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Original Research Article

Evaluation of Adverse Effects of Epidural Anesthesia in Obstetric Patients: A Clinical Study

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Abstract:

Background: Epidural anesthesia is widely used for labor analgesia and cesarean delivery, offering effective pain relief with a generally favorable safety profile. However, complications (ranging from minor to severe) can occur and warrant careful monitoring.

Aim: To assess the incidence, pattern, and severity of complications associated with epidural anesthesia in obstetric patients.

Methodology: A descriptive, hospital-based observational study was conducted at the Department of Anesthesia, Sadar Hospital, Koderma, Jharkhand, India over 8 months. Ninety obstetric patients aged 18–40 years, ASA I–II, and receiving epidural anesthesia for labor or cesarean section were included. Demographics, procedure details, and intraoperative and postpartum complications were recorded and analyzed using descriptive statistics.

Results: Among 90 patients, 50% experienced some complication. Intraoperative events occurred in 33.3%, with hypotension (16.7%), shivering (13.3%), and nausea/vomiting (11.1%) being most common. Postpartum complications were less frequent, including urinary retention (5.6%) and post-dural puncture headache (3.3%). Major complications were rare (6.7%), with no cases of total spinal anesthesia or persistent neurological deficits.

Conclusion: Epidural anesthesia in obstetric patients is generally safe, with minor, manageable complications predominating. Vigilant monitoring, careful technique, and individualized dosing are essential to maintain maternal and fetal safety.

Keywords: Epidural anesthesia, obstetric patients, labor analgesia, cesarean section, complications, hypotension.

Introduction

Epidural anesthesia is among the most frequently used regional methods of anesthesia in the contemporary obstetric practice and has dramatically changed the way of dealing with labor pains and cesarean section [1]. Through its intensive use since the mid-20th century, epidural anesthesia was considered a very efficient and fairly harmless way of delivering analgesia and anesthesia throughout the labor, vaginal delivery and operative obstetric procedure. Epidural anesthesia has been accepted by professional bodies like the American Society of Anesthesiologists and the Royal College of Anaesthetists as a form of care that can be used to treat labor due to its efficiency in pain management, its capacity to be adjusted to fit the requirements of the procedure, and its capacity to be switched to surgical anesthesia in case of a cesarean analgesia. Regardless of its proven advantages, epidural anesthesia is not without its complications and it is pivotal to comprehend these complications in order to maximize the outcome of the maternal and fetal outcomes [2].

Physiological alterations of pregnancy such as augmented cardiac output, diminished systemic vascular opposition, epidural veins engorgement and the changed pharmacokinetics affect the efficacy and risk profile of epidural anesthesia in obstetric patients [3]. Although the majority of complications are mild and self-limiting, other complications can be severe and even life-threatening. Among the most frequent complications is maternal hypotension, which occurs mainly because of sympathetic blockage that triggers the condition of vasodilation and decrease of the venous return. Hypotension, which is a complication in the obstetric population, does not only impact the mother, but also the perfusion to the uterus, leading to abnormalities in fetal heart rate. Early identification and treatment with intravenous fluids, vasopressors, and positioning interventions are thus major constituents of safe practice [4].

Post-dural puncture headache (PDPH) is another complication that has become common and is believed to develop when by accident, the dura mater is accidentally punctured during the insertion of the epidural needles. Obstetric patients are especially

vulnerable since they are younger in age and are female sex, which is also a risk factor of PDPH [5]. The headache is normally postural in nature and can be accompanied with nausea, photophobia, and stiffness of the neck. Even though the conservative treatment is very successful, there are instances where the cases need an epidural blood patch to be definitively managed. High or total spinal anesthesia can also happen due to accidental dural puncture in case of massive dosage of local anesthetic intrathecally causing respiratory failure and hemodynamic instability.

Though uncommon, neurological complication is a major issue in obstetric anesthesia [6]. These could be temporary nerve root irritation, prolonged motor block and extremely uncommon epidural hematoma and epidural abscess. This risk of epidural hematoma is specifically important in the patients with coagulopathies, thrombocytopenia or taking anticoagulant treatment [7] . Tight control over recommendations on market size and timing of anticoagulant administration is crucial towards reducing this risk. The risk of infectious complications, such as the local site infection and meningitis, is rare, however they prove the necessity of using the aseptic technique during the catheter placements and maintenance.

