

Intrapartum Epidural Anesthesia and Obstetric Outcome in Nulliparous Women with Term Labor: An analysis of 2 years' Experience

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Abstract

Aim: to ascertain whether labour profiles and delivery outcomes of nulliparous women who received epidural analgesia were comparable to those of women whose labour was managed with alternative forms of pain relief.

Patients and Methods: a prospective, randomised, controlled clinical study carried out in Saudi German and Elhussine University hospitals. Recruitment was open to 100 nulliparous women planning a vaginal delivery of a term singleton foetus.

Results: 100 women, with gestational age of 37–41 completed weeks, were chosen at random to receive either continuous epidural analgesia (EPI) or alternative forms of pain relief (NEPI). Compared to the EPI group, the NEPI group's labour took less time to deliver ($P < 0.05$). The first stage's mean duration was 3.7 ± 1.1 hours compared to 4.8 ± 3.1 hours ($P < 0.05$), while the second stage's mean duration was 102.4 ± 9.3 minutes compared to 132.1 ± 15.8 minutes ($p < 0.05$). The mean NEPI dose of oxytocin was 10.5 ± 2.3 units, while the mean EPI dose was 15.6 ± 2.5 units ($p < 0.05$).

While NEPI groups had higher rates of spontaneous vaginal deliveries and caesarean sections than EPI groups, NEPI groups required fewer surgical deliveries overall ($p < 0.05$). VAS scores during labour were less significantly in EPI group ($p < 0.05$).

Conclusion: Regardless of their intention to labour, nulliparous women use epidural analgesia frequently. Other pain management techniques are linked to a slight but statistically significant decrease in the average length of labour and the rate of surgical delivery in women who do not plan to use epidural analgesia as their primary analgesic modality.

Key words: intrapartum epidural anesthesia; nulliparous women; term labor

Introduction

One of the most common pains is labour pain, which may have an impact on both the mother and foetus by causing a number of neurophysiological changes, including an increase in maternal oxygen stress hormones, an increase in blood pressure, and a decrease in foetal oxygen transport [1]. One of the best methods for giving expectant mothers superior intrapartum analgesia at the moment is epidural analgesia (EA) [2, 3]. Parturients who request EA during labour now make up 20–70% of all deliveries, a significant increase from previous years [4–7].

The impact of EA and pain relief during childbirth on maternal and neonatal outcomes has been studied since EA was first introduced into the field of labour analgesia. It is debatable, though, how EA affects labour pain relief. Numerous studies have demonstrated that the positive analgesic effects are

associated with a number of negative outcomes, including longer labour times, a rise in instrumental vaginal deliveries, and emergency caesarean sections [8–11]. The research that has been done on the connection between EA and neonatal outcomes is conflicting when it comes to the analgesic effects on the infant [12–14]. Furthermore, it's unclear if the rise in maternal or newborn morbidity is a result of EA.

Research on the effects of anaesthesia on the outcomes of mothers and newborns is still ongoing. Future and ongoing research in these fields may enhance physicians' capacity to customise obstetric anaesthesia care. This study sought to ascertain the impact of EA on maternal-neonatal outcomes with regard to labour duration.

Patients and Methods

Between January 2020 and January 2022, Elhussine University and Saudi German hospitals hosted this prospective randomised controlled clinical experiment. The Institutional Ethics Committee provided prospective approval for this trial's conduct. During the antepartum phase, 100 nulliparous women with a singleton foetus who planned to deliver vaginally, were selected from the hospital's prenatal clinics. At first, written materials describing the research and the possible intrapartum analgesic choices were given to the women. The criteria for recruitment eligibility were a cervical dilatation of ≥ 4 cm, a gestational age of 37–41 completed weeks, a willingness to be assigned to either research group, and the absence of a contraindication to epidural analgesia.

This study's objective was to evaluate the potential impacts of The ladies were divided into two groups: the epidural analgesia group (EPI) and the nonepidural group (NEPI). Women assigned to the NEPI group were urged to take control of their labour with medical guidance and to refrain from using epidural analgesia. Among the pain management techniques used were nitrous oxide inhalation, injectable pethidine (1.5 mg/kg maternal body weight), and non-pharmacological pain reduction techniques. It was recommended that women assigned to the EPI analgesia group use epidural analgesia as their main method of pain management during childbirth.

At the beginning of the trial, pain was measured using a 0–100 mm Visual Analogue Scale (VAS). From then on, pain was measured every two hours, and during the second stage of labour, every hour. Vaginal exams were conducted to assess the progress of labour on admission, before analgesia was administered, before oxytocin was started, and every 2–4 hours after that. An active management of labour protocol was followed. Amniotomy was carried out either at the start of oxytocin induction or after increasing cervical dilatation was seen and it was thought that amniotomy would be safe when the foetal head was applied to the cervix.

