

Labor Analgesia by Lumbar Epidural Technique, in a Tertiary Care Hospital: An Observational Study

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ABSTRACT

Background: Labor pain is a severe form of acute pain with both visceral and somatic components, often requiring effective analgesia. Epidural analgesia is widely used as the most effective method for pain relief during labor, providing good maternal comfort with minimal neonatal effects. This study aimed to evaluate the effectiveness and safety of lumbar epidural analgesia in laboring women at a tertiary care hospital. **Methods & Materials:** This prospective observational study was conducted in the Department of Anaesthesiology, Shaheed Ziaur Rahman Medical College Hospital, Bogura, from May 2023 to May 2024. A total of 100 pregnant women in active labor who received epidural analgesia were selected through purposive sampling. Maternal sociodemographic data, pain scores, hemodynamic parameters, mode of delivery, complications, and neonatal outcomes were recorded and analyzed. **Results:** The majority of participants belonged to the lower socioeconomic group (52%). Epidural analgesia resulted in significant pain reduction throughout labor. Most women (98%) delivered vaginally; only 3% required instrumental delivery and 2% underwent cesarean section. Heart rate remained stable with slight transient variation. Neonatal outcomes were favorable, with 99% of newborns having APGAR scores of 7–10 at 5 minutes and 1% between 4–6. No significant maternal complications such as hypotension, respiratory distress, or urinary retention were observed. **Conclusion:** Lumbar epidural analgesia is an effective and safe method for labor pain relief, providing excellent analgesia, stable maternal hemodynamics, and favorable neonatal outcomes without increasing cesarean delivery rates.

Keywords: Labor pain, epidural analgesia, VAS score, maternal outcome, neonatal outcome, APGAR score, obstetric analgesia.

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INTRODUCTION

Labor pain, a form of acute pain, is perceived by many women as very severe or intolerable. Parturition pain has both visceral and somatic components. Visceral stimulation occurs as the cervix and lower uterine segment dilate, while somatic pain results from distension, inflammation, and tissue injury of the pelvic joints, vagina, pelvic floor, and perineum as the fetus descends through the birth canal during the late first and second stages of labor. Early labor pain is primarily visceral and occurs during uterine contractions. Afferent impulses are transmitted through sensory nerves (myelinated A δ and unmyelinated C fibers) via the paracervical nerve plexus [1]. These nerves accompany sympathetic fibers through the hypogastric and celiac plexuses, enter the lumbar sympathetic chain, and pass through the T10, T11, T12,

and L1 spinal segments. Consequently, pain is often referred to the abdomen, back, and other areas innervated by these segments [2].

The optimal labor analgesic should provide effective pain relief throughout labor while having minimal effects on the mother and baby. Neuraxial techniques, including epidural, spinal, and combined spinal-epidural (CSE) analgesia, are currently the most effective methods of labor pain relief. Their side-effect profile is generally acceptable to both women and obstetricians.

Epidural analgesia is a central nerve block technique achieved by injection of a local anaesthetic into the epidural space and is widely used for pain relief during labor. The technique allows the mother to remain awake and actively participate in the birthing process [3]. When administered by

an experienced anaesthetist in collaboration with an obstetrician and trained midwife, epidural analgesia can transform a painful labor into a less stressful event [4,5]. Despite being highly effective, limitations include irregular analgesia and local anaesthetic toxicity. It also facilitates emergency caesarean section without the need for general anesthesia [6]. Epidural doses are often reduced during the second stage of labor to improve maternal expulsive efforts and reduce instrumental vaginal delivery (IVD) rates [7].