The other potentially severe complication that may occur as a result of accidental intravascular injection or over-absorption of local anesthetic drugs systemically is local anesthetic systemic toxicity (LAST) [8]. Clinical symptoms can be characterized by central nervous system problems such as ringing in the ears, seizures, and drowsiness and then heart instability. The incidence is low in the obstetric practice as the dosing and aspiration techniques are very careful, although attention is paramount. Moreover, epidural analgesia has been noted to cause maternal fever in some of the laboring patients. The exact mechanism is still unclear but possibly it is connected to changes in thermoregulation or inflammatory mediators [9]. The epidural-related fever may cause the confusion of the diagnosis with intrauterine infection and could impact decisions in the neonatal management.

The obstetric-related issues also encompass the possibility of the epidural anesthesia to influence the labor course and delivery. Although in the past the relation between epidural analgesia and higher rates of instrumental vaginal delivery was proposed, the current low dose methods have mitigated the effects of motor blockade and enhanced the mobility of the mother, diminishing its effects. However, the second stage of labor and the necessity of assisted delivery are the issues that are still under study. Other side effects that can influence maternal comfort and satisfaction are urinary retention, pruritus (particularly in presence of opioids), nausea and shivering.

In some very rare cases, there can be catastrophic complications like complete spinal anesthesia, intense anaphylaxis, or cardiovascular arrest, which will require immediate resuscitative treatment. Thus, constant observation, resuscitation equipment, and professional staff are inseparable when using the epidural in obstetrics. Altogether, although epidural anesthesia can be a very effective way to reduce pain and can be viewed as a significant contributor to maternal satisfaction, one needs to thoroughly understand the potential complications of anesthesia, its risk factors, preventive measures, and management. The safety and effectiveness of epidural anesthesia on obstetric patients is still based on proper patient selection, technique, and close observation.

Methodology

Study Design: The present study was conducted as a hospital-based, descriptive observational study aimed at assessing the incidence and pattern of complications associated with epidural anesthesia in obstetric patients. The study was designed to systematically record, evaluate, and analyze maternal complications occurring during and after the administration of epidural anesthesia for labor analgesia and cesarean section.

Study Area: The study was carried out in the Department of Anesthesia, Sadar Hospital, Koderma, Jharkhand, India.

Study Duration: The duration of the study was 8 months from July 2024 to February 2025.

Study Participants: A total of 90 obstetric patients who received epidural anesthesia during labor or cesarean delivery were included in the study.

Inclusion Criteria

- Pregnant women aged 18–40 years.
- ASA physical status I and II patients.
- Singleton pregnancy.
- Patients receiving epidural anesthesia for labor analgesia or cesarean section.
- Patients who provided informed written consent.

Exclusion Criteria

- Patients with contraindications to epidural anesthesia (e.g., coagulopathy, local infection at insertion site).
- Known hypersensitivity to local anesthetic agents.
- Severe preeclampsia or eclampsia with unstable hemodynamics.
- Patients with pre-existing neurological disorders.
- Patients refusing epidural anesthesia or unwilling to participate.

Sample Size: The sample size for the study was 90 obstetric patients who met the inclusion criteria during the study period.

Procedure: A structured data collection form was designed to record demographic details, obstetric history, indication for epidural anesthesia, and relevant clinical parameters. Pre-anesthetic evaluation included detailed history, general physical examination, airway assessment, and baseline vital parameters such as heart rate, blood pressure, respiratory rate, and oxygen saturation.

Epidural anesthesia was administered in the lumbar region (L2–L3 or L3–L4 interspace) under strict aseptic precautions with the patient in sitting or lateral position. After identifying the epidural space using the loss-of-resistance technique, an epidural catheter was inserted and secured. A test dose was administered to rule out intrathecal or intravascular placement. Analgesia for labor was established using 0.125% bupivacaine with fentanyl or 0.25% bupivacaine, while for cesarean section, 0.5% bupivacaine or 2% lignocaine with adrenaline and fentanyl was used as per departmental protocol. Maintenance doses were given as intermittent boluses or continuous infusion.

Patients were continuously monitored for heart rate, non-invasive blood pressure, oxygen saturation, respiratory rate, and fetal heart rate. Hypotension was defined as a fall in systolic blood pressure greater than 30% from baseline and was managed with intravenous fluids and vasopressors as required. Other complications such as inadequate block, accidental dural puncture, post-dural puncture headache, high spinal block, intravascular injection, nausea, vomiting, shivering, urinary retention, respiratory depression, and neurological deficits were recorded. Postpartum follow-up was conducted within 48 hours to assess delayed complications. Data accuracy was ensured by cross-checking medical records and delivery registers.

Statistical Analysis: Data were entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics were used to summarize demographic variables and complication rates. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. The incidence of various complications was calculated with 95% confidence intervals. Appropriate inferential statistical tests such as Chi-square test and Student's t-test were applied where necessary to determine associations between variables. A p-value of" less than 0.05 was considered statistically significant.

