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Instillation of Lidocaine Intraperitoneally Improves Postoperative Analgesia at Cesarean Delivery

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Abstract:

Background: Cesarean delivery has become the most frequently performed surgical procedure in many countries, with its prevalence rising in recent decades. Effective management of postoperative pain is essential for patient recovery. This study aimed to assess the effectiveness and safety of intraperitoneal lidocaine for postoperative analgesia after cesarean delivery. **Methods:** In this prospective, double-blinded, placebo-controlled clinical trial, 221 patients undergoing cesarean delivery—either primigravida or with a previous cesarean section and no extensive adhesions—were enrolled. Patients were randomly assigned into two equal groups using az computer-generated table. At the end of surgery, just before parietal peritoneum or fascia closure, Group A (lidocaine group) received 20 mL of 2% lidocaine with epinephrine (1:200,000) intraperitoneally, while Group B (placebo group) received 20 mL of normal saline. **Results:** Group A reported significantly lower postoperative pain scores at 4, 6, 12, and 24 hours ($P < 0.001$) based on the visual analogue scale (VAS). Additionally, patients in the lidocaine group required less supplemental analgesia and experienced fewer instances of moderate to severe pain. **Conclusion:** Intraperitoneal lidocaine significantly improves postoperative analgesia in cesarean delivery without increasing adverse effects. It is a safe, simple, and cost-effective adjunct for pain management in this surgical setting.

Keywords: Lidocaine; Cesarean Delivery; Intraperitoneally; Postoperative Analgesia.

Introduction

The prevalence of cesarean delivery has increased in recent decades, and it is the most frequently performed surgical procedure in a number of countries. Consequently, it is imperative to address the administration of cesareans [1]. Elective and emergency cesarean deliveries are conducted under spinal anesthesia, which is identified as the preferred method. The absence of durable postoperative analgesia is the primary disadvantage of spinal anesthesia, which requires the administration of auxiliary analgesic medications postoperatively to guarantee a high-quality and long-lasting pain control [2].

Walking is a challenge for puerperal patients who are experiencing pain and they may adopt an antalgic position which impacts lactation [3]. In addition, the likelihood of experiencing chronic post-cesarean pain increases in patients whose acute postoperative pain is not adequately managed, which impacts long-term quality of life and can contribute to postpartum depression [4]. The cornerstone of pain management protocols following cesarean delivery is multimodal analgesia, which has been developed to address these challenges. The objective of this method is to provide superior pain relief with fewer adverse effects than any single analgesic agent alone by combining analgesic agents that exhibit distinct mechanisms. Neuraxial opioids, non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen and a variety of regional anesthetic procedures are often included in the composition [2]. Therefore, spinal anesthesia can be improved and postoperative analgesia can be extended by combining adjuvant medications with local anesthetics [5]. The adverse effects of local anesthetics during surgery are significantly lower than those of opioids or neuroaxial methods. Research has been conducted to evaluate the potential analgesic advantages of a diverse array of local anesthetic techniques. A spinal, epidural, paravertebral, or transversus abdominis plane block can be used to encircle the nerves or an incision can be made to position a local anesthetic at the lesion site [5].

First findings point to the possibility that blocking peritoneal afferents with intraperitoneal (IP) local anesthetics may improve outcomes after gynecological laparoscopic surgery and cesarean sections [6, 7].

In an effort to ascertain whether the intraperitoneal injection of Lidocaine improves postoperative analgesia following cesarean delivery, as well as to evaluate its safety and efficacy, this investigation was conducted.

Patients and methods

This prospective, double-blinded, placebo-controlled clinical trial included 221 patients with primigravida (PG) or previous (CS) without any extensive adhesions. The study was carried out between 2024 and 2025 at the Department of Obstetrics & Gynecology, Faculty of Medicine, Benha University, Benha, Egypt.

The patients and their spouses provided written consent that was informed. Each patient was informed of the purposes of the study and allocated a secret code number. The investigation was conducted with the consent of the investigation Ethics Committee at the Faculty of Medicine at Benha University.

Inclusion criteria were patients aged above 18 years and below 40 years with PG or CS without any extensive adhesions, term pregnancy (37 wk. gestation and more), single viable fetus and body mass index (BMI <35 Kg/m2).