In a study from Pakistan, Fouzia and associates reported that 78.5% of women were satisfied with epidural labor analgesia. Neonatal outcomes were favorable, with mean APGAR scores of 9.1 and 9.9 at 1 and 5 minutes, respectively. Maternal complications such as urinary retention and prolonged labor were

uncommon [5]. However, controversy remains regarding whether epidural analgesia increases the rate of cesarean delivery by prolonging labor or causing dystocia [8-10]. Opioids such as intramuscular pethidine provide limited pain relief and are associated with maternal and neonatal side effects, including nausea, vomiting, reduced fetal heart rate variability, and neonatal respiratory depression [11-15]. Nevertheless, pethidine continues to be widely used. Lumbar epidural analgesia remains the mainstay of neuraxial labor analgesia and can effectively block both visceral and somatic pain. Therefore, this study aimed to observe labor pain management and associated maternal and neonatal outcomes using lumbar epidural analgesia in a tertiary care hospital.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Anaesthesiology, Shaheed Ziaur Rahman Medical College Hospital (SZMCH), Bogura, from 16 May 2023 to 15 May 2024. A total of 100 pregnant women in the active stage of labor who were willing to receive epidural analgesia were enrolled by purposive sampling. Women who provided informed written consent and

received epidural analgesia according to hospital protocol were included in the study, whereas those not receiving epidural analgesia were excluded. After obtaining ethical approval from the Institutional Review Board (IRB) of Shaheed Ziaur Rahman Medical College Hospital, baseline sociodemographic and obstetric information, including age, education, occupation, monthly expenditure, co-morbidities, body mass index, gestational age, gravidity, and parity, were collected using a pretested structured questionnaire. Baseline clinical parameters including blood pressure, pulse rate, and oxygen saturation were recorded before epidural catheter placement. Epidural analgesia was administered by consultant anaesthesiologists according to hospital protocol. The effectiveness of analgesia was assessed using the Visual Analogue Scale (VAS) at 30-minute intervals until delivery. Maternal outcomes including VAS score, mean arterial pressure, heart rate, mode of delivery, prolonged labor, urinary retention, respiratory distress, and patient satisfaction were observed and recorded. Additional anesthetic doses administered through the epidural catheter and medications required during cesarean delivery were also documented. Neonatal outcomes were

assessed by APGAR scores at the 1st and 5th minutes after birth. Data were collected directly by the investigator with assistance from colleagues and were checked carefully for completeness and consistency. All information was entered, edited, and analyzed using Statistical Package for Social Sciences (SPSS) version 23.0 and Microsoft Excel. Quantitative variables were expressed as mean ± standard deviation, while qualitative variables were presented as frequencies and percentages. Results were summarized using tables and graphical presentations. Confidentiality and anonymity of participants were maintained throughout the study, and all procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

RESULTS

According to the Table I, history of all the 100 selected cases was taken, the clinical examination was carried out meticulously. In this series, the maximum number of cases (59.0%) was between 18-24 years age group, next (24.0%) were 25-30 years age group. Mean age was 21.38 ± 5.27years.

Table I
Age distribution of the study subject (n=100).

Age (years)	Frequency	Percentage (%)
18-24	59	59
25-30	24	24
>30	17	17
Mean ± SD	21.38 ± 5.27 years	

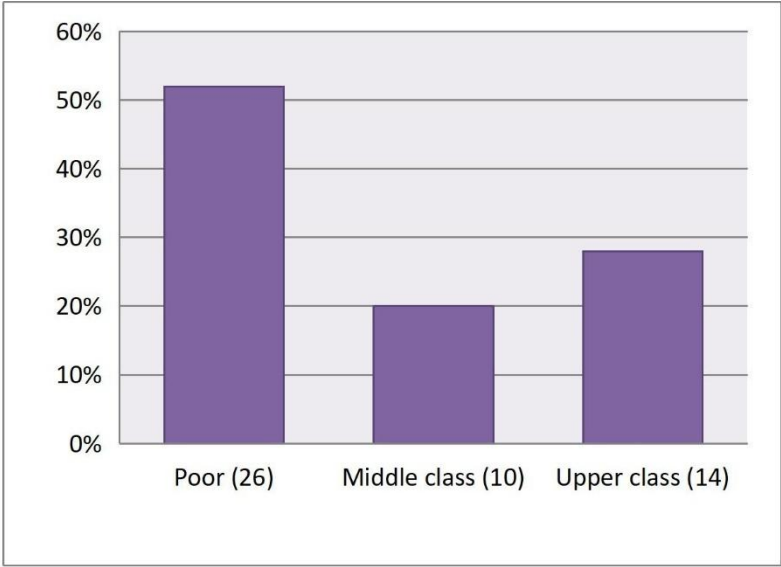


Figure 1 Socioeconomic status of the study population (n=100).

