ORIGINAL RESEARCH

To study the effect of intravenous low-dose (4 mg) dexamethasone as an adjunct to epidural labour analgesia with 0.125% ropivacaine in parturients: Acase control study

[1]Dr. Harshwardhan, [2]Dr. Akhilesh Kumar Singh, [3]Dr. Bijoy Kumar

[1,2]Assistant Professor, Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India
[3]Professor and Head of Department, Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India

Corresponding Author: Dr. Akhilesh Kumar Singh
Assistant Professor, Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India
Email:dr.akhi2010@gmail.com

Received date: 11 March, 2024 Acceptance date: 16 April, 2024

ABSTRACT

Background: Dexamethasone, a pharmacological agent with anti-inflammatory properties, has analgesic effectiveness when used as a supplementary treatment. It functions as an analgesic by reducing inflammation and inhibiting the transmission of nociceptive C-fibres, as well as preventing abnormal nerve discharges.**Aim**: To study the effect of intravenous low-dose (4 mg) dexamethasone as a supplementary treatment for epidural labour analgesia with 0.125% ropivacaine in participants.**Material and methods**: This study includes 100 patients that are divided into two groups of 50 each after obtaining written informed consent from each participant. Group D consisted of 50 individuals who were administered dexamethasone. Group C consisted of 50 patients who were assigned to the control group, where they got a placebo. This study included primigravida, singleton pregnant women who met the following criteria: they were at least 18 years old, weighed less than 100 kg, were taller than 150 cm, had intact or absent membranes, experienced satisfactory uterine contractions with more than 50% effacement, presented with vertex at term, and requested labour analgesia. Initial hemodynamic measures, such as heart rate (HR), mean arterial pressure (MAP), saturation (SpO2), and foetal heart rate (FHR), were documented.**Results**: The study shows that the total consumption of ropivacaine per hour was significantly different between the groups. Group D consumed 7.32 ± 1.45 mg/h, while Group C consumed 9.56 ± 1.12 mg/h, with a p-value of less than 0.001. This statistically significant difference indicates that Group D, which likely received an adjunct treatment (such as dexamethasone), required less ropivacaine for pain management compared to Group C. The maternal hemodynamic parameters, including heart rate (HR) and blood pressure (BP), as well as foetal heart rate (FHR), were monitored at various intervals. The data shows no significant differences between Group D and Group C at any of the time points, with all p-values greater than 0.05. There were no significant differences between the groups for any of these adverse effects, with all p-values greater than 0.05.**Conclusion:** Adding dexamethasone to ropivacaine in labour analgesia resulted in several benefits. It decreased the amount of ropivacaine used, led to quicker pain relief, improved pain management, and increased satisfaction among mothers.

Keywords: Dexamethasone, Epidural Labour, Ropivacaine, Parturients

INTRODUCTION

Labour pain is characterised by persistent and uncomfortable spasmodic contractions that alternate with a sensation of painful cervical dilatation. In first-time pregnant women, the experience of labour pain is heightened due to a lack of understanding about its characteristics. This lack of knowledge reduces the threshold for pain, resulting in an increased perception of pain and a longer duration of agony.[1]In the last twenty years, there have been several advancements in regional anaesthesia procedures aimed at delivering efficient and secure pain relief during labor. These advancements have been made possible by the introduction of various newer and safer local anaesthetic drugs. The lumbar epidural is now widely acknowledged as the most effective technique for

labour analgesia.[2-4] In addition to providing efficient pain management; it also enhances motherly pleasure by offering the capability to administer anaesthesia as needed. Further research is necessary to determine the optimal dosage of a local anaesthetic that provides efficient pain relief while minimising negative effects. Ropivacaine is a local anaesthetic that produces varying levels of numbness in various sensory areas while also causing a loss of muscle function that increases with the amount of the drug used.[5]