For the purpose of augmentation or induction of labour, oxytocin was started at a rate of 2 mU/min and increased incrementally by 2 mU/min every 30 minutes, up to a maximum of 36 mU/min. When there was no increasing cervical dilatation over a period of 2–4 hours, ineffective labour was identified. When sufficient uterine activity failed to cause the foetal head to descend or the cervical dilatation to proceed, dystocia was detected. When possible, all mothers had continuous electronic foetal heart rate monitoring.

Results

During the course of the trial, a total of 100 nulliparous women were enrolled, and they were randomised to receive either EPI or NEPI analgesia.

Between the two groups, there were no variations in obstetric or demographic characteristics (Table 1).

Parameter	Group NEPI (50 cases)	Groups EPI (50 cases)	P value
Age	22.7 ± 3.1	22.5 ± 2.9	> 0.05
Gestational age	39.5 ± 1.6	38.9 ± 1.4	> 0.05
BMI	21.5 ± 2.4	21.1 ± 2.6	> 0.05
Maternal education			> 0.05
• Post secondary	31	30	
• Secondary or less	19	20	
Smoking			> 0.05
• Yes	7	6	
• No	43	44	
Antenatal complications			> 0.05
• DM			
• HTN	1	2	
• Cardiac diseases	2	2	
• Anemia	1	1	
• Thyroid disorders	12	13	
	1	1	
Induction of labor	9	8	> 0.05

Table 1: Comparison of the Demographic parameters of the study populations

Compared to the EPI group, the NEPI group's labour took a shorter total time (Table 2). Both the first and second phases of labour showed this variation in length. When the first analgesic was administered, the groups' cervical dilatation was comparable between the two analgesia groups. At an hour into labour, there were significant differences in VAS pain scores between NEPI and EPI during the early, late, and second phases of labour.

The groups varied significantly in their need for oxytocin augmentation during labour. Compared to the EPI group, the NEPI group required a considerably lower amount of instrumental administration ($P < 0.05$). There

was a significant difference between the two groups in terms of spontaneous vaginal birth and caesarean sections; the NEPI group had a greater rate of spontaneous vaginal deliveries and caesarean sections than the EPI group ($P < 0.05$).

Maternal fever in labour (temperature $> 37.5^{\circ}\text{C}$) was substantially related with epidural analgesia, and the necessity for maternal urine catheterization during labour was much higher in the EPI group. There were no discernible variations between the groups' short-term results or newborn biometric characteristics (Table 2).

Parameter	Group NEPI (50 cases)	Group EPI (50 cases)	P value
Mean rate of active 1 st stage (≥ 6 cm) in hours	3.7 ± 1.1	4.8 ± 3.1	< 0.05
Duration of 2 nd stage in min	102.4 ± 9.3	132.1 ± 15.8	< 0.05
Cervical dilatation on admission	4.1 ± 0.6	4.3 ± 0.4	> 0.05
VAS			
• Cervical dilatation 4-6 cm	56	31	
• Cervical dilatation 8 cm	62	30	< 0.05

• 2nd stage of labor	65	35	
• Oxytocin need	38	49	
• Mean oxytocin needed dose	10.5 ± 2.3	15.6 ± 2.5	<0.05
Delivery mode			
• SVD	31	24	< 0.05
• F	4	9	
• V	4	10	
• CS	11	7	
Birth weight (kg)	3.1 ± 0.57	3.2 ± .61	> 0.05
5 min Apgar score <7	12	11	> 0.05
NNICU admission	4	4	> 0.05
Postpartum hemorrhage	5	6	> 0.05
Maternal postnatal length of stay (hours)	19.4± 2.6	18.5± 2.9	> 0.05
Maternal urinary catheter need	2	12	< 0.05
Maternal fever	3	11	< 0.05

Table 2: Comparison of the labor parameters of the study populations

Discussion

Labour is an unpleasant event for most women. Analgesia can take many different forms: nonpharmacological analgesia (such as local heat, transcutaneous nerve stimulation, massage, showers, baths, acupuncture), systemic analgesia (such as inhaled nitrous oxide and intramuscular or intravenous opioid), or regional analgesia. The latter is usually provided by a trained health professional, such as a nurse. Because epidural analgesia provides excellent pain relief, women and obstetricians have welcomed it and are using it more frequently. Its possible negative consequences have received less attention until lately. There has been debate over the past ten years about a possible detrimental effect on labour progress, since an increase in the frequency of dystocia has led to a higher rate of caesarean sections. The effectiveness of non-epidural analgesic treatments in labour has been compared with epidural analgesia in many randomised controlled studies (15).