Exclusion criteria these patients were categorized as having uncooperative behaviour, general anesthesia, extensive adhesions, multiple gestations, pregnancy-induced hypertension, chorioamnionitis, bleeding diathesis, bronchial asthma, kidney or liver diseases, psychological disturbance, chronic pain, diabetes, and any other conditions that may affect a woman's ability to breathe during or after pregnancy, polyneuropathy, burns, fracture bone, disturbed conscious level, and addict behaviour.

Randomization: patients were divided into two equal groups by a computer-generated random number table immediately before the parietal peritoneum or fascia was closed at the conclusion of the cesarean delivery: **Group A (Study group; IP instillation group) (n=110):** received 20 mL of 2% lidocaine with epinephrine (1:200,000) instilled intraperitoneally before parietal peritoneal or fascia closure and **group B (Placebo control group) (n=110):** received 20 mL of normal saline instilled intraperitoneally at the same surgical stage.

All patients underwent comprehensive preoperative evaluation including Detailed history including (age, gravidity, parity, previous CS, previous dilatation and curettage, recent pregnancy complications including antepartum hemorrhage (APH), and past obstetric history). **General examination** including [vital signs (blood pressure, pulse, temperature) pallor, height, weight, eyelid puffiness, and lower limb edema], abdominal examination including (contour, presence of striae, edema, and surgical scars), obstetric examination including [fundal height and grips (fundal, umbilical, pelvic), and per vaginal examination] and transabdominal ultrasound, **laboratory investigations** cross-matched blood was prepared if clinically indicated, in addition to (blood group , complete blood count, Rh typing, renal and liver function tests, random blood sugar ,routine urine analysis , coagulation profile).

Operative procedure:

Cesarean deliveries were performed by experienced obstetricians under spinal anesthesia using 0.75 percentage hyperbaric bupivacaine combined with morphine and fentanyl. Operating surgeon completed the data collection documents with the corresponding codes prior to the procedure. These documents were finalized after the operation.

Outcome:

Pain assessment: pain was assessed postoperatively at 4, 6, 12, and 24 hours using the Visual Analogue Scale (VAS) [8], "No pain" is anchored at 0 mm and "unbearable pain" at 100 mm in a 100-mm horizontal line. Severe pain as 75–100 mm, moderate pain as 45–74 mm, mild pain as 5–44 mm and no pain were classified as 0–4 mm. The VAS was self-completed by the patients without external assistance. Those unable or unwilling to complete the scale were excluded from pain analysis. In addition, a numerical pain rating scale [9] (0–10) was used to categorize pain intensity as 9–10 was worst possible pain, 7–8 was very severe pain, 5–6 was severe pain , 3–4 was moderate pain , 1–2 was mild pain and 0 was no pain .

Pain characteristics including location and type (aching, burning, cramping, crushing, numbness, throbbing, stabbing), onset, course, duration, and associated symptoms (nausea, vomiting, itching) were documented. Pain characteristics including location and type (aching, burning, cramping, crushing, numbness, throbbing, stabbing), onset, course, duration, and associated symptoms (nausea, vomiting, itching) were documented.

Analgesic consumption: The amount of postoperative analgesics, including pethidine and other medications, was recorded.

Side effects that adverse effects associated with pethidine, including constipation, dry mouth, nausea, vomiting, sweating, and dizziness, were monitored. Blurred vision, hearing disturbances, paraesthesia, pruritus, uncontrolled muscle contractions, convulsions, headache, hypotension, and bradycardia were also documented as adverse effects of lidocaine.

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Sample size

The sample size was determined using the formula n = Z2 P (1 - M) / d2. P is the anticipated prevalence or proportion, and Z is the Z statistic for a level of confidence (e.g., 1.96 for a 95% level of confidence). Within 48 hours post cesarean birth, a significantly higher percentage of women in the placebo group (61 [65%] compared to 40 [40%] in the lidocaine group) asked for analgesics for breakthrough pain (P value = 0.001). This was consistent with an earlier study [(10)], so d = precision (0.05). Six cases were added to overcome dropout. Therefore, 220 patients were allocated.