Socioeconomically patients are grouped into three classes. Among the patients the poor class 26(26%) comprising the major

percentage of the patients, which is followed by upper class (14%) and

remaining are middle class (20%) (Figure 1).

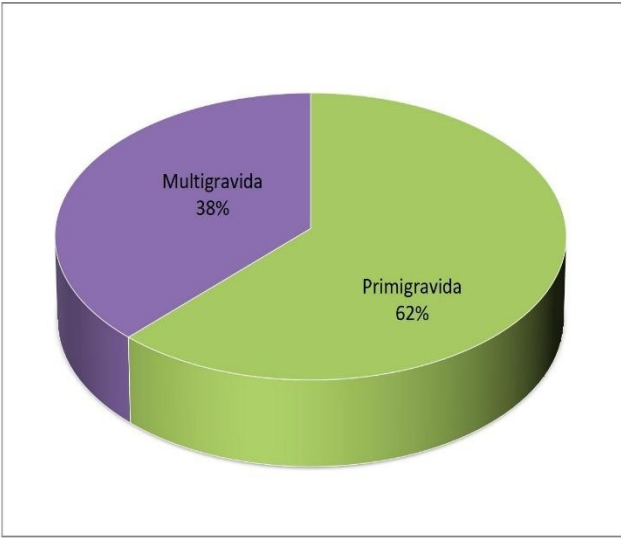


Figure 2 Obstetrics history (Gravidity) of mothers (n=100).

Most of the women were primigravida (62%). Multi gravida (two or more gravida) was seen in (38.0%) of women (Figure 2). Maternal outcome in terms of analgesia demonstrates that onset of analgesia was observed in epidural analgesia after 12 mins. Majority (92.0%) of the patients exhibited effective analgesia throughout the period of labor (Table II).

Table II
Evaluation of analgesia in the study groups (n=100).

Analgesia Parameter	Result & Observations
Time to onset of analgesia (min)	12.3 ± 2.5
Effective analgesia (%)	92

Pain was monitored at half hourly interval after onset of analgesia and it was recorded in the data-sheet. Pain score at onset of analgesia was staggeringly lower after epidural analgesia. P-value is got by comparing with baseline (Table III).

Table III
Changes in VAS score following epidural analgesia (n=total) (n=variable).

Intensity of pain (VAS 0-10 cm)/ pain score (Time)	Mean ± SD	Number of parturients/ N= total	P value
Pre-induction / Baseline	7.5 ± 1.7	100	0.015
at 15 min after induction	1.4 ± 0.2	100	0.011
0.5 hr	1.4 ± 0.1	100	0.018
1 hrs	1.5 ± 0.3	100	0.012
1.5 hrs	1.5 ± 0.2	75	0.015
2 hrs	1.5 ± 0.1	50	0.019
2.5 hrs	1.5 ± 0.4	42	0.015
3 hr	1.5 ± 0.1	40	0.022
3.5 hrs	2.0 ± 0.3	30	0.016
4 hrs	1.4 ± 0.4	20	0.018
4.5 hrs	1.5 ± 0.3	18	0.012
5 hrs	1.5 ± 0.2	16	0.018
5.5 hrs	1.5 ± 0.3	12	0.012
6 hrs	1.5 ± 0.2	7	0.012
> 6 hrs	1.5 ± 0.2	5	0.012

After epidural analgesia, MAP decreased compared with baseline MAP. At the 5th minute, MAP was 73.45+-8.2 mm of Hg, after 30 min, MAP was 75.57+-10.2. Till delivery, follow up was done and MAP was observed stable. P-value is got by comparing with baseline (Table IV).

Table IV

Evaluation of maternal mean arterial pressure (MAP).

