



Original Research Article

Effectiveness of epidural anesthesia on progress of labor and vaginal delivery

Article History:

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Received: 12-11-2025

Revised: 25-11-2025

Accepted: 20-12-2025

Published: 30-12-2025

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Abstract: Background: One of the worst types of pains that women feel during childbirth is labor pain, and adequate pain management is a vital part of contemporary obstetric care. **Objective:** To establish the validity of epidural anesthesia with regard to the development of labor and vaginal delivery. **Methods:** The study was a Prospective observational comparative study in the labor room of Memon Medical institute hospital, Karachi, which took six months following the approval of the Institutional Review Board. Out of the 124 pregnant women who met the inclusion criteria, consecutive sampling technique was used to enroll them and participants would be divided into two groups 62 women who had epidural analgesia and 62 women who did not have epidural analgesia during labor. The analysis of data was done using SPSS version 24 with a p-value of less than 0.05 as being a statistically significant value. **Results:** Participants in both the epidural and non-epidural groups had similar average ages (27.8 ± 4.2 vs 26.9 ± 4.5). The epidural group had a much longer labor phase than the non-epidural group (2.3 ± 0.7 vs 1.6 ± 0.6 hours; $p=0.001$), but no significant difference of the first and third labor phase. There were no differences in the mode of delivery, as well as neonatal outcomes such as birth weight and Apgar scores between the two groups. **Conclusion:** Epidural analgesia does not affect neonatal outcomes or mode of delivery, as well as, it does not adversely impact the second stage of labor.

Keywords: Epidural analgesia, labor pain, labor stages, neonatal outcomes, vaginal delivery.

INTRODUCTION

Labor pain is commonly known to be one of the greatest pains that women undergo during the process of giving birth. Smooth pain control in the course of labor has thus been an imperative aspect of the contemporary obstetrics to enhance maternal comfort and overall childbirth experience. Epidural analgesia is regarded as the best method of analgesia among those offered in the practice, due to its better analgesic properties and relative safety to both mother and child. [1]. The application of epidural pain medication has grown in most countries with more women opting to have painless labor and better satisfaction during delivery [2].

The epidural analgesia can be explained as the use of local anesthetics that may be combined with or without opioids into the epidural space to prevent the pain signaling from uterine and cervical tissues during labor. The method is very effective in reducing pain during labor and gives the mother a chance to be awake and be actively involved in the process of giving birth [3]. Latest developments in anesthetic drugs and methods have also added to the safety and efficacy of labor analgesia. Indicatively, some recent pharmacological regimes, including esketamine and sufentanil have been promising in increasing analgesic effects and decreasing the incidence of psychological complications in the postpartum period such as postpartum depression [4].

Regardless of its advantages, the epidural analgesia use is still the matter of constant debates due to its possible impact on the labor processes and the maternal outcome. Some researches have been undertaken to measure its effects on the time and the course of labor. There is some evidence that epidural analgesia can actually extend some part of the labor, especially the second part of labor but the findings have not consistently corroborated the same across different populations and clinical scenarios [1,2]. The systematic reviews also discuss the implications of labor analgesia on the overall obstetric outcomes with the benefits of pain management and the importance of attentively monitoring maternal and fetal parameters in case of its use [5].

The other issue linked with epidural analgesia is incidence of intrapartum maternal fever reported in a number of clinical trials. The recent studies show that there is a significant correlation between epidural analgesia and maternal temperature rise during labor, so close monitoring of clinical conditions should be the priority when the mentioned method is employed [6]. In addition, most of the factors that determine the choice of using epidural analgesia include maternal education, socioeconomic status, cultural beliefs and institutional practices that may influence in the

consumption and use of epidural analgesia among the pregnant women [7].

Other methods of epidural administration have been also explored to maximize the analgesic action with minimal complications. As an example, the comparison of the conventional epidural analgesia with the dural puncture epidural method has indicated that analgesia onset, quality, and maternal satisfaction differed, which indicates that the choice of a technique could affect the clinical outcome [8]. Epidural analgesia has also been studied through audits and observational studies conducted in various healthcare settings to give a more insight into how it is used, its complications, and the overall effectiveness of this method in the daily obstetric practice [9].

Other than providing relief during childbirth, painless delivery has also been linked to better psychological wellbeing of the mother and the birth experience being more positive. Women who get sufficient analgesia during labor usually report a reduction in stress and anxiety, which can lead to improved mental health after partaking [10]. Considering these possible advantages and the existing worries about its impact on the evolution of labor and maternal outcome, more studies are necessary to determine the influence of epidural analgesia in various clinical practices. Hence, the proposed study will determine the impact of epidural analgesia on the outcomes of labor and maternal wellbeing.

