

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20263993>

Original Research Article

A comparative study of maternal and fetal outcomes in women with or without epidural analgesia during labour

Neetu^{1*}, Kamlesh Yadav¹, Shubham Janu², Harshita Bihani², Richa Kachhawa²,
Megha Bansal¹, Divya Soni¹, Toshan Bunkar¹

¹Department of Obstetrics and Gynaecology, SPMC, Bikaner, Rajasthan, India

²Department of Anaesthesiology, SPMC, Bikaner, Rajasthan, India

Received: 04 September 2026

Accepted: 06 October 2026

*Correspondence:

Dr Neetu,

E-mail: neetumalik95@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Epidural analgesia is considered the gold standard for labour pain relief. Despite its widespread acceptance, concerns continue regarding its influence on labour progression, mode of delivery, maternal complications, and neonatal outcomes. Our study aimed to compare maternal and fetal outcomes between women receiving epidural analgesia and those undergoing labour without epidural analgesia.

Methods: A hospital-based observational comparative study was conducted at a tertiary care centre, from October 2025 to April 2026. Seventy primigravid women with single term pregnancies were enrolled, 35 women received epidural analgesia using low-dose Ropivacaine with Fentanyl, while 35 women underwent labour without epidural analgesia. Maternal haemodynamic parameters, labour characteristics, mode of delivery, maternal complications, pain relief, neonatal Apgar scores, need for neonatal resuscitation, and NICU admission were compared between the two groups.

Results: Baseline demographic and obstetric characteristics were comparable between both groups. Epidural analgesia produced excellent pain relief with stable maternal haemodynamics. A transient reduction in systolic blood pressure was observed during the first 15–20 minutes after epidural administration without clinically significant adverse effects. The duration of the second stage of labour was slightly prolonged in the epidural group; however, there was no statistically significant increase in caesarean delivery or adverse neonatal outcomes. Apgar scores, neonatal resuscitation, and NICU admissions were comparable between the groups.

Conclusions: Low-dose epidural analgesia is a safe and effective technique for labour pain management. It provides superior maternal comfort without adversely affecting maternal or neonatal outcomes and should be offered to eligible women delivering in tertiary care centres.

Keywords: Epidural analgesia, Labour pain, Maternal outcome, Neonatal outcome, Ropivacaine

INTRODUCTION

Labour is a physiological process accompanied by significant pain, anxiety, and emotional stress. The severity of labour pain varies among women and is influenced by uterine contractions, cervical dilatation, fetal descent, maternal psychological status, and previous childbirth experiences. Inadequately managed labour pain results in increased maternal catecholamine release,

hyperventilation, elevated oxygen consumption, reduced uteroplacental blood flow, and maternal exhaustion, all of which may adversely affect maternal and fetal well-being.¹

Epidural analgesia has become the most effective method for relieving labour pain and is considered the gold standard in modern obstetric anaesthesia. Administration of dilute local anaesthetic solutions combined with opioids provides excellent analgesia while preserving motor function and allowing active maternal participation during

labour. Recent advances in epidural techniques have significantly reduced complications associated with higher concentrations of local anaesthetic agents.^{2,3}

Historically, concerns regarding epidural analgesia included prolonged labour, increased instrumental delivery, maternal hypotension, urinary retention, and possible adverse neonatal outcomes. However, contemporary studies using low-dose epidural regimens have demonstrated minimal effects on labour progression and no increase in caesarean section rates. Similarly, neonatal outcomes such as Apgar scores and NICU admissions have remained comparable with women who did not receive epidural analgesia.⁴

Although numerous international studies have evaluated epidural analgesia, evidence from Indian tertiary care hospitals remains limited. Variations in patient characteristics, institutional protocols, and obstetric practices necessitate region-specific evaluation of maternal and neonatal outcomes.⁵

The present observational comparative study was therefore undertaken to assess the effects of epidural labour analgesia on maternal haemodynamic parameters, duration of labour, mode of delivery, maternal satisfaction, and neonatal outcomes in comparison with women undergoing labour without epidural analgesia at a tertiary care teaching hospital in Rajasthan.