The results of this study showed that a longer duration of the second and overall phases of labour was linked to epidural anaesthesia (EA). This also had an impact on the rate of instrumental deliveries without any significant negative effects on the mother or the newborn, and, interestingly, it also reduced the number of caesarean sections.

Our findings conflict with recent research that found that having epidural anaesthesia (EA) during childbirth does not raise the percentage of vaginal births (spontaneous or instrumental) and that it is safe for both moms and foetuses [15, 16]. A study also found that EA did not influence the likelihood of caesarean delivery. This analysis also revealed that EA did not seem to have an instant impact on newborn status as assessed by Apgar scores or on the decision to admit the child to neonatal critical care [17].

Similarly, we discovered that while the non-epidural group's second stage of labour was shorter than the epidural group's, there was a lesser rate of instrumental delivery, higher rate caesarean sections, and similar newborn outcomes in both groups. Nevertheless, in contrast to our findings, earlier research shown that although a longer second stage of labour may raise the percentage of vaginal deliveries, it may also increase the morbidity of both mothers and newborns [18]. Certain obstetric nurses request that the rate of epidural infusion be decreased or stopped in order to enhance the mother's exertive efforts during the second stage of labour, as they are worried about a protracted labour and its unfavourable consequences [19].

Some researchers discovered that the length of the second stage of labour was unaffected by bupivacaine administered continuously epidurally. This result suggested that the impact of the second stage of labour should be correlated with the concentration of epidural local anaesthetics in a dose-response manner [20]. The results of these authors are consistent with prior research showing that parturients may have adequate and safe analgesia at

minimal local analgesic doses of either epidural sufentanil or ropivacaine, with a low frequency of adverse effects [21]. More research is required to determine the possible dose-response mechanism of EA on the success of the second stage of labour.

Women using epidural analgesia during delivery showed a non-significant tendency towards an increase in caesarean section rates, according to a small research [22]. A 1998 study described randomly assigning nulliparous women in spontaneous term labour to either epidural or intravenous narcotic analgesia. The women receiving epidural analgesia showed significant prolongation of both the first and second stages of labour, greater requirements for oxytocin augmentation, slower rates of cervical dilatation, an increased rate of foetal malposition, and an increased rate of caesarean section when compared to the group receiving opioid analgesia. The primary cause of the noted rise in the rate of caesarean sections was dystocia. The short sample size, early termination, and statistical problems raised by this research have all been challenged [23].

Because the authors only examined compliant patients in their analysis, selection bias might have influenced the results. The study revealed a noteworthy correlation between epidural analgesia and many adverse outcomes such as prolonged labour, chorioamnionitis, higher oxytocin administration rates, and operational vaginal birth, which carries a twofold increased chance of caesarean delivery. The authors came to the conclusion that using epidural analgesia to control labour increased the need for obstetric intervention [24]. Trials, that have been conducted, have made an effort to address the methodological shortcomings of the first research by employing intention to treat and adjusting for intrapartum variables that could affect the duration of labour. In the presence of epidural analgesia, several studies were unable to detect a statistically significant increase in the rate of caesarean sections [25,26].

Leighton BL and Halpern SH conducted a systematic review and found that there was no difference between the epidural and parenteral groups in terms of the 5-min APGAR score, umbilical PH level, or foetal heart rate abnormality. However, the parenteral group had a higher need for neonatal naloxone and a 1-min poor APGAR score [27]. According to the results of another investigation, a labour epidural may reduce the APGAR score at one minute but not at five [28]. There was no indication of a significant difference in the 5-min APGAR score between neonates born to women with epidurals and those treated with opiates, according to the Cochrane study by Smyth R, Howell C [29]. Improved Apgar scores at one minute, no change at five minutes, and a decreased requirement for newborn naloxone administration have all been linked to epidural analgesia [30, 32]. One RCT that found no significant differences in the 5-min APGAR scores between the epidural and control groups [32] further supports this.

Additionally, there is debate about whether labour epidural cause an increase in non-infectious maternal fever, while the precise mechanism is unknown [33]. Many speculate that the correlation between epidural and mother fever could be due to changes in heat production and dissipation brought on by epidural analgesia, and that neonates born to mothers who received epidurals and those who did not do not differ in the incidence of foetal sepsis [34,35].

