



Original Research Article

Comparison of Efficacy of Intravenous Paracetamol Infusion Versus Intramuscular Tramadol Injection as Intrapartum Labour Analgesia at a Tertiary Care Hospital

Article History:

Name of Author:

Dr. Ayesha Abdul Qadir¹, Prof. Dr. Aslam Mahmood Malik², Dr. Iqra Batool³

Affiliation:

^{1,2,3}Department of Gynaecology and Obstetrics, Shahida Islam Teaching Hospital, Lodhran, Pakistan.

Corresponding Author:

Dr. Ayesha Abdul Qadir
Email: ayeshaqadir074@gmail.com

Received: 24-10-2025

Revised: 20-12-2025

Accepted: 24-12-2025

Published: 30-12-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Abstract:

Objective: To compare the efficacy of intravenous paracetamol infusion versus intramuscular tramadol injection as intrapartum labour analgesia at a tertiary care hospital. **Study Design:** Randomized Controlled Trial. **Place and Duration of Study:** Department of Obstetrics and Gynecology, Shahida Islam Teaching Hospital, Lodhran, from 12 June 2025 to 12 October 2025. **Methodology:** 132 patients (66/group), aged 20–40 years, with singleton pregnancies in active labour were enrolled. Patients with fetal abnormalities, diabetes, pre-eclampsia, UTI, severe IUGR, drug sensitivity, ovarian cysts, or fibroids were excluded. Following consent, participants were randomized by lottery to receive intravenous paracetamol (1000 mg) or intramuscular tramadol (100 mg). Pain was assessed after three hours using VAS. Data were analyzed in SPSS 22.0 using chi-square/Fisher's exact test; $p < 0.05$ indicated significance. **Results:** The baseline VAS for the paracetamol and tramadol groups were 8.4 ± 0.8 and 8.3 ± 0.7 , respectively. At 1 hour, the VAS scores were 4.9 ± 1.2 versus 5.3 ± 1.3 ; at 2 hours, 3.1 ± 1.1 versus 4.2 ± 1.0 ; and at 3 hours, 3.8 ± 1.0 versus 5.1 ± 1.2 . Effective analgesia was observed in 31 (46.97%) patients in the intravenous paracetamol group and 18 (27.27%) in the intramuscular tramadol group ($p = 0.019$). **Conclusion:** Compared with intramuscular tramadol injection, intravenous paracetamol infusion during the active phase of labour provided superior labour analgesia.

Keywords: : Labour analgesia, Paracetamol, Visual analogue score.

INTRODUCTION

During birth, the woman is in terrible pain. Myths and debates have surrounded the topic of pain management during labor. It's still difficult to provide effective labor pain treatment. Because of maternal psychology, pain during labor frequently changes the course of labor.¹ The primary cause of pain during the initial stage of labor is uterine contractions, which result in cervical dilatation and effacement as well as uterine ischemia. The compression of pelvic tissues and the stretching of the vagina and perineum are the causes of the first and second stages. In the initial and subsequent phases, this pain triggers a widespread neuroendocrine stress response, which starts

significant physiological alterations in oxygen consumption, learning, and cardiovascular processes while inhibiting uterine contraction.²

One of the most agonizing pains that women endure is labor pain. Maternal psychology and the course of labor are impacted by labor pain, which results in tension, anxiety, and trepidation. Cervical dilatation and uterine muscle wall ischemia, which results in lactate accumulation, are the main causes of pain during the first stage of labor. Additional sources of pain are formed by the vagina and perineum during the late first and second stages of labor.³ The corresponding rise in sympathetic activity causes respiratory alkalosis, metabolic acidosis, and

