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Original Research Article

Effect of Epidural Labour Analgesia on Progress of Labour, Mode of Delivery, and Neonatal Outcome: A Prospective Cohort Study from an Indian District Hospital

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Abstract

Background: Epidural analgesia (EA) remains the gold standard for labour pain relief. However, concerns persist in India regarding its influence on labour progress, operative delivery rates, and neonatal safety. Modern techniques using low-concentration local anaesthetic–opioid combinations may mitigate earlier risks.

Objectives: To evaluate the impact of epidural labour analgesia on labour duration, mode of delivery, and neonatal outcomes in a district hospital setting.

Methods: A prospective cohort study was conducted over one year (Jan–Dec 2024). 300 term parturients were enrolled; 150 opted for EA and 150 did not. Standardised obstetric and neonatal data were collected. Statistical analysis included t-tests, chi-square, and multivariable logistic regression adjusting for confounders.

Results: Mean first-stage duration was slightly longer in the EA group (7.1 ± 1.9 h) vs non-EA (6.4 ± 2.1 h, p = 0.01). Second-stage duration was modestly prolonged with EA (72 ± 25 min vs 61 ± 20 min, p = 0.001). Rates of spontaneous vaginal delivery were comparable (EA 72% vs non-EA 76%, p = 0.41). Instrumental delivery was slightly higher in the EA group (15% vs 9%, p = 0.12). Cesarean section rates were not significantly different (EA 13% vs non-EA 15%, p = 0.64). Neonatal Apgar <7 at 5 min occurred in 3.3% (EA) vs 4.0% (non-EA), with no significant difference. NICU admissions were similar (EA 6% vs non-EA 7%, p = 0.71). No severe maternal morbidity was observed.

Conclusion: In this Indian district hospital cohort, epidural labour analgesia was associated with modest prolongation of labour but no significant increase in cesarean delivery or adverse neonatal outcomes. These findings support wider adoption of EA in district-level settings.

Keywords: Epidural Analgesia, Labour Pain, Cesarean Delivery, Neonatal Outcome, India, Obstetric Anaesthesia.

Introduction

Labour is universally acknowledged as one of the most painful physiologic events, arising from visceral afferents during the first stage and somatic inputs from pelvic structures in the second stage. Uncontrolled labour pain contributes to maternal stress, hyperventilation, catecholamine surges, and potentially adverse fetal effects. Neuraxial techniques, particularly epidural analgesia (EA), provide the most effective and titratable analgesia, improving maternal comfort and facilitating safer obstetric management [1,2].For decades, concerns were raised regarding potential adverse effects of EA on the course of labour, especially prolongation of the second stage, increased instrumental vaginal delivery, and higher cesarean section rates. These associations largely reflected earlier practices employing high concentrations of local anesthetics in continuous infusions, which produced dense motor block [3]. With the advent of modern low-dose local anesthetics, opioid adjuvants, and advanced delivery modalities such as programmed intermittent epidural bolus (PIEB), patient-controlled epidural analgesia (PCEA), and dural puncture epidural (DPE), these concerns merit re-evaluation [4,5]. Large contemporary cohort studies and systematic reviews suggest that EA does not increase cesarean birth rates, and when modern regimens are used, the effects on labour

duration are modest and clinically acceptable [6,7]. Timing of EA initiation (early vs late) appears safe and does not negatively influence neonatal outcomes [8]. Recent evidence suggests that EA may actually reduce severe maternal morbidity (SMM), including hemorrhage and sepsis, possibly by facilitating safer intrapartum care [9]. Organisational and service-delivery reviews highlight EA as both a clinical and equity issue, since access remains limited in many low- and middle-income countries, including India [2]. Despite global data, limited prospective studies exist in the Indian context, particularly in district hospitals where resources are constrained and practice patterns vary. Historical associations of EA with adverse obstetric outcomes may not apply to contemporary regimens. Thus, our study seeks to clarify the effect of epidural labour analgesia on labour progress, mode of delivery, and neonatal outcomes & to explore public health implications for wider EA service delivery in Indian district hospitals.

Materials & Methods

Study design: Prospective cohort study conducted at [Government medical college & District Hospital, Bundi, Rajasthan over 12 months (June2024–June 2025). After Ethics approval and written consent obtained. Participant's selection as per Inclusion & Exclusion Criteria.