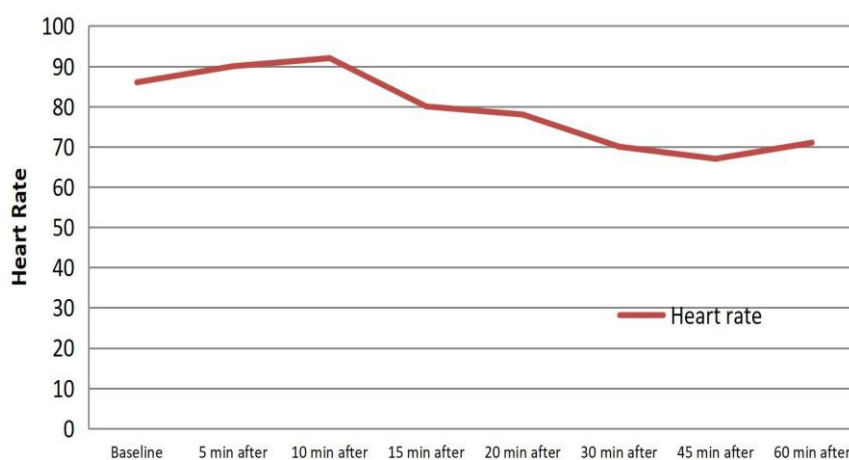
Time point after epidural	Mean arterial pressure -MAP (mmHg)	P- value
Baseline	79.60±11.6	
5 min	73.45±8.2	0.254
10 min	75.40±7.9	0.587
15 min	76.92±8.1	0.382
20 min	76.31±8.6	0.324
30 min	75.57±10.2	0.611
45 min	75.05±9.3	0.468
60 min	79.55±10.8	0.724
120 min	76.55±10.8	0.324
240 min	75.05±9.3	0.468
360 min	75.05±9.3	0.468
>360 min	75.05±9.3	0.468
Till delivery	75.05±9.3	0.468

Majority (98) of the parturients have had normal delivery. Among them only 3 required instrumental delivery (forceps/Ventouse). Only 2 parturients required caesarean delivery (Table V).

Table V

Evaluation of mode of delivery (n=100).

Mode of Delivery	Frequency	Percentage (%)
Normal delivery		
1. Without instrument (forceps, ventouse)	95	95
2. With instrument (forceps, ventouse)	3	3
Caesarean	2	2
Total	100	100

**Figure 3** Trends of changes of heart rate (HR) in the studied group (n=100).

Regarding the heart rate, no significant changes detected after epidural analgesia. Patient's shows slightly increased heart rate at the 10 min time. Following that heart rate decreased. So at the end of follow up we found that, heart rate almost

stabilized in epidural analgesia patients (Figure 3).

Complications like nausea and/or vomiting, respiratory distress, urinary retention were absent after epidural analgesia. Duration of

1st stage of labor was not affected after epidural analgesia. But three (3.0%) parturients experienced prolonged 2nd stage of labor (Table VI).

Table VI

Evaluation of maternal complications (n=100).

Complications	Frequency	Percentage (%)
Nausea/Vomiting	0	0
Prolonged 2nd stage of labor	3	3
Respiratory distress	0	0
Urinary retention	0	0

Neonatal outcome was evaluated in terms of APGAR score at 1 and 5 minutes of birth. The table shows most of the baby

(99%) APGAR score at five minute were between 7-10 and (1%) were between 4-6 (Table VII).

Table VII
Evaluation of neonatal outcome (n=100).

APGAR Score	At first minute (Number of patients with percentage)	At five minutes (Number of patients with percentage)
7-10	94%	99%
4-6	5%	1%
<4	0%	0%
Mean ± SD	8.9 ± 0.7	9.5 ± 0.6