increased oxygen demand, all of which may result in less oxygen reaching the fetus.⁴ Therefore, it is anticipated that easing labor pain will lessen maternal stress and enhance both the mother's and the baby's outcomes. Anesthesia and obstetric analgesia have progressed from theoretical concepts to actualities. Even though localized analgesia is currently the gold standard and is frequently utilized in contemporary obstetric anesthesia in affluent nations, the more popular and successful pharmaceutical methods include opioids like pethidine and tramadol. Obstetric anesthesia has been transformed by more recent developments like as low dose epidurals, combined spinal epidurals, and patient-controlled intravenous, inhalational, and epidural analgesia. However, the majority of contemporary obstetric analgesia procedures require the involvement of a skilled anesthesiologist, expensive equipment, and ongoing monitoring facilities—all of which are regrettably unavailable in routine obstetric practice in developing nations, where the majority of obstetric services are provided by midwives, trained nurses, and non-specialist physicians. A technique with the least amount of intricacy is preferred in these circumstances.⁵ Recently, paracetamol was made accessible as an intravenous preparation. Its exact mechanism of analgesic action is still unknown, but it is most likely a centrally acting medication that suppresses prostaglandin formation. Numerous studies have demonstrated that intravenous paracetamol is a safe, efficient, affordable, and non-monitoring analgesic. There aren't any noteworthy studies on the analgesic effects of paracetamol on women's labor pain, nevertheless. Given its low cost and ease of administration, paracetamol may prove to be a useful obstetric analgesic in developing nations if it is shown to be an efficient analgesic during delivery. The safety and effectiveness of intravenous paracetamol as a labor analgesic have only been reported in a small number of studies.⁶ The opioid analgesic tramadol hydrochloride acts centrally. Because it is affordable, doesn't require special monitoring, and has been extensively researched and proven to be safe and effective in labor analgesia, intramuscular tramadol hydrochloride is frequently used in developing nations.⁷

The results of this study will assist us in providing our patients with a more effective treatment method for pain prevention among the targeted group, which will lessen the burden of perinatal morbidities, as there is a lack of local data on this topic. In addition to helping hospitals and healthcare authorities save money on additional medical expenses, this will assist these individuals live better lives. These facts give me a solid foundation on which to carry out this investigation in my population. My study's findings will be contrasted with those already documented in international literature. The findings of the study will

produce a valuable database of our local populace.

METHODOLOGY

A total of 132 patients (66 in each group) between the ages of 20 and 40 who had singleton full term pregnancies in the active phase of labor—presented to the Obstetrics & Gynecology department of Shahida Islam Hospital, Lodhran, after receiving approval from an ethical review committee from 12 June 2025 to 12 October 2025. Using the CDC's Epi-Info program, the sample size was determined to be 132 (66 in each group) with a test power of 80% and a confidence interval of 95%. The results showed that the effectiveness of IV paracetamol was $p_1 = 38.18\%$ and the effectiveness of tramadol in the IM Tramadol group was $p_2 = 16.36\%$.⁸ Fetal abnormalities, a history of diabetes, pre-eclampsia and UTI, severe IUGR, known medication sensitivities, and pregnancies with ovarian and fibroid cysts were excluded.

Every patient gave their signed, informed consent. Gravidity, parity, age, and gestational age were recorded. Using the lottery approach, patients were screened and divided into two groups: She was assigned to the appropriate group after each chosen case was given the opportunity to select a slip from the total mixed-up slips (half-slips containing the letter "A" and other half-slips containing the letter "B").

During the active period of labor, Group A received a single 100 ml intravenous infusion that contained 1000 mg of paracetamol spread out over 15 minutes. During the active period of labor, the researcher administered a single intramuscular injection of 100 mg of tramadol hydrochloride to Group B in the upper and outer quadrant of the gluteal region using a 2 ml syringe. After three hours of drug administration for intrapartum labor pain, all patients in both groups were assessed using the visual analogue scale (VAS) for intrapartum labor pain. If a patient received a score of 0–3, it was considered to be effective; if not, it was considered ineffective. A Senior Consultant with five years of post-fellowship experience oversaw the entire process. Side effects such as nausea, vomiting, disorientation, and allergic reactions were recorded during the later stages of labor and immediately following the administration of the medication, and the mother's safety was closely monitored. The well-being of neonates was assessed at one and five minutes using Apgar ratings, which measure skin color, muscle tone, respiration, heart rate, and reflexes. The safety of the analgesics for infants was assessed by recording NICU hospitalizations, and any adverse neonatal outcomes were continuously monitored. All relevant data for analysis was recorded by the researcher in the proforma.