Statistical analysis

To carry out the statistical analysis, we made use of SPSS v28 (IBM©, Armonk, NY, USA). Using histograms and the Shapiro-Wilks test, we checked if the data was normally distributed. An unpaired student t-test was utilized to assess the quantitative data, which was shown using standard deviation (SD) and mean. The sample mean (X) is calculated by taking the total number of observations and dividing it by the sample size. A measure of how dispersed a set of variables is with respect to its meaning is the standard deviation (SD). When comparing quantitative data between two groups, the unpaired student t-test was utilized. We used the Chi-square test or Fisher's exact test to assess qualitative variables where applicable, and we provided the results as frequency and percentage (%). Chi-square (x^2): This statistical test is utilized for analyzing qualitative data from contingency tables involving two or more groups. To analyze contingency tables containing qualitative data between two groups, particularly in cases when the sample sizes are extremely tiny, one can utilize Fisher's exact test, a statistical significance test. When the two-tailed P value was less than 0.05, statistical significance was established.

Results

The 286 patients were evaluated for eligibility; 21 patients declined to participate in the study, and 45 patients did not satisfy the eligibility requirements. Randomly, the remaining 220 patients were divided into two groups, with 110 patients in each cohort. All patients were statistically analyzed and followed up **Figure 1**

Regarding age, BMI, gravidity, or parity, there wasn't significant difference between both groups. **Table 1**

Regarding postoperative VAS, Group A, which received lidocaine intraperitoneally, reported significantly lower pain scores at all time intervals (4, 6, 12, and 24 hours postoperatively) compared to Group B (placebo group) (P value <0.001), indicating that lidocaine significantly improved postoperative analgesia at cesarean delivery. Group A, which received lidocaine intraperitoneally, experienced significantly fewer patients with moderate or severe pain compared to Group B (placebo group) (P value = 0.003 and 0.006 respectively), with more patients in Group A reporting mild pain (0-4) compared to Group B (P value <0.001) according to the numerical rating scale. **Table 2**

The incidence of side effects was generally low in both groups, with no significant differences between the groups in terms of dizziness, nausea, vomiting, headache, hypotension, or bradycardia. This suggests that lidocaine instillation does not significantly increase the risk of adverse events when compared to the placebo. **Table 3**

Group A, which received lidocaine intraperitoneally, required significantly less postoperative analgesia (pethidine) compared to Group B (placebo group) (P value <0.001), highlighting the superior analgesic effect of intraperitoneal lidocaine administration. **Table 4**

Table 1: Demographic data of the studied groups

		Group A (n=110)	Group B (n=110)	P value
Age (years)	**Mean ± SD**	30.5 ± 4.7	30.3 ± 4.8	0.755
	Range	23 - 36	22 - 33	
BMI (Kg/m²)	**Mean ± SD**	26.4 ± 3.1	26.5 ± 3.2	0.814
	Range	19.4 - 34.5	19.7 - 34.8	
Gravidity	**Mean ± SD**	1.1 ± 0.5	1.0 ± 0.6	0.181
	Range	1 - 3	1 - 3	
Parity	**Mean ± SD**	0.5 ± 0.5	0.5 ± 0.6	1.000
	Range	0 - 2	0 - 2	

Data was presented as mean ± SD or range. *: statistically significant as P value <0.05. BMI: body mass index.

Table 2: Postoperative VAS and pain intensity scale (numerical rating scale) of the studied groups

		Group A (n=110)	Group B (n=110)	P value
Postoperative VAS	**4 hours**	3.2 ± 1.3	5.1 ± 1.8	**<0.001***
	6 hours	2.7 ± 1.1	4.8 ± 1.6	**<0.001***
	12 hours	3.1 ± 1.4	5.3 ± 1.9	**<0.001***
	24 hours	3.4 ± 1.6	5.7 ± 2.0	**<0.001***
Pain intensity scale (numerical rating scale)	**Mild pain (0-4)**	80 (72.7%)	45 (40.9%)	**<0.001***
	Moderate pain (5-6)	20 (18.2%)	40 (36.4%)	**0.003***
	Severe pain (7-10)	10 (9.1%)	25 (22.7%)	**0.006***

Data was presented as mean ± SD or range. *: statistically significant as P value <0.05. VAS: visual analogue scale.

Table 3: Side effects of the studied groups

	Group A (n=110)	Group B (n=110)	P value
Dizziness	6 (5.5%)	2 (1.8%)	0.280
Nausea	8 (7.3%)	5 (4.5%)	0.391
Vomiting	4 (3.6%)	3 (2.7%)	1.000
Headache	3 (2.7%)	2 (1.8%)	1.000
Hypotension	2 (1.8%)	1 (0.9%)	1.000
Bradycardia	1 (0.9%)	0 (0%)	1.000

Data was presented as frequency (%). *: statistically significant as P value <0.05.