METHODS

The study was a Prospective observational comparative study that was done in the labor room of Memon Medical Institute Hospital, Karachi. This research was conducted in a duration of Six months from May 2025- October 2025, following the consent of the synopsis of the research by the College of Physicians and Surgeons Pakistan (CPSP). The study is conducted under the consent of the Institutional Review Board, Memon Medical Institute Hospital, with approval no: [REF NO: IRB/MMIH/2023/18]. The pregnant women who were admitted in the labor room were informed and signed written consent form.

The population was comprised of gravid females who came to give birth. The sample was determined with the assistance of Open Epi online software, where the presumed frequency of epidural analgesia (12.5%) and non-epidural analgesia (5%) in the second stage of labor were taken into consideration in a study in a local tertiary care hospital [10]. The sample size was determined at 124 participants and 95% confidence level and 5% margin of error, therefore, 62 women in each group. The participants were selected through the consecutive sampling technique based on eligibility criteria.

Pregnant women who fulfilled the inclusion criteria were recruited in the study. The inclusion criteria were singleton pregnancies of pregnant women (primigravida or multigravida), cephalic presentation, and a gestational age of 28-42 weeks. To limit the possibility of confounding factors, women were excluded in case there were contraindications to epidural analgesia such as patient refusal, sepsis, or coagulation disorders.

Following the enrollment, the participants would be divided into two groups, one that would receive epidural analgesia and the other one that would not receive epidural analgesia. The administration of epidural analgesia was made when the patient achieved the cervical dilatation of 4 cm and demanded the pain killing procedure, and was pre-procedurally assessed by the anesthesiologist. Following the measurement of the baseline vital signs, the patient was placed in either the sitting or lateral position with the flexion of the back. The lumbar epidural space was inserted through a hollow needle into the lumbar epidural space with a standardized technique following aseptic preparation and local anesthesia of the skin. The needle was then passed through a small plastic catheter so that anesthetic drugs could be continuously infused. Analgesic agents were used as maintenance doses in order to maintain pain relief, and supplementary doses were also given as needed.

The blood pressure in a mother was checked at irregular intervals since epidural anesthesia had the potential to lead to hypotension. Cardiotocography

was used to continuously monitor the fetal heart rate during labor, and was done in epidural analgesic patients. Partogram was used to monitor the advancement of the labor, and the time taken in each phase of the labor was checked in both groups. Since the second phase of labor might be extended in women who get epidural analgesia, up to three hours of extended labor was allowed among primigravida women and two hours among multigravida women. On the contrary, the second stage was taken to last up to two hours among patients without epidural analgesia and an hour among women of multigravida. The delivery mode was recorded in relation to every patient. The indication of the procedure was also noted in case of assisted vaginal delivery or cesarean section. Neonatal outcomes were recorded on gender, weight of birth and Apgar scores, one and five minutes respectively following birth. Also, the time taken to repair episiotomy was documented in patients receiving epidural analgesia and those receiving no analgesic.

Statistical Analysis: The Statistical Packages of Social Sciences (SPSS) version 24 was used in data analysis. Numerical variables were described using descriptive statistics (mean and standard deviation) whereas frequencies and percentages were used to describe categorical variables. The Shapiro-Wilk test was used to test the normality of the data. Logistic regression analysis was done to assess the effect of the epidural analgesia to different study variables. The p-value of below 0.05 was regarded as statistically significant.

RESULTS

A total of 124 pregnant women were included in the study and were equally divided into two groups: 62 women received epidural analgesia while 62 women did not receive epidural analgesia during labor. The baseline demographic and obstetric characteristics of the participants are presented in **Table 1**.

Table 1: Baseline demographic and obstetric characteristics of study participants (n=124)

Variable	Epidural Analgesia (n=62)	No Epidural Analgesia (n=62)	p-value
Age (years), mean $\pm$ SD	27.8 $\pm$ 4.2	26.9 $\pm$ 4.5	0.214
Primigravida, n (%)	36 (58.1%)	34 (54.8%)	0.702
Multigravida, n (%)	26 (41.9%)	28 (45.2%)	
Gestational age (weeks), mean $\pm$ SD	38.6 $\pm$ 1.4	38.4 $\pm$ 1.6	0.418

The comparison of the duration of different stages of labor between the epidural and non-epidural groups is summarized in **Table 2**.

Table 2: Comparison of duration of labor stages between study groups

Variable	Epidural Analgesia (n=62) Mean $\pm$ SD (hours)	No Epidural Analgesia (n=62) Mean $\pm$ SD (hours)	p-value
First stage of labor	7.9 $\pm$ 1.6	7.4 $\pm$ 1.8	0.083
Second stage of labor	2.3 $\pm$ 0.7	1.6 $\pm$ 0.6	0.001
Third stage of labor	0.17 $\pm$ 0.05	0.16 $\pm$ 0.04	0.291

The mode of delivery and neonatal outcomes among participants in both groups are presented in **Table 3**.