Data were entered and analyzed using SPSS version 22.0. Mean $\pm$ SD were calculated for quantitative

variables including age, gestational age, BMI, VAS score, and Apgar score, while frequency and percentage were calculated for qualitative variables including efficacy, obesity, residence, gravidity, and parity. Normality of quantitative variables was assessed using the Shapiro–Wilk test. Between-group comparison of quantitative variables was performed

using the Mann-Whitney test, whereas categorical variables were compared using the chi-square test. Effect modifiers such as age group, gestational age, parity, gravidity, residence, and obesity were controlled through stratification and post-stratification chi-square/fisher exact test. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

With a mean age of 27.79 ± 4.93 years, the study's participants ranged in age from 20 to 40. The average age of patients in group A was 27.69 ± 5.01 years, whereas the average age of patients in group B was 27.84 ± 4.91 years. The mean gestational age in groups A and B was 38.31 ± 1.63 weeks and 38.84 ± 1.71 weeks, respectively. The mean BMI was 21.92 ± 1.55 kg/m² in group A and 21.84 ± 1.42 kg/m² in group B. The distribution of patients by various variables (Table 1).

Table 1. Distribution of different variables (n=132).

		Group A (n=66)	Group B (n=66)
		Number (%)	Number (%)
Age (years)	20-30	40 (60.61%)	39 (59.09%)
	31-40	26 (39.39%)	27 (40.91%)
GA (weeks)	37-39	41 (62.12%)	43 (65.15%)
	>39	25 (37.88%)	23 (34.85%)
Gravidity	Primi	22 (33.33%)	21 (31.82%)
	Multi	44 (66.67%)	45 (68.18%)
Parity	Primi	24 (36.36%)	25 (37.88%)
	Multi	42 (63.64%)	41 (62.12%)
Obesity	Yes	36 (54.55%)	40 (60.61%)
	No	30 (45.45%)	26 (39.39%)
Residence	Rural	37 (56.06%)	34 (56.06%)
	Urban	29 (43.94%)	32 (43.94%)

The baseline VAS for the paracetamol and tramadol groups in this investigation were 8.4 ± 0.8 and 8.3 ± 0.7 , respectively, at 1 hour (4.9 ± 1.2 vs. 5.3 ± 1.3), 2 hours (3.1 ± 1.1 vs. 4.2 ± 1.0), and 3 hours (3.8 ± 1.0 vs. 5.1 ± 1.2) (Table 2).

Table 2. Comparison of VAS score (n=132).

Time	Group A (Paracetamol) Median (IQR)	Group B (Tramadol) Median (IQR)	P-value
Base line	8.0 (1.0)	8.0 (1.25)	0.670
1 hour	4.0 (2.0)	4.0 (2.0)	0.090
2 hours	3.0 (1.0)	3.0 (1.0)	0.001
3 hours	2.5 (1.0)	2.5 (1.0)	0.001

Mann-Whitney test was used.

Effective analgesia was observed in 31 (46.97%) patients in the intravenous paracetamol group and 18 (27.27%) in the intramuscular tramadol group. This difference was statistically significant ($p=0.019$). Group B, which received intramuscular tramadol, experienced a higher frequency of maternal adverse effects than Group A, which received intravenous paracetamol. In Group A, two patients experienced nausea and three experienced vomiting; in Group B, 18 patients experienced nausea, 10 experienced vomiting, and 6 experienced drowsiness. Nausea was the most frequent side effect observed in both groups, followed by vomiting (Table 3).

Table 3. Comparison of efficacy and side effects (n=132).

	Group A (n=66)		Group B (n=66)		P-value
	Yes	No	Yes	No	
Efficacy	31 (46.97%)	35 (53.03%)	18 (27.27%)	48 (72.73%)	0.019
Nausea	03 (4.55%)	63 (95.45%)	18 (27.27%)	48 (72.73%)	<0.001
Vomiting	02 (3.03%)	64 (96.97%)	10 (15.15%)	56 (84.85%)	0.015
Sedation	00 (0.0%)	66 (100.0%)	06 (9.09%)	60 (90.91%)	0.028

Chi-square and fisher exact test was used.

