisplatin-induced acute and delayed emesis in the ferret. Eur J Pharmacol 2001; 417: 231-37.
17. Suzuki T, Sugimoto M, Koyama H, Mashimo T, Uchida I. Inhibitory effect of glucocorticoids on human-cloned-hydroxytryptamine3A receptor expressed in Xenopus oocytes. Anesthesiology 2004;101:660-65.
18. Wang JJ et al. AnesthAnalg 91:136, 2000.
19. Feroci F, Rettori M, Borrelli A, Lenzi E, Ottaviano A, Scatizzi M. Dexamethasone prophylaxis before thyroidectomy to reduce postoperative nausea, pain, and vocal dysfunction: a randomized clinical controlled trial. Head Neck 2011; 33: 840–6.
20. Bianchin A, De Luca A, Caminiti A. Postoperative vomiting reduction after laparoscopic cholecystectomy with single dose of dexamethasone. Minerva Anestesiol 2007; 73: 343–6.
21. Fukami Y, Terasaki M, Okamoto Y, et al. Efficacy of preoperative dexamethasone in patients with laparoscopic cholecystectomy: aprospective randomized double-blindstudy.J Hepatobiliary PancreatSurg 2009;16:367–71.
22. Gao T, Zhang JJ, Xi FC, Shi JL, Lu Y, Tan SJ, Yu WK. Evaluation of Transversus Abdominis plane (TAP) block in hernia surgery: a Meta-analysis. Clin J Pain. 2017;33(4):369–75.
23. Bromage PR. A comparison of the hydrochloride and carbon dioxide salts of lidocaine and prilocaine in epidural analgesia. ActaAnaesthesiologicaScandinavicaSupplementum. 1965;16:55–69.
24. Hargreaves KM, Swift JQ, Roszkowski MT, Bowles W, Garry MG, Jackson DL. Pharmacology of peripheral neuropeptide and inflammatory mediator release. Oral Surg Oral Med Oral Pathol. 1994;78(4):503-10.
25. Antunes AA, Avelar RL, Martins Neto EC, Frota R, Dias E. Effect of two routes of administration of dexamethasone on pain, edema, and trismus in impacted lower third molar surgery. Oral Maxillofac Surg. 2011;15(4):217-23.
26. Joshi A, Parara E, Macfarlane TV. A double-blind randomized controlled clinical trial of the effect of preoperative ibuprofen, diclofenac, paracetamol with codeine and placebo tablets for relief of postoperative pain after removal of impacted third molars. Br J Oral Maxillofac Surg. 2004;42(4):299-306.
27. Grape S, Tramèr MR. Do we need preemptive analgesia for the treatment of postoperative pain? Best Pract Res ClinAnaesthesiol. 2007;21(1):51-63.
28. José Leonardo, Simone Waldyr, Antonio Jorge, Anna Carolina, RattoTempestiniHorliana. Comparative analysis of preemptive analgesic effect of Dexamethasone and Diclofenac following third molar surgery. Braz Oral Re 2013;27(3):266-277.

29. In Jun Koh MD, Chong Bum Chang MD, Jung Ha Lee MD, Young-Tae Jeon MD, Tae Kyun Kim MD. Preemptive Low-dose Dexamethasone Reduces Postoperative Emesis and Pain After TKA: A Randomized Controlled Study. ClinOrthopRelat Res 2013; 471:3010–3020.
30. Gilda` sio S, De Oliveira, Jr. Marcela D. Perioperative Single Dose Systemic Dexamethasone form Postoperative Pain A Meta-analysis of Randomized Controlled Trials. Anesthesiology 2011; 115:575–88.
31. N. H. Waldron, C. A. Jones, T. J. Gan, T. K. Allen and A. S. Habib. Impact of perioperative Dexamethasone on postoperative analgesia and side-effects: systematic review and meta-analysis. BJA feb 2013;110(2): 191-200.
32. O. Mathisen. Pregabalin and Dexamethasone in combination with paracetamol for postoperative pain control after abdominal hysterectomy. A randomized clinical trial. ActaAnaesthesiolScand 2009; 53: 227–235.
33. Kaur H, Misra R, Mittal S, Sidhu GAS. Prospective Randomized Control Trial comparing effect of Dexamethasone Versus Fentanyl as Adjuvants to Intrathecal Bupivacaine for Orthopedic surgery. Cureus. 2021;13(3):e13949.
34. Baxendale BR, Vater M, Lavery KM. Dexamethasone reduces pain and swelling following extraction of third molar teeth. Anaesthesia. 1993;48(11):961–4.
35. Kopacz DJ, Lacouture PG, Wu D, Nandy P, Swanton R, Landau C. The dose response and effects of dexamethasone on bupivacaine microcapsules for intercostal blockade (T9 to T11) in healthy volunteers. AnesthAnalg. 2003;96(2):576–82.
36. Shalu PS, Ghodki PS. To study the efficacy of Intravenous Dexamethasone in prolonging the duration of spinal anesthesia in Elective Cesarean Section. Anesth Essays Researches. 2017;11(2):321–5.
37. Desmet M, Braems H, Reynvoet M, Plasschaert S, Van Cauwelaert J, Pottel H, Carlier S, Missant C, Van de Velde M. I.V. and perineural dexamethasone are equivalent in increasing the analgesic duration of a single-shot interscalene block with ropivacaine for shoulder surgery: a prospective, randomized, placebo-controlled study. Br J Anaesth. 2013;111(3):445–52.
38. prophylactic dexamethasone on nausea and vomiting after laparoscopic cholecystectomy: a systematic review and meta-analysis. Ann Surg. 2008;248(5):751–62.
39. Nortcliffe SA, Shah J, Buggy DJ. Prevention of postoperative nausea and vomiting after spinal morphine for caesarean section: comparison of cyclizine, dexamethasone and placebo. Br J Anaesth. 2003;90(5):665–70.
40. Ho CM, Wu HL, Ho ST, Wang JJ. Dexamethasone prevents postoperative nausea and vomiting: benefit versus risk. ActaAnaesthesiologicaTaiwanica: Official Journal of the Taiwan Society of Anesthesiologists. 2011;49(3):100–4.