Inclusion: Healthy term parturients (≥37 weeks), singleton, cephalic, in spontaneous or induced labour, requesting vaginal delivery.

Exclusion: Contraindications to neuraxial block, previous cesarean, multiple gestation, major obstetric complications (eclampsia, placenta previa).

Groups

Epidural group (n = 150): Received low-dose EA (0.1% ropivacaine + fentanyl 2 µg/mL). Initiated at cervical dilatation ≥4 cm. Maintained with PIEB + PCEA.

Non-epidural group (n = 150): Received non-pharmacologic support ± systemic opioids (as per obstetrician).

Data collected

Labour: Duration of first and second stages, oxytocin augmentation, mode of delivery.

Neonatal:

Apgar scores at 1 and 5 min, NICU admission.

Maternal safety: Hypotension, fever, postpartum hemorrhage.

Sample size: Based on expected cesarean difference of 10%, $\alpha = 0.05$, power = 80%, required n = 136 per group. We enrolled 150 each.

Statistical analysis: SPSS v26 used. Continuous variables: mean ± SD, compared with t-test. Categorical: chi-square/Fisher's exact. Logistic regression adjusted for age, BMI, parity, induction, and oxytocin use. $p < 0.05$ significant.

Results: Baseline characteristics among groups were comparable in age, BMI, parity, induction rates table 1, and chart 1.

Table 1: Baseline maternal characteristics

Characteristic	EA group (n=150)	Non-EA (n=150)	p value
Age (years)	25.6 ± 3.8	25.2 ± 4.1	**0.47**
BMI (kg/m²)	24.8 ± 3.2	24.5 ± 3.5	**0.52**
Primigravida (%)	58	55	**0.68**
Induction of labour (%)	42	40	**0.77**

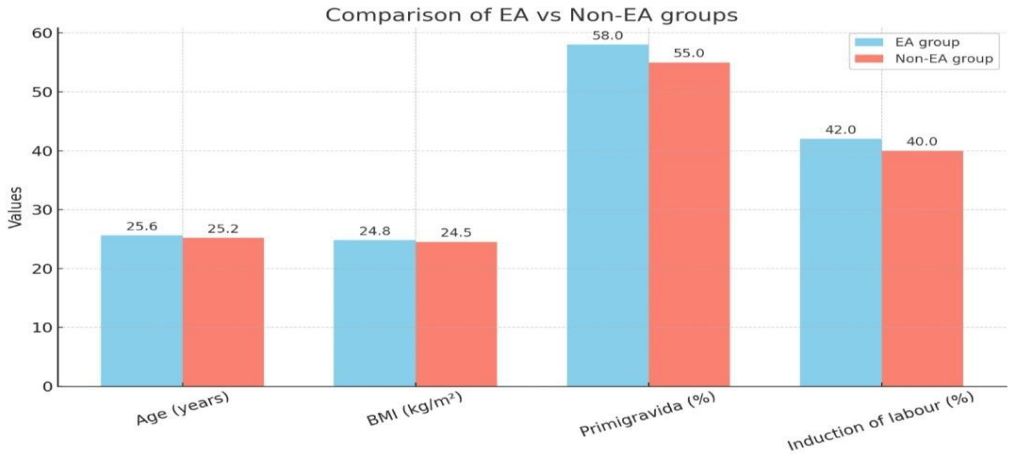

Chart 1: Baseline maternal characteristics

Labour outcomes among groups are as shown in Table 2, Chart 2, and Chart 3

Table 2: Labour progress and mode of delivery

Outcome	EA (n=150)	Non-EA (n=150)	p value
First stage duration (h)	7.1 ± 1.9	6.4 ± 2.1	**0.01***
Second stage duration (min)	72 ± 25	61 ± 20	**0.001***
Spontaneous vaginal delivery (%)	72	76	**0.41**
Instrumental delivery (%)	15	9	**0.12**
Cesarean delivery (%)	13	15	**0.64**