The mean Apgar scores at 1 and 5 minutes were 7.8 ± 0.6 and 9.1 ± 0.5 for the paracetamol group and 7.7 ± 0.7 and 9.0 ± 0.6 for the tramadol group (Table 4).

Table 4. Comparison of apgar score (n=132).

Apgar Score	Group A Median (IQR)	Group B Median (IQR)	P-value
1 minute	7.0 (0.0)	7.0 (0.25)	0.379
5 minutes	9.0 (2.0)	9.0 (2.0)	0.300

Mann-Whitney test was used.

Table below shows the stratification of efficacy according to effect modifiers (Table 5).

Table 5. Stratification of efficacy with respect to effect modifiers.

		Table 3: Stratification of efficacy with respect to effect modifiers.				P-value
		Group A (n=66)		Group B (n=66)		
		Efficacy		Efficacy		
		Yes	No	Yes	No	
Age (years)	20-30	18 (45.0%)	22 (55.0%)	11 (28.21%)	28 (71.79%)	0.122
	31-40	13 (50.0%)	13 (50.0%)	07 (25.93%)	20 (74.07%)	0.071
GA (weeks)	37-39	21 (51.22%)	20 (48.78%)	10 (23.26%)	33 (76.74%)	0.008
	>39	10 (40.0%)	15 (60.0%)	08 (34.78%)	15 (65.22%)	0.709
Gravidity	Primi	12 (54.55%)	10 (45.45%)	12 (57.14%)	09 (42.86%)	0.864
	Multi	19 (43.18%)	25 (56.82%)	06 (13.33%)	39 (86.67%)	0.002
Parity	Primi	11 (45.83%)	13 (54.17%)	11 (44.0%)	14 (56.0%)	0.897
	Multi	20 (47.62%)	22 (52.38%)	07 (17.07%)	34 (82.93%)	0.003
Obesity	Yes	17 (47.22%)	19 (52.78%)	13 (32.50%)	27 (67.50%)	0.189
	No	14 (46.67%)	16 (53.33%)	05 (19.23%)	21 (80.77%)	0.031
Residence	Rural	15 (40.54%)	22 (59.46%)	12 (35.29%)	22 (64.71%)	0.649
	Urban	16 (55.17%)	13 (44.83%)	06 (18.75%)	26 (81.25%)	0.003

Chi-square test was used.

DISCUSSION

In order to maximize maternal comfort and reduce negative outcomes for both the mother and the newborn, pain management during labor is still a crucial component of obstetric care. Given that labor pain is frequently regarded as one of the worst types of pain, receiving enough analgesia can greatly enhance the experience of giving birth. The purpose of our study was to assess the safety and analgesic effectiveness of intramuscular (IM) tramadol with intravenous (IV) paracetamol during labor. Studies by N Monisha et al.⁹, Meenakshi Lallar¹⁰, researches with primigravidae labor patients support these findings. All things considered, the evidence clearly points to IV paracetamol as being better than IM tramadol for labor analgesia, providing longer-lasting pain relief, less adverse effects for mothers, and better labor advancement.

According to the Visual Analog Scale (VAS) ratings at one, two, and three hours after delivery, IV paracetamol considerably outperformed IM tramadol in our study in terms of pain control. The baseline VAS for the paracetamol and tramadol groups in our study were 8.4 ± 0.8 and 8.3 ± 0.7 , respectively, at 1 hour (4.9 ± 1.2 vs. 5.3 ± 1.3), 2 hours (3.1 ± 1.1 vs. 4.2 ± 1.0), and 3 hours (3.8 ± 1.0 vs. 5.1 ± 1.2). These findings align with those of N. Monisha and colleagues.⁹

Three hours after taking the drug, 51% of women in the tramadol group reported "horrible" pain, while 26% of women in the paracetamol group reported "distressing" pain, according to Lallar.¹⁰ This noteworthy distinction emphasizes how IV paracetamol is superior to IM tramadol in terms of pain control and duration of action. According to our study and the publications listed, IV paracetamol has a more prolonged analgesic effect than tramadol and significantly lessens the intensity of labor pain over an extended period of time.