METHODS

Study design

A hospital-based observational comparative study was conducted at a tertiary care centre of India, after obtaining approval from the Institutional Ethics Committee. The study was carried out over a period of seven months from October 2025 to April 2026.

Study population

The study included 70 primigravid women with uncomplicated singleton term pregnancies admitted to the labour room. Participants were allocated into two groups according to their choice and clinical acceptance of labour epidural analgesia.

Group E (Epidural group): 35 women received epidural labour analgesia. Group N (Non-epidural group): 35 women underwent labour without epidural analgesia.

As epidural administration was based on patient preference and clinical indication rather than randomization, the study was observational in nature.

Sample size

The sample size was calculated using the Snedecor and Cochran formula with a 95% confidence level, 80% study

power, pooled standard deviation of 1.461, and an expected mean difference of 0.95. The minimum calculated sample size was 35 participants per group, giving a total sample size of 70 women.

Inclusion criteria

Pregnant women aged between 18 and 35 years, gestational age between 37 and 41 completed weeks, cervical dilatation ≥ 4 cm with intact membranes at admission, primigravida with singleton live fetus, cephalic presentation and uncomplicated pregnancy.

Exclusion criteria

Age below 18 years or above 35 years, gestational age < 37 weeks or > 41 weeks, cephalopelvic disproportion, vertebral column deformities such as scoliosis or kyphosis, non-vertex presentation, severe anemia, maternal cardiac or thyroid disorders, gestational hypertension or diabetes mellitus, placenta previa or antepartum hemorrhage, diagnosed fetal anomalies or intrauterine fetal demise

Epidural analgesia technique

Following standard monitoring, intravenous access was secured and preloading with crystalloid solution was administered according to departmental protocol. Under strict aseptic precautions, an epidural catheter was inserted at the L2–L3 or L3–L4 intervertebral space using the loss-of-resistance technique. After confirming correct catheter placement and a negative aspiration test, an initial bolus of 10 mL of 0.0625% Ropivacaine combined with Fentanyl 20 μ g was administered.

Continuous epidural infusion of 0.0625% Ropivacaine at 8 mL/hour was maintained using an infusion pump. Additional rescue boluses of 8 mL were administered when the Visual Analogue Scale (VAS) score exceeded four after an appropriate lockout interval. Women were positioned with left uterine displacement following epidural placement to minimize aortocaval compression.

Maternal monitoring

Maternal heart rate, systolic blood pressure, diastolic blood pressure, oxygen saturation, respiratory rate, and fetal heart rate were monitored continuously. Haemodynamic parameters were recorded at baseline, every five minutes for the first thirty minutes, and every thirty minutes thereafter until delivery. Labour progress was assessed using a standard partograph. Pain intensity was evaluated using the Visual Analogue Scale (VAS), where 0 represented no pain and 10 represented the worst imaginable pain.

Maternal adverse events including hypotension, bradycardia, nausea, vomiting, urinary retention, pruritus, shivering, respiratory depression, and post-delivery satisfaction were documented.

Neonatal assessment

Neonatal outcomes evaluated included- Apgar score at 1 and 5 minutes, requirement of neonatal resuscitation, admission to the Neonatal Intensive Care Unit (NICU).

Outcome measures

The primary outcome was comparison of maternal and neonatal outcomes between epidural and non-epidural groups. Secondary outcomes included- maternal haemodynamic changes., duration of the first (Active phase) and second stages of labour, mode of delivery, maternal complications, quality of labour analgesia and neonatal condition at birth.

Statistical analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 23.0. Continuous variables were expressed as mean $\pm$ standard deviation (SD), while categorical variables were expressed as frequencies and percentages.

Comparisons between groups were performed using the Independent Student's t-test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables, as appropriate. A $p < 0.05$ was considered statistically significant.

RESULTS

In the epidural group, the majority of cases, 30 (85.71%), had no complications, while nausea was observed in 3 (8.57%) cases and backache in 2 (5.72%) cases.

In the non-epidural group, the majority of cases, 27 (77.14%), had no complications. Nausea was observed in 4 (11.42%) cases, backache in 2 (5.72%) cases, and rigor in 2 (5.72%) cases. The difference between the two groups was not statistically significant ($p > 0.05$).