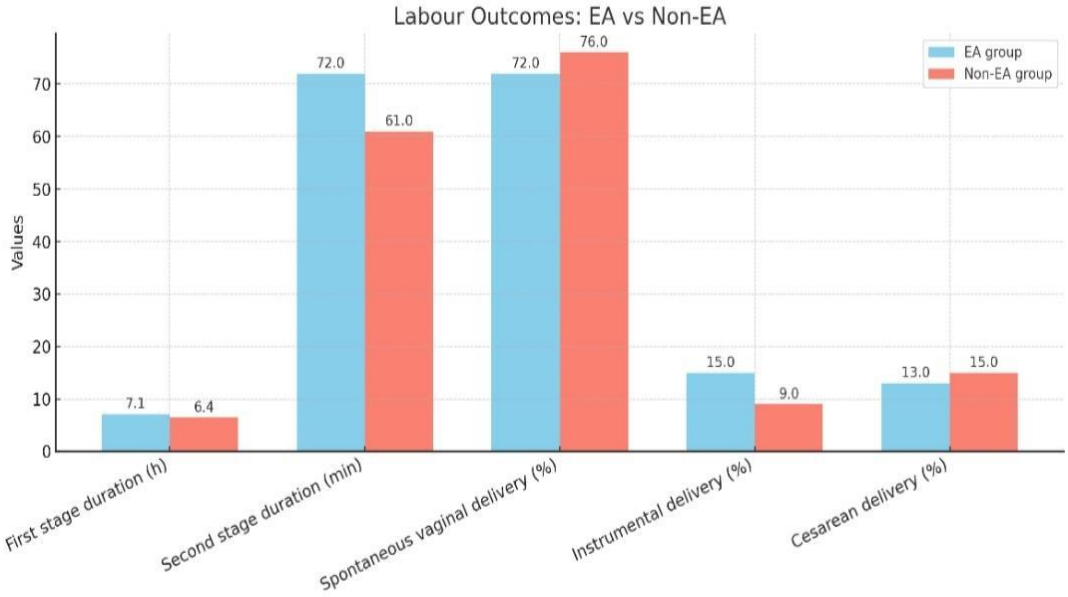

Chart 2:

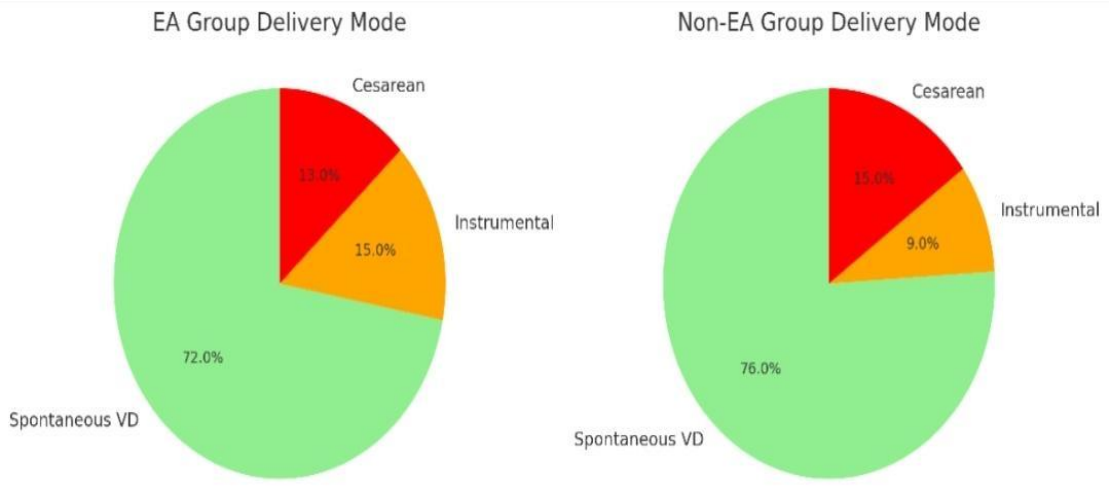

Chart 3:

Neonatal outcomes among groups are as shown in Table 3, Chart 4

Table 3: Neonatal results

Outcome	EA (n=150)	Non-EA (n=150)	p value
Apgar <7 at 1 min (%)	9	10	**0.81**
Apgar <7 at 5 min (%)	3.3	4.0	**0.77**
NICU admission (%)	6	7	**0.71**