Table 4: Postoperative analgesic consumption of the studied groups

		Group A (n=110)	Group B (n=110)	P value
Total pethidine (mg)	**Mean ± SD**	50.1 ± 18.2	75.5 ± 21.4	**<0.001***
	Range	20 - 90	30 - 120	

Data was presented as mean ± SD or range. *: statistically significant as P value <0.05.

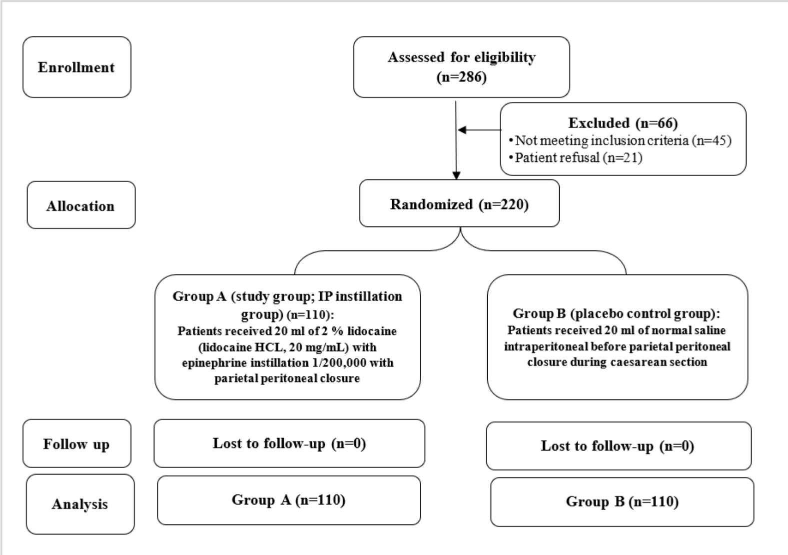

Figure 1: CONSORT flow chart

Discussion

In order to deliver one or more infants, CS is a surgical procedure that involves the creation of one or more incisions through the abdominal layers and uterus of a mother. A CS is intended to be administered when the life or health of the mother or infant would be jeopardized by a vaginal delivery Egypt's cesarean delivery rate is 52%, which is the third highest in the world, following the Dominican Republic (56.4%) and Brazil (55.6%) [11]. Surgery is the sole cause of chronic pain in approximately 50% of cases, and 20% of patients attribute it to surgery. One risk factor for the development of chronic pain was the memory of significant acute postoperative pain. Chronic post-cesarean discomfort is prevalent in a range of 12.3% to 17.8%, as indicated by recent reports. To mitigate chronic postsurgical pain, four strategies are implemented: nerve preservation, the use of minimally invasive surgical procedures (e.g., laparoscopy in place of open surgery), the prevention of direct nerve compression and the administration of local anesthetics during surgery [10, 12].

The present study did not identify any significant disparities between the two groups in terms of age, parity, gravidity, and BMI

In line with our resuls, Amr Riad et al, [12] Two hundred women participated in a randomized, double-blind, placebo-controlled clinical trial: One hundred women made up the "Lidocaine group," which also went by the name "COTROL group," and they were all given 20 milliliters of a mixture of 2% lidocaine and epinephrine (1:200,000). People in the Lidocaine group had a considerably higher body mass index, according to the results. On the other hand, neither group differed significantly from the other with regard to age or obstetrics history.

In the present study, it was found that group A reported significantly lower pain scores at all-time intervals (4, 6, 12, and 24 hours postoperatively) compared to Group B (P value <0.001), indicating that lidocaine significantly improved postoperative analgesia at cesarean delivery.

In line with our results, Patel et al. [10] Estimated parameter value is 0.02; p-value is.823; 95% CI is -0.14 to 0.18. The primary result of this study was discomfort upon movement at 24 hours post-c-section; however, no statistically significant differences were found between the two patient groups. When comparing the two groups of researchers, there was no significant difference in pain scores at rest at 24 hours (0.00; 95% CI −0.32 to 0.33; P =.986), pain scores at rest at 48 hours (0.08; 95% CI −0.27 to 0.43; P =.644), or pain scores on movement at 48 hours (−0.07; 95% CI −0.27 to 0.14; P =.518). The lidocaine group reported significantly less pain two hours after the cesarean delivery, particularly when resting (parameter estimate −1.00 [95% CI −1.57 to −0.43]; P =.001) and when moving (parameter estimate −0.58 [95% CI −0.90 to −0.26]; P =.001).