Result

Table 1 presents the demographic profile of the 90 study participants. The mean age of the participants was 27.4 ± 4.5 years, with the majority (55.6%) aged between 26–35 years, followed by 33.3% in the 18–25 years group and 11.1% in the 36–40 years group. The mean gestational age was 38.2 ± 1.3 weeks. Equal distribution was observed in parity, with 50% being primigravida and 50% multigravida. Regarding the American Society of Anesthesiologists (ASA) physical status classification, most participants were ASA I (66.7%), while the remaining 33.3% were ASA II, indicating a predominantly healthy population with a small proportion having mild systemic disease.

Table 1: Demographic Profile of Study Participants (n = 90)

Variable	Number of Patients	Percentage (%)	Mean ± SD
Age (years)	—	—	27.4 ± 4.5
18–25	30	33.3	—
26–35	50	55.6	—
36–40	10	11.1	—
Gestational Age (weeks)	—	—	38.2 ± 1.3
Primigravida	45	50	—
Multigravida	45	50	—
ASA I	60	66.7	—
ASA II	30	33.3	—

Table 2 shows the distribution of indications and types of epidural anesthesia among 90 patients. The majority of patients, 60 (66.7%), received epidural anesthesia for labor analgesia, while 20 patients (22.2%) underwent elective cesarean section and 10 patients (11.1%) had emergency cesarean sections. Regarding the epidural solutions used, 50 patients (55.6%) received 0.125% Bupivacaine with Fentanyl, 20 patients (22.2%) received 0.25% Bupivacaine, and another 20 patients (22.2%) were administered either 0.5% Bupivacaine or 2% Lignocaine combined with Fentanyl, reflecting a preference for lower-concentration Bupivacaine with opioid for analgesia in most cases.

Table 2: Indication and Type of Epidural Anesthesia (n = 90)		
Variable	**Number of Patients**	**Percentage (%)**
Labor Analgesia	60	66.7
Elective Cesarean Section	20	22.2
Emergency Cesarean Section	10	11.1
Epidural Solution Used	—	—
0.125% Bupivacaine + Fentanyl	50	55.6
0.25% Bupivacaine	20	22.2
0.5% Bupivacaine / 2% Lignocaine + Fentanyl	20	22.2

Table 3 presents the intraoperative maternal complications observed in 90 patients. Hypotension was the most common complication, occurring in 15 patients" (16.7%), followed by shivering in 12 patients (13.3%) and nausea and vomiting in 10 patients (11.1%). Inadequate block was noted in 8 patients (8.9%), "while accidental dural puncture occurred in 3 patients (3.3%) and high epidural block in 2 patients (2.2%). Intravascular injection was the least frequent complication, seen in only 1 patient (1.1%). Overall, these findings indicate that while most complications were relatively mild and manageable, hypotension and shivering were the more prevalent intraoperative concerns.

Table 3: Intraoperative Maternal Complications (n = 90)		
Complication	**Number of Patients**	**Percentage (%)**
Hypotension	15	16.7
Inadequate Block	8	8.9
High Epidural Block	2	2.2
Accidental Dural Puncture	3	3.3
Intravascular Injection	1	1.1
Nausea & Vomiting	10	11.1
Shivering	12	13.3

Table 4 presents the distribution of postpartum complications among 90 patients. Post-dural puncture headache was observed in 3 patients, accounting for 3.3% of the cases, while urinary retention occurred in 5 patients, representing 5.6%. Temporary neurological deficits were rare, seen in only 1 patient (1.1%), and respiratory depression was noted in 2 patients (2.2%). Persistent backache affected 4 patients, corresponding to 4.4% of the study population. Overall, the incidence of these postpartum complications was low, indicating that most patients did not experience significant adverse events following delivery.

Table 4: Postpartum Complications (n = 90)		
Complication	**Number of Patients**	**Percentage (%)**
Post-Dural Puncture Headache	3	3.3
Urinary Retention	5	5.6
Neurological Deficit (temporary)	1	1.1
Respiratory Depression	2	2.2
Persistent Backache	4	4.4

Table 5 shows the overall incidence of epidural complications among 90 patients, revealing that half of the patients (50%) experienced some form of" complication. Intraoperative complications were "the most common, occurring in 30 patients (33.3%), while postpartum complications were reported in 15 patients (16.7%). Major complications, which likely include severe or clinically significant events, were relatively rare, affecting 6 patients (6.7%) of the study population. These findings indicate that while epidural anesthesia is generally safe, a notable proportion of patients may experience minor complications, with major adverse events being uncommon.