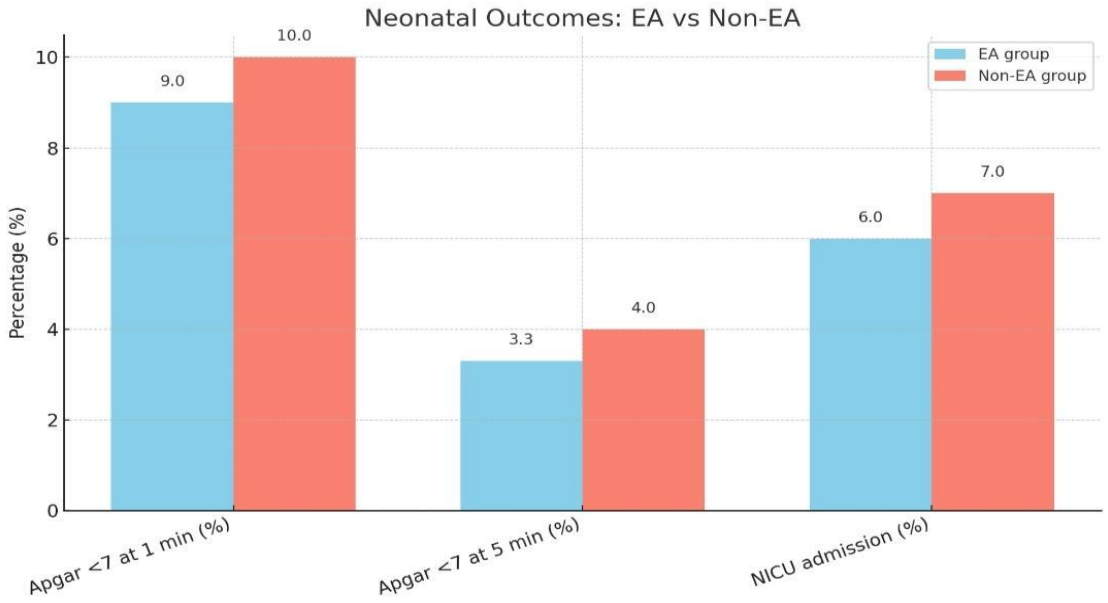

Chart 4:

Discussion

This prospective cohort study from a Government Medical College & district hospital found that epidural labour analgesia (EA) modestly prolonged the first and second stages of labour but did not significantly increase cesarean section rates or compromise neonatal outcomes. Instrumental delivery was numerically higher with EA but not statistically significant. Neonatal Apgar scores and NICU admissions were comparable between groups.

Our results are consistent with large systematic reviews and randomized trials.

The Cochrane review [10] concluded that modern low-dose epidurals prolong labour by about 30–60 minutes but do not increase cesarean rates. Similarly, Callahan et al.[11] emphasised that contemporary regimens with dilute local anaesthetic–opioid mixtures minimise motor block and attenuate the rise in assisted vaginal deliveries. Our observed prolongation (≈42 min first stage, 11 min second stage) aligns with these pooled estimates.

Cesarean rates in our cohort (13% vs 15%) reflect international evidence showing no association between EA and increased cesarean section [6,9]. The slight trend towards higher instrumental delivery (15% vs 9%) is in line with Antonakou et al.[12], though attenuated with modern regimens. Neonatal outcomes were reassuring, echoing findings from Ravelli et al.[13] and Cornet et al.[14], who reported no increased risk of low Apgar or hypoxic-ischemic encephalopathy with EA, despite associations with maternal fever. Strengths of this study include its prospective design, uniform low-dose ropivacaine–fentanyl regimen, and adjustment for confounders. Limitations are its single-centre setting, modest sample size insufficient to assess rare adverse events, and lack of long-term neonatal follow-up. Nevertheless, the findings demonstrate that EA is safe and effective in district hospital practice and support its wider adoption in India, provided that staff training and monitoring protocols are in place.

Conclusion

Epidural analgesia in labour, when administered with low-dose regimens and modern delivery techniques, is safe in Indian district hospital settings. It modestly prolongs labour stages but does not increase cesarean risk or compromise neonatal outcomes. Wider availability of EA should be encouraged to improve maternal comfort without compromising safety.

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