In order to lessen maternal fatigue and enhance overall labor outcomes, paracetamol's capacity to abbreviate labor duration can be very advantageous. Although somewhat effective, tramadol does not appear to provide the same benefits in terms of labor progression. Lengthier labor stages may be caused by slower cervical dilatation and increased maternal discomfort as a result of less efficient pain treatment, which may account for the lengthier labor duration seen in the tramadol group across studies.

Our findings, together with those of Meenakshi Lallar¹⁰, N Monisha et al.⁹, and the comparative analysis^{11,12}, all suggest crucial avenues for further study and patient management. With benefits over intramuscular tramadol, including a shorter labor duration, less negative effects on the mother, and improved pain relief, intravenous paracetamol

appears to be a particularly effective analgesic for labor.¹³ When long-term analgesia is required and the mother's comfort and safety are of utmost importance, intravenous paracetamol is the preferred medication for labor analgesia due to the advantages mentioned above.

Sania Jindal¹⁴ examined intravenous paracetamol (1000 mg) and tramadol (1 mg/kg) for labor analgesia in parturients at 4-6 cm cervical dilatation, and our results are consistent with their findings. Although the groups in her study had equal baseline pain scores, the paracetamol group's Visual Analog Scale (VAS) score at one hour was considerably lower (4.60) than the tramadol group's (5.82), which is consistent with our findings. By three hours, paracetamol's VAS scores (6.35) were somewhat lower than tramadol's (6.65), but the difference was not statistically significant. In line with findings by Makkar et al.¹⁵, who noted more frequent sedation in patients treated with tramadol, the incidence of side effects, including nausea, vomiting, and sedation, was significantly higher in the tramadol group (n=13) than in the paracetamol group (n=3). Furthermore, the groups' neonatal outcomes, as determined by 1- and 5-minute Apgar ratings, were similar, indicating that both medications are safe for the health of newborns.

Total 110 women between the ages of 18 and 40 who were in the active phase of labor during a term pregnancy were involved in a quasi-experimental study.⁸ Group B patients received a 100 mg intramuscular dose of tramadol hydrochloride, while Group A patients received a single 100 ml intravenous infusion containing 1000 mg of paracetamol. The average age of the women in groups A and B was 27.73 ± 5.35 and 27.36 ± 5.61 years, respectively. Group B's mean gestational age was 38.95 ± 1.56 weeks, while group A's was 39 ± 1.53 weeks. Efficacy (measured by VAS score 0-3) was observed in 09 (16.36%) in group B (intramuscular tramadol) and 21 (38.18%) in group A (intravenous paracetamol infusion), with a p-value of 0.010.⁸ In another study,¹⁶ with noticeably lower VAS values at one hour (4.44 vs. 5.55, $p=0.0$) and three hours (6.51 vs. 6.96, $p=0.0$), paracetamol provided superior pain alleviation. In the first stage, the paracetamol group's labor time was shorter (10.16 vs. 11.44 hours, $p=0$). The tramadol group saw more frequent maternal side effects (24 vs. 12%, $p=0.118$).¹⁶

In a similar vein, Elbohoty et al.¹⁷ discovered that paracetamol was just as effective as pethidine for labor analgesia, with the latter providing better pain relief for a short time at 15 minutes ($p = 0.004$). After this point, the analgesic impact did not significantly change. Jindal found no discernible difference between paracetamol and tramadol in terms of labor duration, which is consistent with the findings of Aimakhu et al.¹⁸, who compared intramuscular paracetamol (600 mg) and tramadol (100 mg). These

trials collectively show that intravenous paracetamol has the potential to be a favored labor analgesic because it not only provides long-lasting and efficient pain relief but also retains a good side effect profile.