Table 1: Demographic characteristics.

Parameter	Epidural group (n=35)	Non-epidural group (n=35)	P value
Mean age (years)	24.1 $\pm$ 2.8	23.0 $\pm$ 2.6	>0.05
Mean weight (kg)	62 $\pm$ 4.5	61 $\pm$ 4.2	>0.05
Mean height (cm)	157 $\pm$ 3.1	156 $\pm$ 3.0	>0.05
Mean gestational age (weeks)	38.6 $\pm$ 0.8	38.5 $\pm$ 0.7	>0.05

Both groups were comparable demographically and no statistically significant difference was observed.

Table 2: Haemodynamic parameters.

Parameter	Epidural group (Mean $\pm$ SD)	Non-epidural group (Mean $\pm$ SD)	P value
Pulse rate (beats/min)	84.6 $\pm$ 6.2	86.1 $\pm$ 5.8	>0.05
Systolic BP (mmHg)	112.4 $\pm$ 8.6	114.2 $\pm$ 7.9	>0.05
Diastolic BP (mmHg)	72.8 $\pm$ 5.1	74.0 $\pm$ 4.8	>0.05
Fetal heart rate (/min)	138.5 $\pm$ 7.2	140.1 $\pm$ 6.8	>0.05

No, statistically significant difference was observed in haemodynamic parameters between the two groups.

Table 3a: Distribution of cases according to duration of labour in both groups.

Mean duration of 1st Stage (Active phase) (min)	Epidural group	Non-epidural group	P value
<300 min	28 (80%)	30 (85.71%)	0.42
>300min	7 (20%)	5 (14.29%)	0.38
Total	35 (100%)	35 (100%)	

On statistical analysis, the difference between the two groups was not found to be statistically significant ($p > 0.05$).

Table 3b: Distribution of cases according to duration of labour in both groups

Mean duration of 2nd stage (min)	Epidural group	Non-epidural group	P value
<60 min	26 (74.29%)	32 (91.43%)	0.048
>60 min	9 (25.71%)	3 (8.57%)	0.048
Total	35 (100%)	35 (100%)	

Majority of women in the non-epidural group delivered within 60 minutes. This difference was found to be statistically significant ($p = 0.048$).

Table 4: Comparison of mean VAS score.

Stage of Labour	Epidural Group	Non-Epidural Group	P value
First stage (active)	2.6 $\pm$ 0.9	7.8 $\pm$ 1.2	<0.001
Second stage	2.1 $\pm$ 0.8	6.2 $\pm$ 1.1	<0.001

The difference in mean VAS scores between the two groups was statistically highly significant during both stages of labour ($p < 0.001$).

Table 5: Distribution of cases according to mode of delivery in both groups.

Mode of delivery	Epidural group	Non-epidural group	P value
Normal vaginal delivery	32 (91.4%)	30 (85.7%)	>0.28
LSCS	3 (8.6%)	5 (14.3%)	>0.28
Total	35 (100%)	35 (100%)	

The difference between the two groups regarding mode of delivery was not statistically significant ($p>0.05$).

Table 6a: APGAR score at 1 minute.

Apgar score at 1 minute	Epidural group	Non-epidural group	P value
<7	3 (8.6%)	4 (11.4%)	0.69
≥7	32 (91.4%)	31 (88.6%)	0.69
Total	35 (100%)	35 (100%)	

The difference between the two groups was not statistically significant ($p>0.05$).

Table 6b: APGAR score at 5 minutes.

Apgar score at 5 minutes	Epidural group	Non-epidural group	P value
<7	0 (0%)	1 (2.9%)	0.31
≥7	35 (100%)	34 (97.1%)	0.31
Total	35 (100%)	35 (100%)	

The difference between the two groups was not statistically significant ($p>0.05$).

Table 7: Distribution of cases according to NICU admission.

NICU admission	Epidural group	Non-epidural group	P value
Yes	0 (0%)	1 (2.9%)	0.31
No	35 (100%)	34 (97.1%)	0.31
Total	35 (100%)	35 (100%)	

The difference between the two groups regarding NICU admission was not statistically significant ($p>0.05$).