While identifying the individuals that do not require bladder catheterization is critical, it is as crucial to ascertain which populations do. Researchers looked at the risk variables that put women at risk for postpartum urine retention (PUR) in a prior study. They discovered that women who underwent substantial vaginal trauma, had an extended length of epidural anaesthesia, or had too few intermittent catheterizations during labour were more likely to acquire PUR. Although the small sample size from a single hospital hampered this study, it did investigate factors other than intermittent catheterization that lead to PUR and indicates that continuous catheterization may be necessary for certain women undergoing prolonged epidural anaesthesia [36].

In an effort to refute the notion that continuous catheterization was preferable to intermittent catheterization, researchers set out to investigate the effects of intermittent vs continuous catheterization on the duration of labour in a fundamental study. The length of labour did not change clinically significantly according to the bladder draining technique employed. It was discovered that intermittent catheterization was marginally less costly than continuous catheterization. The analysis of labour length, cost, and nursing preference was conducted; however, the infectious potential of each technique was not investigated. Notably, the whole duration of labour was examined rather than just the second phase, which can vary depending on whether labour was induced or spontaneous [37].

It was discovered that the length of the second stage of labour was not statistically affected by the method of bladder catheterization. Surprisingly, however, it was found that women who underwent intermittent catheterization or were able to urinate on their own following epidural anaesthesia experienced less side effects associated with catheter placement [38].

A lengthier initial stage of labour has been linked to EA [39]. Even in prospective, randomised trials, this result holds true when bias-prone retrospective studies are disregarded. A meta-analysis of research comparing epidural and parenteral opioids was carried out by Halpern et al. in 1998. The results showed that the epidural group had a first-stage duration that was 42 minutes longer (weighted mean difference [MD], 95% confidence interval [CI], 17–68 minutes) [40]. It is yet unclear what theorises behind this correlation. It's interesting to note that if neuraxial analgesia is started before to 4-cm cervical dilatation, several writers have subsequently observed reduced first-stage durations [41-43].

A Cochrane study from 2014 found no evidence to support the beneficial effects of early epidurals on reducing labour duration [44].

The Cochrane evaluation of trials comparing labour with and without an epidural by Anim-Somuah et al. is still the most recent, excellent analysis of the impact of EA on the labour course. The first stage was 32 minutes shorter in the opioid groups (95% CI, 18–46 minutes) in the authors' evaluation of research comparing EA with opioid analgesia; however, the same tendency did not appear in trials comparing LEA with placebo or no analgesia [45].

The findings of a sizable retrospective cohort research that looked at the second-stage durations of over 42,000 vaginal births in a population of parous and nulliparous women were released in 2014 by Cheng et. al. for nulliparous (median duration, 120 vs 47 minutes; $P < .001$) and multiparous (median duration, 38 vs 14 minutes; $P < .001$) patients, the authors observed that the second stage was longer in the EA group than in the no-EA group. The degree of prolongation was even more pronounced at the 95th percentiles in both groups. The study concluded that this discovery had to be taken into account when determining what a normative labour trajectory is

[46]. Because of its retroactive design, it should not be construed as proving a causal relationship between longer second stage and EA, as has been previously established. However, even in RCTs, there could be minute but consistent signs of EA delaying the second stage of labour. In comparison to the parallel opioid-only groups, EA groups had an average second stage that was 15 minutes longer (MD, 95% CI, 9–22 minutes) according to Anim-Somuah et al.'s Cochrane comprehensive review [45]. However, this effect did not show up in trials that compared EA with placebo or no analgesia. This might be as a result of different physiological variables influencing the second stage of labour than the first.

Theoretically, voluntary and involuntary expulsive attempts may be hampered by local anesthetic-induced motor block, lengthening the second stage. A 2017 double-blind RCT of 400 parturients assigned to either continuation of low-concentration EA through delivery or discontinuation at full cervical dilation showed no difference in duration of the second stage or mode of delivery between the arms [47]. This effect is likely mitigated with low-concentration EA maintenance solutions. A reassuring foetal health throughout is arguably more significant than any quantitative assessment of stage duration [48]. Importantly, no higher risk of unfavourable short-term neonatal outcomes was mentioned for the EA groups in Anim-Somuah's review [45].

Conclusion

Nulliparous women will continue to need epidural analgesia until a very effective non-epidural analgesic option is discovered. Healthcare professionals should talk to nulliparous women about the possibility of intervention following epidural administration.

Conflict of interest

Neither a fund nor a conflict of interest existed.

Study limitations

SPSS for Windows 20.0 must be used for analysis. For numerical parametric variables, data should be given as range, mean, and standard deviation; for numerical non-parametric variables, range, median, and interquartile range; or for categorical variables, number and percentage.

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