In the current study, it was determined that Group A (the experimental group) had significantly fewer patients with moderate or severe pain than Group B (the placebo group) (P values = 0.003 and 0.006, respectively). Additionally, Group A had a greater number of patients reporting mild pain (0-4) than Group B (P value <0.001) as determined by the numerical rating scale.

In agreement with our results, Patel et al. [(10)] The lidocaine group showed a lower VAS pain score on movement at 24 hours compared to the placebo group in patients with peritoneum closure (−0.33 [95% CI −0.64 to −0.03]; P =.032).However In patients who did not have peritoneum closure, no statistically significant difference was observed. There was no discernible distinction between the two groups in terms of the VAS satisfaction scale. Additionally, Shahin and Osman et al**,** (7) The patients in the lidocaine group reported a worldwide abdominal VAS ranging from 2.0 to 7.0 on the first day after the operation, while those in the control group reported a significantly lower score (4.4 ± 1.4 vs. 2.8 ± 1.3, p<0.001). Subjects who reported pain eight months following surgery and who had intraperitoneal lidocaine given had considerably reduced pain scores on pain scales given one, fifteen-, and eight-months following surgery compared to control subjects. Results showed that 81 out of 178 patients (45.5% of the total) in the control group and 30 out of 176 patients (17% of the total) in the lidocaine group reported VAS scores higher than 5 on the first post-surgery day, when comparing the two groups (P<0.001). On the first day after surgery and at 8 months, patients with VAS scores above 5 experienced significantly more ongoing pain than those with scores below 5 on either day (38 out of 81, 46.9% vs. 21 of 97, 21.6%, P<0.00001) and during the 8-month period (27 out of 81, 33.3% vs. 9 of 97, 9.3%, P<0.001)

There were no statistically significant differences in the occurrence of vertigo, nausea, vomiting, headache, hypotension, or bradycardia between the two groups, and the present study indicated that adverse effects were minimal in both. Conclusion. This implies that the risk of adverse events is not substantially elevated when lidocaine instillation is administered in comparison to a placebo.

In agreement with our results, Amr Riad et al, [(12)] It was discovered that the Lidocaine group experienced a lower incidence of nausea complaints.

In systematic review conducted by Shahin and Osman et al, [(7)] A diverse range of intraperitoneal lidocaine concentrations (100–1000 mg) was found to have not resulted in any reported cases of clinical toxicity or elevated plasma levels. In an effort to reduce the average peak plasma level and extend the time to peak plasma level of local anaesthetics in IPLA solutions, the reviewers suggested including epinephrine with the research drug. This improves the systemic safety profile even more.

Also, the study by Anwar et al, [(13)] Although not statistically significant, the control group had the highest frequency of postoperative nausea and vomiting, while the intraperitoneal and intravenous groups had the lowest.

Furthermore, the study by Hirmanpour et al, [(14)] There was no statistically significant difference in the frequency of adverse effects between the two groups (p> 0.05), according to the report. However, there was a notable difference in the frequency of nausea and vomiting (p< 0.05).

In the present study, it was found that group A required significantly less postoperative analgesia (pethidine) compared to Group B (P value <0.001), highlighting the superior analgesic effect of intraperitoneal lidocaine administration.

In line with our results, Amr Riad et al, [(12)] found that the Lidocaine group had significantly fewer patients who required additional analgesia than the control group.

In agreement with our results Anwar et al et al, [(13)] Study indicated that compared to the control group, the intraperitoneal and intravenous groups consumed significantly less pethidine in 24 hours, had a shorter latency to ambulation, had pain relief start sooner, and needed rescue analgesia less often.

The study's limitations included the following: it was conducted at a single center, and the postoperative follow-up was limited to 24 hours. Consequently, the evaluation of long-term pain control and the potential development of chronic postoperative pain was not possible. At 2 hours after a cesarean section, patients' ability to sit forward may have been impacted by the residual effects of spinal anesthesia since sensory block was not evaluated and pain intensity was measured using a subjective numerical rating scale.