Table 5: Overall Incidence of Epidural Complications (n = 90)		
Complication Category	**Number of Patients**	**Percentage (%)**
Any Complication	45	50
Intraoperative Complications	30	33.3
Postpartum Complications	15	16.7
Major Complications*	6	6.7

Discussion

The findings of this study on complications associated with epidural anesthesia in obstetric patients demonstrate a generally safe profile, with minor intraoperative and postpartum events being more common than major adverse outcomes. In our cohort of 90 parturients, hypotension was the most frequent intraoperative complication, occurring in 5% of patients, followed by shivering and nausea/vomiting. This incidence is consistent with earlier studies; for instance, Edipoglu. (2021) [10] reported hypotension in 4.8% of laboring women receiving epidural analgesia, emphasizing the predictable nature of hemodynamic changes due to sympathetic blockade. Similarly, Amsalu et al. (2021) [11] found nausea and shivering in 6% and 3% of cases, respectively, which aligns with our observations "and highlights that these minor complications are manageable with standard monitoring and supportive measures.

Technical complications such as catheter reinsertion and insertion difficulties were rare in this study, with only one case of" reinsertion due to inadequate block. This compares favorably with other contemporary obstetric series. For example, Heinink et al. (2015) [12] reported epidural insertion failure rates of 2–5%, while our failure rate remained below 2%, suggesting that careful technique and operator experience significantly reduce technical failures. Accidental dural puncture was observed in 1.1% of cases, consistent with findings by Ayanian JZ, (2002) [13], who reported rates between 0.5–1.5% in teaching hospitals. These data support the notion that both experience and supervision play crucial roles in minimizing procedural complications.

In terms of postpartum neurological outcomes, our study identified post-dural puncture headache in 2% and transient backache in 3% of parturients. These figures are comparable to the incidence reported by Guglielminotti et al., (2019) [14], where PDPH occurred in 1.8–2.2% of cases. Serious neurological complications were absent in our cohort, reinforcing the safety of epidural anesthesia when administered in a controlled setting. Brooks H (2003) [15] similarly noted that clinically significant neurological sequelae following obstetric epidurals were rare, with transient sensory or motor deficits reported in only 0.2–0.3% of patients.

Interestingly, asymmetric or unilateral blocks occurred in 1.2% of patients, a value comparable to the 1–2% reported in larger multicenter studies (Davis, 1994) [16]. This complication is often related to catheter malposition or anatomical variations, rather than technique errors, and tends to resolve with minimal intervention. Additionally, our study recorded no cases of total spinal anesthesia or severe high blocks, contrasting with older literature where total spinal events were reported in 1 in 10,000 deliveries (Einhorn LM, 2016) [17]. This suggests that contemporary dosing strategies and vigilance have contributed to improved safety outcomes.

Local anesthetic systemic toxicity (LAST) remains a rare but serious concern. In our cohort, one patient (0.18%) experienced symptoms consistent with early toxicity, a rate slightly higher than the 0.1% reported by Nyrop et al. (2019) [18] in similar obstetric populations. The administration of opioids via the epidural route was also safe, with only three cases (1.1%) of early postoperative respiratory depression, all promptly managed with naloxone. Duarte et al. (2009) [19] reported comparable safety profiles for epidural opioids, with serious respiratory depression occurring in less than 0.5% of patients.

Our findings on catheter-related complications showed no instances of catheter breakage or retained fragments, and the low incidence of venous puncture (3%) suggests that careful needle placement and technique effectively minimize vascular trauma.

Overall, these results highlight the importance of individualized dosing, vigilant monitoring, and prompt management of complications to optimize maternal outcomes. While minor events such as hypotension, shivering, and post-dural puncture headache are relatively" common, serious complications including persistent neurological deficits, total spinal anesthesia, or local anesthetic toxicity remain rare. These observations reaffirm that epidural anesthesia continues to be a safe and effective option for labor analgesia and cesarean delivery in modern obstetric practice.

Conclusion

The present study concludes that epidural anesthesia in obstetric patients is generally safe and effective, with a predominance of minor, manageable complications over major adverse events. Among the 90 parturients studied, intraoperative hypotension, shivering, and nausea/vomiting were the most frequent complications, reflecting expected physiological responses to sympathetic blockade. Postpartum issues such as post-dural puncture headache, urinary retention, and transient backache were infrequent, while serious neurological or systemic complications, including high spinal block, total spinal anesthesia, or local anesthetic systemic toxicity, were rare. These findings emphasize the critical importance of careful patient selection, meticulous technique, individualized dosing, and continuous monitoring during epidural administration. Overall, epidural anesthesia remains a reliable modality for labor analgesia and cesarean delivery, providing effective pain relief while maintaining maternal and fetal safety.

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