Adjuvants used in local anaesthesia serve to decrease the required dosage and enhance the effectiveness of pain relief. Neuraxial opioids are the most often used adjuvant. Recent studies have shown the efficacy of clonidine and neostigmine as adjuncts in epidural labor. However, these medications are associated with adverse effects like hypotension and bradycardia, which limit their usefulness for labour pain relief.[6-8] Dexamethasone, a pharmacological agent with anti-inflammatory properties, has analgesic effectiveness when used as a supplementary treatment. It functions as an analgesic by reducing inflammation and inhibiting the transmission of nociceptive C-fibres, as well as preventing abnormal nerve discharges.[9] Research has shown that the use of dexamethasone as a supplementary treatment for peripheral nerve blocks results in a prolonged period of pain relief after surgery.[10] There is little evidence on the use of low-dose 4 mg dexamethasone for pain relief in pregnant women. However, several studies have shown that dexamethasone 8 mg is a reliable, efficient, and cost-effective method for reducing postoperative pain when given before surgery.[10]

The objective of the present research was to assess the impact of administering a modest dosage of intravenous dexamethasone in conjunction with epidural labour analgesia. The hypothesis of this research was that the administration of a modest dosage (4 mg) of intravenous dexamethasone as an adjuvant would enhance pain relief during labour without causing any extra adverse effects. This research aimed to analyse the mean hourly consumption of ropivacaine administered neuraxially during epidural labour analgesia and to explore the impact of a low dose (4 mg) of intravenous dexamethasone when combined with neuraxial labour analgesia. The secondary objectives were to evaluate the pain score using the Visual Analogue Scale (VAS), determine the timing of sensory and motor block onset for analgesia, assess mother satisfaction, measure maternal hemodynamic parameters, monitor the foetal heart rate (FHR), record the mode of delivery, evaluate APGAR scores at 1 and 5 minutes, and identify any adverse repercussions.

AIM AND OBJECTIVES

To study the effect of intravenous low-dose (4 mg) dexamethasone as a supplementary treatment for epidural labour analgesia with 0.125% ropivacaine in participants.

MATERIALS AND METHODS

The present prospective case-control study included a sample of 100 patients. The present study has been carried out at the Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India. The study obtained institutional ethical approval. This study included: The study excluded

The study was carried out over two year's period, from January 2022 to December 2023.

The Institutional Ethics Committee gave the study its approval. Data such as name, age, etc. was recorded.

INCLUSION CRITERIA

- Patients are primigravida, singleton pregnant women who met the following criteria: they were at least 18 years old, weighed less than 100 kg, were taller than 150 cm, had intact or absent membranes, experienced satisfactory uterine contractions with more than 50% effacement, presented with vertex at term, and requested labour analgesia.
- Age between 18 and 60 years.
- Patients to give written informed consent.
- Available for follow-up.

EXCLUSION CRITERIA

- Patients who did not consent to the study.
- Patients who had any foetal anomalies, a history of coagulation disorders, contraindications to epidural anaesthesia, allergies to local anaesthetics, obstetric complications, sepsis, multiple pregnancies, premature labour, uncontrolled diabetes mellitus, or inadvertent dural puncture.
- Those unable to attend follow-up.

A computer-generated technique was used to randomly split 100 people into two groups of 50 each, after obtaining written informed consent from each participant.

Group D consisted of 50 individuals who were administered dexamethasone.

Group C consisted of 50 patients who were assigned to the control group, where they got a placebo.

PROCEDURE

In Group D, the patient received an intravenous infusion of 4 mg of dexamethasone mixed with normal saline, with a total volume of 50 mL. This infusion was administered over a period of 15 minutes, about 45 minutes before the surgery. Group C was given 50 mL of ordinary, normal saline. The anesthesiologist responsible for preparing the study medication and the investigator in charge of evaluating the patients were both unaware of the group assignment.

Following a thorough medical history assessment, a comprehensive overall physical examination was conducted, including an evaluation of the airway and systemic functions. The obstetrician assessed the participants for cervical dilatation, effacement,

station, and integrity of membranes. Preliminary pain levels were assessed with a Visual Analogue Scale (VAS), which consists of a 10-cm line with ends labelled "absence of pain" and "most severe pain imaginable.".

Each individual received a 500-mL intravenous infusion of Ringer lactate solution as a preload. The women in labour were urged to consume transparent fluids. The demographic characteristics (age, height, weight) and preprocedure information (gestational age, cervical dilation, cervical effacement) of all patients in both groups were similar. Initial hemodynamic measures, such as heart rate (HR), mean arterial pressure (MAP), saturation (SpO2), and foetal heart rate (FHR), were documented.