Conclusion

This study shows that patients having cesarean sections benefit greatly from improved postoperative analgesia after lidocaine is injected intraperitoneally. Patients who received lidocaine reported lower pain scores, required less additional analgesia, and experienced fewer instances of moderate to severe pain compared to those who received a placebo. Moreover, lidocaine administration wasn’t associated with an increased incidence of adverse effects, confirming its safety and efficacy as a simple, cost-effective analgesic adjunct during cesarean delivery.

Therefore, the study recommended that intraperitoneal lidocaine appears to be an effective and safe adjunct for postoperative analgesia in cesarean deliveries and could be considered for routine use within multimodal pain management protocols to reduce opioid requirements. Future studies should be conducted across multiple centers with more diverse populations, longer follow-up periods are also recommended and it would be beneficial to incorporate objective measures such as serum lidocaine concentrations to better understand pharmacokinetics and safety profiles.

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Conflicts of interest

No conflicts of interest

References

1. Boerma T, Ronsmans C, Melesse DY, Barros AJD, Barros FC, Juan L, et al. Global epidemiology of use of and disparities in caesarean sections. Lancet. 2018;392:1341-8.

2. Macones GA, Caughey AB, Wood SL, Wrench IJ, Huang J, Norman M, et al. Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery (ERAS) Society recommendations (part 3). Am J Obstet Gynecol. 2019;221:247.e1-.e9.

3. Carvalho FA, Tenório SB. Comparative study between doses of intrathecal morphine for analgesia after caesarean. Braz J Anesthesiol. 2013;63:492-9.

4. Tan HS, Sng BL. Persistent pain after childbirth. BJA Educ. 2022;22:33-7.

5. Bamigboye AA, Hofmeyr GJ. Local anaesthetic wound infiltration and abdominal nerves block during caesarean section for postoperative pain relief. Cochrane Database Syst Rev. 2009:Cd006954.

6. Chou YJ, Ou YC, Lan KC, Jawan B, Chang SY, Kung FT. Preemptive analgesia installation during gynecologic laparoscopy: a randomized trial. J Minim Invasive Gynecol. 2005;12:330-5.

7. Shahin AY, Osman AM. Intraperitoneal lidocaine instillation and postcesarean pain after parietal peritoneal closure: a randomized double

blind placebo-controlled trial. Clin J Pain. 2010;26:121-7.
8. Alexakis C, Zacharis K, Anagnostaki I, Tsapadikou VK, Chondros S, Kalantzi S, et al. Anxiety Assessment Using the Visual Analogue Scale Among Women Undergoing Elective Cesarean Section. Cureus. 2025;17:99-112.
9. Getahun Z, Kebede M, Tilla M, Asnak G, Iuzzolino M, Urmale A, et al. Comparison of postoperative pain severity between primary and repeated cesarean section: a prospective cohort study. BMC Anesthesiol. 2025;25:97-112.
10. Patel R, Carvalho JC, Downey K, Kanczuk M, Bernstein P, Siddiqui N. Intraperitoneal instillation of lidocaine improves postoperative analgesia at cesarean delivery: a randomized, double-blind, placebo-controlled trial. Anesthesia & Analgesia. 2017;124:554-9.
11. Abd Elatay NB, Hathout HM, Gabr HM. Prevalence of Cesarean section delivery and associated risk factors. The Egyptian Family Medicine Journal. 2021;5:40-51.
12. Amr Riad MT, Sarah Hamada Mohamed Hamza, Ahmed Mohamed Abdelhamed. Efficacy of intraperitoneal Lidocaine for post cesarean section Analgesia: A prospective randomized, double-blind, placebo-controlled clinical trial GinPolMedProject. 2023;25:1-5.
13. Anwar Murad AW, Elhadi Farag MA, Abosrie M, Abd Alazeem ES, Mostafa A. Efficacy of intraperitoneal versus intravenous lidocaine for postcesarean pain relief. Evidence Based Women's Health Journal. 2016;6:144-8.
14. Hirmanpour A, Talakoub R, Mansouri H. Effect of intravenous infusion of lidocaine on pain reduction after cesarean section under general anesthesia. Journal of Cellular & Molecular Anesthesia. 2018;3.

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