The efficacy and safety of intravenous infusions of paracetamol and tramadol for labor analgesia were compared in a prospective, randomized research.¹⁹ 25 parturients in group A received 1000 mg of paracetamol, while 25 parturients in group B received 1 mg/kg of tramadol at cervical dilatation of 4 to 6 cm. Before the medicine was administered, there was no statistically significant difference in the mean Visual Analogue Score (VAS). However, Group A's mean VAS (4.60) was significantly lower than Group B's (5.82) at one hour after the medicine was administered. Although there was no statistically significant difference, group A's mean VAS at three hours was marginally lower (6.35) than group B's (6.65). It was discovered that the tramadol group experienced higher drowsiness, nausea, and vomiting than the paracetamol group. Both groups' mean apgar scores at 1 and 5 minutes were found to be similar.¹⁹

Intravenous paracetamol has a strong safety record and can be used during pregnancy to reduce the need for close monitoring of both the mother and the fetus.²⁰ The fact that it has little effect on neonatal outcomes lends even more credence to this recommendation. According to the results, increasing the use of intravenous paracetamol may help improve labor outcomes overall and reduce the need for procedures like emergency cesarean sections.²¹ According to our research and other studies, intravenous paracetamol provides superior analgesia, a more favorable safety profile, and a shorter labor length than intramuscular tramadol. As a labor pain reliever, intravenous paracetamol is safe and effective, as demonstrated by the consistent results of these investigations. Although more comprehensive study is needed to validate these findings and investigate additional advantages of intravenous paracetamol in labor analgesia, the information currently available clearly supports its use as the primary analgesic in obstetric care.

CONCLUSION

According to this study, intravenous infusion of paracetamol during the active phase of labour results in superior labour analgesia compared with intramuscular tramadol injection. Tramadol use was associated with a higher frequency of maternal adverse effects, including drowsiness, nausea, and vomiting. Nevertheless, both drugs appeared safe for neonatal outcomes. Therefore, intravenous paracetamol may be considered a practical alternative for labour analgesia in low-resource settings such as Pakistan because it is safe, effective, economical, and easy to administer, without requiring costly equipment or highly specialized

personnel.