Table 3: Mode of delivery and neonatal outcomes among study participants

Variable	Epidural Analgesia (n=62)	No Epidural Analgesia (n=62)	p-value
Normal vaginal delivery, n (%)	44 (71.0%)	48 (77.4%)	0.421
Assisted vaginal delivery, n (%)	8 (12.9%)	5 (8.1%)	
Cesarean section, n (%)	10 (16.1%)	9 (14.5%)	
Birth weight (kg), mean $\pm$ SD	3.08 $\pm$ 0.42	3.02 $\pm$ 0.39	0.392
Apgar score at 1 min, mean $\pm$ SD	7.4 $\pm$ 0.9	7.5 $\pm$ 0.8	0.511
Apgar score at 5 min, mean $\pm$ SD	8.9 $\pm$ 0.6	9.0 $\pm$ 0.5	0.334

DISCUSSION

The epidural analgesia has widely been regarded as the best way to relieve labor-related pain, and its use has been on an increase in the contemporary obstetric practice. In the past, it has been stated that epidural analgesia causes a great reduction in maternal pain and contentment without significantly reducing the safety of the mother or the infant [11, 12]. The safety profile of epidural analgesia has been improved by further development of anesthetic methods and better monitoring, therefore, it is an option of choice in the management of pain during labor in most healthcare facilities [13].

In the current investigation, the first stage of labor took a little bit longer in the epidural group than in non-epidural group, but the difference was not significant. The same results have been documented in other studies in which epidural analgesia had no significant effect in terms of the first stage of labor progression. Wang et al. found that epidural analgesia did not have significant effects on length of time in the initial phase of labor, but might have some effects in subsequent phases based on obstetric and maternal conditions [14].

The findings of this research revealed the statistically significant extension of the second phase of labor in women who underwent epidural analgesia. This finding is in agreement with a number of past researches, which indicated a longer second stage in patients under epidural analgesia because of lower maternal bearing-down reflex and less pelvic muscle tone [15]. It has also been suggested by systematic reviews that epidural analgesia can indeed extend the second labor stage but this extension does not necessarily imply negative maternal or neonatal outcomes provided proper obstetric guard is kept [16].

Concerning the mode of delivery, the current research study showed that the epidural and non-

epidural groups recorded similar rates of normal vaginal delivery, assisted vaginal delivery and cesarean section. These results are in line with the past cohort research studies that revealed that epidural analgesia does not have a significant effect on the incidence of cesarean section when used in the rightful manner during labor [17]. Moreover, the outcomes of neuraxial analgesia during postpartum have been found to be, on the whole, positive, and there is no other significant rise in maternal morbidity or operative delivery rates [18].

Regarding the neonatal outcome, the current research identified no meaningful difference between the two groups in regards to the birth weight or the Apgar scores at one and five minutes. The findings are in line with previous studies that have shown that epidural analgesia does not have a negative effect on neonatal wellbeing or immediate postnatal adaptation [19]. Moreover, the results of the large population-based studies also showed that the use of epidural analgesia during labor is not linked to undesirable neonatal outcomes and is still a safe analgesic method in the case of both mother and baby [20].

In general, this research study provides evidence to the accumulating body of literature that epidural analgesia offers the most effective pain management during childbirth with little regard to maternal and neonatal outcomes, though, a small increase in the second phase of labor might be possible. Effective mitigation of possible risks in case of prolonged labor stages is possible through proper monitoring and obstetric management.

Limitations of study: Although this piece of work was insightful, it was limited in a number of ways that should be taken into consideration when defining the findings. To begin with, the research was carried out at one tertiary care hospital, thus restricting the ability to generalize the findings to other health care units with different patient

populations and clinical activities. Second, the sample was relatively small and this may limit the statistical power to identify a smaller difference in maternal and neonatal outcomes in the two groups. Third, despite the efforts to reduce the confounding effects by incorporating inclusion and exclusion criteria, other possible variables were not studied and they might have affected the results of labor and delivery, including maternal body mass index, oxytocin augmentation, and individual pain tolerance.

CONCLUSION

Finally, epidural analgesia was also discovered as an effective pain management system in the course of labor and linked with statistically significant reduction in the length of the second stage of labor. It however did not have any significant effect on the first or third stage of the labor and the mode of delivery and the neonatal outcomes like birth weight and Apgar scores. These results indicate that when maternal and fetal monitoring is considered right, epidural analgesia can safely be used in managing the pain of labor. More multicentric trials involving more participants are also suggested in order to have a greater evaluation of the long-term maternal and newborn outcomes related to epidural labor analgesia.

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