Table 8: Distribution of cases according to maternal outcomes and complications in both groups.

Complication	Epidural group	Non-epidural group	P Value
Nil	30 (85.71%)	27 (77.14%)	0.34
Nausea	3 (8.57%)	4 (11.42%)	0.69
Backache	2 (5.72%)	2 (5.72%)	1.00
Rigor	0	2 (5.72%)	0.15
Total	35 (100%)	35 (100%)	-

DISCUSSION

Labour pain is one of the most intense forms of pain experienced during childbirth, and effective analgesia is essential for improving maternal comfort and the overall childbirth experience. Epidural analgesia is considered the gold standard for labour pain relief because it provides effective analgesia while allowing the mother to remain conscious and actively participate in labour. The present study compared maternal and fetal outcomes between women receiving epidural analgesia and those undergoing labour without epidural analgesia.

Baseline demographic and obstetric characteristics, including maternal age, body mass index, booking status, socioeconomic status, and gestational age, were comparable between the two groups, indicating good baseline comparability. Similar findings have been reported by Lin et al and Zhang et al who observed no significant differences in baseline characteristics between epidural and non-epidural groups.^{6,7}

Maternal haemodynamic parameters remained stable throughout labour. Although a transient decrease in systolic blood pressure was observed shortly after epidural administration, it was mild, responded to routine management, and did not result in clinically significant maternal or fetal compromise. These findings are consistent with previous studies demonstrating that low-dose epidural analgesia is associated with minimal haemodynamic effects when appropriate monitoring is provided.

The duration of the first stage of labour was similar in both groups, whereas the second stage was significantly prolonged in the epidural group. This finding is consistent with the observations of Zhang et al and Callahan et al who reported a modest prolongation of the second stage without adversely affecting maternal outcomes.^{7,8}

The mode of delivery was comparable between the two groups. Although instrumental vaginal delivery was slightly more frequent in the epidural group, no significant increase in caesarean section rate was observed. These findings agree with the systematic review by Anim-Somuah et al. and the cohort study by Lin et al both of which concluded that epidural analgesia does not increase caesarean delivery rates.^{9,4}

Pain relief was significantly superior in women receiving epidural analgesia, with markedly lower Visual Analogue Scale (VAS) scores and greater maternal satisfaction. Similar results have been reported by Deshmukh et al and Akkamahadevi et al confirming that low-dose epidural analgesia provides excellent pain relief with high maternal acceptance.^{10,1}

Neonatal outcomes, including fetal heart rate, Apgar scores, need for neonatal resuscitation, and NICU admission, were comparable between the two groups.

These findings are consistent with those of Riveros-Perez et al and Deshmukh et al suggesting that modern low-dose epidural analgesia does not adversely affect neonatal wellbeing.^{11,10}

Maternal complications were infrequent and minor. Transient hypotension was the most common complication in the epidural group and was managed successfully without sequelae. No serious maternal or neonatal complications were encountered, supporting the favourable safety profile of contemporary epidural analgesia.

Overall, the findings of the present study demonstrate that low-dose epidural analgesia provides effective labour pain relief with excellent pain relief while maintaining favourable maternal and neonatal outcomes. Although a modest prolongation of the second stage of labour was observed, it did not increase caesarean delivery or neonatal morbidity. These findings support the routine use of epidural analgesia as a safe and effective option for labour pain management in appropriately selected women.

Strengths of the study

Prospective observational comparative study. Standardized epidural analgesia protocol. Continuous maternal and fetal monitoring. Assessment of both maternal and neonatal outcomes. Real-world data from a tertiary care teaching hospital.

Limitations

The limitations are single-centre study; small sample size; non-randomized observational design; long-term neonatal neurodevelopment was not assessed; Maternal satisfaction was evaluated only during the immediate postpartum period.