DISCUSSION

This prospective observational study was conducted in the Department of Anaesthesiology, Shaheed Ziaur Rahman Medical College Hospital, Bogura, to observe labor pain management by lumbar epidural analgesia technique. Pregnant women in the active stage of labor who received epidural analgesia according to hospital protocol were included. The present study assessed the efficacy and safety of epidural analgesia during labor and demonstrated significant pain relief. Pain scores at onset and at different time intervals following induction, as well as at the time of delivery, were markedly reduced, indicating effective analgesia and maintenance of low pain intensity throughout labor. Regarding maternal hemodynamics, no significant changes in heart rate were observed following epidural analgesia. A slight increase was noted at 10 minutes, followed by stabilization throughout labor. Mean arterial pressure (MAP) decreased slightly after epidural administration compared with baseline values. At the 5th minute, MAP was 73.45±8.2 mmHg and at 30 minutes it was 75.57±10.2 mmHg; thereafter, it remained stable until delivery. No cases of nausea and/or vomiting, respiratory distress, urinary retention, or hypotension were observed following epidural analgesia. The duration of the first stage of labor was not affected; however, three (3.0%) parturients experienced prolonged second-stage labor. Most women had spontaneous vaginal delivery, while only two (2.0%) required cesarean section due to fetal distress and three (3.0%) required instrumental delivery (forceps/ventouse). Neonatal outcomes were favorable. Most newborns (99%) had APGAR scores between 7 and 10 at five minutes, while only 1% had scores between 4 and 6, indicating good neonatal adaptation following delivery. Epidural analgesia is a central nerve block technique achieved by injection of a local anaesthetic into the epidural space and is widely used for labor pain relief. Currently, over half of parturient women in the United

States and about one-fifth in England and Wales receive epidural analgesia [8,16]. Anim-Somuah and colleagues conducted a meta-analysis of randomized controlled trials and found that epidural analgesia provided superior pain relief, reduced the need for additional analgesia, and lowered the risk of acidosis and naloxone administration [17]. However, it was associated with an increased risk of assisted vaginal birth and a longer second stage of labor. The authors concluded that epidural analgesia is effective in reducing labor pain [18]. These findings are consistent with the present study, where substantial pain reduction was observed throughout labor. Similarly, Sharma and colleagues reported lower pain scores among women receiving epidural analgesia compared with intravenous meperidine, while Dickinson JE and colleagues also demonstrated superior analgesia among women receiving epidural pain relief [14,19]. In terms of maternal and neonatal safety, epidural analgesia was found to be favorable. None of the women experienced nausea, vomiting, respiratory depression, or urinary retention. The low incidence of adverse maternal effects and the favorable neonatal APGAR scores support the safety profile of epidural analgesia. Although concerns have been raised regarding increased operative delivery rates, only 3% of women in the present study required instrumental delivery and 2% underwent cesarean section. The indication for cesarean delivery was fetal distress, which was attributed to obstetric causes rather than direct effects of epidural analgesia. Sharma and associates [14] did not find any significant difference in cesarean delivery rates among women receiving epidural analgesia [14]. While Sharma and Liao et al., reported higher rates of instrumental delivery and prolonged second-stage labor, these findings were not prominent in the current study [14,20]. Jones reported that women receiving epidural analgesia were more likely to experience hypotension and fever; however, neither complication was observed in the present study [21]. Similarly, Fouzia and associates reported no adverse

fetal outcomes and no postpartum urinary retention associated with epidural analgesia [5]. Overall, the findings of this study suggest that epidural analgesia is highly effective for labor pain relief, provides high maternal satisfaction, and does not significantly increase the risk of cesarean section or adversely affect immediate neonatal outcomes. Further studies with larger sample sizes may help evaluate rare adverse effects and long-term neonatal outcomes [18].

LIMITATIONS

Sample were taken by purposive method in which question of personal biasness might arise. Pain perception was not similar for all women. So, here biasness might arise. The observer alone cannot follow up patient's full time. She needed help of colleagues, here biasness might arise. Further trials with large sample-size should be undertaken.

CONCLUSION

Optimum pain management is integral part of smooth parturition. From the findings of the study, it can be concluded that epidural analgesia induces effective analgesia. The intensity of pain is dramatically reduced to a tolerable level following epidural analgesia and is maintained at this level up to delivery. Though Epidural analgesia has fewer side-effects, overall maternal satisfaction is adequate.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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