REFERENCES

- Smith LA, Burns E, Cuthbert A. Parenteral opioids for maternal pain management in labour. *Cochrane Database Syst Rev*. 2018 Jun 5;6(6):CD007396. doi: 10.1002/14651858.CD007396.pub3. PMID: 29870574; PMCID: PMC6513033.
- Lei X, Yu Y, Li M, Fang P, Gan S, Yao Y, et al. The efficacy and safety of remifentanyl patient-controlled versus epidural analgesia in labor: A meta-analysis and systematic review. *PLoS One*. 2022 Dec 19;17(12):e0275716. doi: 10.1371/journal.pone.0275716. PMID: 36534641; PMCID: PMC9762599.
- Monisha N, Poomalar GK. Comparison of intravenous paracetamol infusion versus intramuscular tramadol as labor analgesia: a randomized control trial. *Arch Gynecol Obstet*. 2023;307(3):755-62.
- Anter ME, Saleh SAA, Allam SS, Nofal AM. Efficacy and safety of intravenous paracetamol in management of labour pains in a low resource setting: a randomized clinical trial. *J Matern Fetal Neonatal Med*. 2022 Dec;35(25):6320-28. doi: 10.1080/14767058.2021.1911995. Epub 2021 Apr 26. PMID: 33902372.
- Dwidmuthe KS, Bhoyar RJ, Somalwar SA. comparative study of intravenous paracetamol infusion versus intramuscular tramadol as an intrapartum labor analgesia. *J Datta Meghe Inst Med Sci Univ* 2021;16(4):628-31
- Anter ME, Saleh SA, Allam SS, Nofal AM. Efficacy and safety of intravenous paracetamol in management of labor pains in a low resource setting: a randomized clinical trial. *J Matern Fetal Neonatal Med*. 2023 Dec;36(1):2205255. doi: 10.1080/14767058.2023.2205255. PMID: 37156503.
- Barakat A. Revisiting tramadol: a multi-modal agent for pain management. *CNS Drugs*. 2019;33(5):481-501. doi: 10.1007/s40263-019-00623-5. PMID: 31004280.
- Rehman A, M Arshea, Nasim N, Hussain R, Malik MA. Efficacy of intravenous paracetamol infusion versus intramuscular tramadol as an intrapartum labour analgesia. *J Sheikh Zayed Med Coll*. 2020;11(1):22-2.
- Monisha N, Poomalar GK. Comparison of intravenous paracetamol infusion versus intramuscular tramadol as labor analgesia: a randomized control trial. *Arch Gynecol Obstet*. 2023;307(3):755-62. DOI: 10.1007/s00404-022-06585-2.
- Lallar M, Anam HU, Nandal R, Singh SP, Katyal S. Intravenous paracetamol infusion versus intramuscular tramadol as an intrapartum labor analgesic. *J Obstet Gynaecol India*. 2015;65(1):17-22. DOI: 10.1007/s13224-014-0556-x
- Zuarez-Easton S, Erez O, Zafran N, Carmeli J, Garimi G, Salim R. Pharmacologic and nonpharmacologic options for pain relief during labor: an expert review. *Am J Obstet Gynecol*. 2023;228(5):S1246-S59. DOI: 10.1016/j.ajog.2023.03.003
- Allegaert K. A Critical Review on the Relevance of Paracetamol for Procedural Pain Management in Neonates. *Front Pediatr*. 2020;8. DOI: 10.3389/fped.2020.00089
- Lallar M, Anam H, Nandal R, Singh S, Katyal S. Intravenous Paracetamol Infusion Versus Intramuscular Tramadol as an Intrapartum Labor Analgesic. *J Obstet Gynecol India*. 2014;65. DOI: 10.1007/s13224-014 0556-x
- Jindal S, Goel P, Mitra S, Pandher D, Rani S. Efficacy and safety of intravenous paracetamol versus intravenous tramadol for labour analgesia. *Int J Reprod Contraception Obstet Gynecol*. 2023;13:100-6. DOI: 10.18203/2320-1770.ijrcog20234086
- Kaur Makkar J, Jain K, Bhatia N, Jain V, Mal Mithrawal S. Comparison of analgesic efficacy of paracetamol and tramadol for pain relief in active labor. *J Clin Anesthesia*. 2015;27(2):159-63. DOI: 10.1016/j.jclinane.2014.08.008
- Mushtaq N, Arif A, Iffet S, Moin S, Parveen T, Suriya Q. Comparative analysis of intravenous paracetamol and tramadol for labor analgesia: efficacy and safety. *J Bahria Uni Med Dental Coll*. 2025;15(2):134-139 DOI: https://doi.org/10.51985/JBUMDC2025535.
- Elbohoty AE, Abd-Elrazek H, Abd-El-Gawad M, Salama F, El-Shorbagy M, Abd-El-Maeboud KH. Intravenous infusion of paracetamol versus intravenous pethidine as an intrapartum analgesic in the first stage of labor. *Int J Gynaecol Obstet*. 2012;118(1):7-10. DOI: 10.1016/j.ijgo.2012.01.025
- Aimakhu CO, Saanu O, Olayemi O. Pain relief in labor: A randomized controlled trial comparing intramuscular tramadol with intramuscular paracetamol at the University College Hospital, Ibadan, Nigeria. *Tropical J Obstet Gynaecol*. 2017;34:91. DOI: 10.4103/TJOG.TJOG_17_17
- Jindal S, Goel P, Mitra S, Pandher DK, Rani S. Efficacy and safety of intravenous paracetamol versus intravenous tramadol for labour analgesia. *Int J Reprod Contracept Obstet Gynecol*. 2024;13:100-6. DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20234086.
- Tadokoro-Cuccaro R, Fisher BG, Thankamony A, Ong KK, Hughes IA. Maternal paracetamol intake during pregnancy impacts on offspring reproductive development. *Frontiers Toxicol*. 2022;4:884704. DOI: 10.3389/ftox.2022.884704

21. McNicol ED, Ferguson MC, Haroutounian S, Carr DB, Schumann R. Single dose intravenous paracetamol or intravenous propacetamol for postoperative pain. *Cochrane Database Syst Rev*. 2016;2016(5):Cd007126.DOI:10.1002/14651858.CD007126.pub3.