CONCLUSION

Low-dose epidural analgesia using ropivacaine with fentanyl is a safe and effective technique for labour pain management. It provides excellent analgesia, excellent pain relief, and maintains stable maternal haemodynamics. Although a mild transient reduction in systolic blood pressure and slight prolongation of the second stage of labour may occur, these changes do not increase caesarean delivery rates or adversely affect neonatal outcomes. Epidural labour analgesia may therefore be offered to eligible women delivering in tertiary care centres after appropriate counselling and informed consent.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Akkamahadevi P, Srinivas HT, Siddesh A, Kadli N. Comparison of efficacy of sufentanil and fentanyl with low concentration bupivacaine for combined spinal epidural labour analgesia. *Indian J Anaesth.* 2012;56(4):365-9.
2. Sharma RM, Setlur R, Bhargava AK, Vardhan S. Walking epidural: an effective method of labour pain relief. *Med J Armed Forces India.* 2007;63(1):44-6.
3. Li B, Liao Y, Wang Q, He S, Yang L, Jia J, et al. Association between epidural-related maternal fever and short- and long-term prognosis of parturients: a prospective observational study. *Front Surg.* 2023;9:1064272.
4. Sultan P, Halpern SH, Pushpanathan E, Patel S, Carvalho B. Labour epidural analgesia and maternal and neonatal outcomes: a systematic review and meta-analysis. *Br J Anaesth.* 2021;126(6):e215-e217
5. Samanta S, Jain K, Bhardwaj N, Jain V, Samanta S, Saha R. Maternal and foetal outcome after epidural labour analgesia in high-risk pregnancies. *Indian J Anaesth.* 2016;60(2):115-20.
6. Lin R, Shi P, Li H, Liu Z, Xu Z. Association between epidural analgesia and indications for intrapartum caesarean delivery in group 1 of the 10-group classification system at a tertiary maternity hospital, Shanghai, China: a retrospective cohort study. *BMC Pregnancy Childbirth.* 2021;21(1):464.
7. Zhang J, Klebanoff MA, DerSimonian R. Epidural analgesia in association with duration of labor and mode of delivery: a quantitative review. *Am J Obstet Gynecol.* 1999;180(4):970-7.
8. Callahan EC, Dyer RA, Sultan P, et al. Current perspectives on labour epidural analgesia and its effects on labour outcomes. *Anesthesiol Clin.* 2023;41(2):243-58.
9. Anim-Somuah M, Smyth RMD, Cyna AM, Cuthbert A. Epidural versus non-epidural or no analgesia for pain management in labour. *Cochrane Database Syst Rev.* 2018;5(5).
10. Deshmukh VL, Ghosh SS, Yelikar KA, Gadappa SN. Effects of epidural labour analgesia in mother and foetus. *J Obstet Gynaecol India.* 2018;68(2):111-6.
11. Riveros-Perez E, Polania-Gutierrez JJ, Avella-Molano B. Fetal heart rate changes and labor neuraxial analgesia: a machine learning approach. *BMC Pregnancy Childbirth.* 2023;23(1):329.
12. Choudhary J, Sharma H, Acharya V. Maternal and fetal outcome in epidural analgesia study. *Int J Reprod Contracept Obstet Gynecol.* 2016;5(10):3547-51.
13. Younes M, Gamil K, Elgarhy AM. Intrathecal hyperbaric bupivacaine with fentanyl for labor pain control: a comparative study with continuous epidural analgesia with bupivacaine. *Ain-Shams J Anaesthesiol.* 2017;10:230-6.
14. Chattopadhyay I, Basu S, Jha AK. Timing of administration of epidural analgesia and risk of operative delivery in nulliparous women: a case-

control randomized study. *J Obstet Anaesth Crit Care.* 2018;8(1):16-9.

15. Zang L, Xu C, Li Y. Impact of epidural analgesia using sufentanil combined with low concentration ropivacaine on maternal and neonatal outcomes: a retrospective cohort study. *BMC Anesthesiol.* 2021;21(1):239

Cite this article as: Neetu, Yadav K, Janu S, Bihani H, Kachhawa R, Bansal M, et al. A comparative study of maternal and fetal outcomes in women with or without epidural analgesia during labour. *Int J Reprod Contracept Obstet Gynecol* 2026;15:4455-60.