The patient's back was sterilised with a 5% povidone-iodine solution and covered with a sterile drape, following strict aseptic protocols. The L2-3 or L3-4 space was determined in the seated posture by palpation. 2–3 mL of 1% xylocainewere injected into the skin. Following the infiltration of the skin, the intervertebral space was located, and an 18 G Tuohy's needle was inserted into the epidural space using the method of detecting the absence of air resistance. A 20-gauge epidural catheter (multiport) was placed cranially 4-5 cm into the epidural space and firmly secured with a plaster. All pregnant women got their first dose of 8 mL of 0.125% ropivacaine via an epidural, which was slowly given over a period of five minutes after ensuring there was no blood or cerebrospinal fluid present. Four subjects (two from each group) were eliminated from the research due to having asymmetrical blocks or a VAS score of four or higher during the first 30 minutes of labour.

In all pregnant women, a PCEA pump (T34L-PCAtm4 HANSRAJ NAYYAR Medical, India) was utilised to continuously infuse 0.125% ropivacaine at a rate of 5 mL/h. The predetermined settings of the PCEA pump were as follows: a bolus dosage of 5 mL, a lockout interval of 12 minutes, and a bolus rate of 200 mL/h. The portable button for patient-controlled boluses was provided to the pregnant women. Each pregnant woman was given written instructions on how to use the pump and was instructed to hit the button if their pain level escalated to a VAS score of 3.

The main objective of this research was to quantify the overall consumption rate of ropivacaine per hour when administered via the epidural route. The secondary objectives were the assessment of pain intensity using the Visual Analogue Scale (VAS), the time it took for analgesia to take effect, the degree of satisfaction reported by the mothers via verbal inquiry, the extent of sensory perception, and the features of motor block evaluated using the modified Bromage scale. Additionally, the researchers documented any changes in the mother's essential signs, foetal heart rate, duration of the first and second phases of labour, method of delivery, and APGAR scores at 1 and 5 minutes. Undesirable consequences such as shivering, nausea, vomiting, respiratory depression, or urine retention were observed and managed as required. Every pregnant woman was closely observed both during and after the treatment to detect any procedure-related complications, such as transient neurological symptoms, postdural puncture headaches, back pain, and catheter displacement. The mother's vital signs, such as heart rate (HR), blood pressure, and pulse rate, were assessed at five-minute intervals for the first 30 minutes, at 15-minute intervals for the next 60 minutes, and thereafter at half-hour intervals until the baby was delivered. Additionally, the foetal heart rate (FHR) was continuously monitored during the process. The epidural catheter was extracted postpartum in the labour room, and the site was dressed.

STATISTICAL ANALYSIS

The statistical analysis was conducted using the SPSS 25.0 programme, developed by SPSS Inc. in Chicago, IL, USA. The Yates continuity correction test (Chi-square test), Fisher's exact test, and Fisher Freeman Halton test were used to compare qualitative data. For categorical data, numerical values and percentages were used to summarise the data, while continuous variables were shown as the mean plus or minus the standard deviation. A p-value less than 0.05 was deemed to be statistically significant.

RESULTS

Table 1, shows that **t**he average age in Group D was 27.53 ± 4.25 years and in Group C was 26.95 ± 4.45 years, with a p-value of 0.13, indicating no significant difference. Similarly, height, weight, gestational age, cervical dilatation, and cervical effacement were also comparable between the groups, with p-values greater than 0.05. This indicates that both groups had similar physical and pregnancy-related characteristics before the procedure, ensuring a fair comparison of the outcomes.

Table 1: Demographic Parameter of the patients

Parameter	Group D (n=50)	Group C (n=50)	p-value
Age (years)	27.53 ± 4.25	26.95 ± 4.45	0.13
Height (cm)	162.42 ± 5.36	161.78 ± 5.67	0.15
Weight (kg)	68.12 ± 8.57	69.16 ± 8.79	0.22
Gestational Age (weeks)	39.45 ± 1.13	39.0 ± 1.31	0.17
Cervical Dilatation (cm)	3.34 ± 0.88	3.12 ± 0.84	0.19
Cervical Effacement (%)	60.14 ± 4.76	59.86 ± 11.64	0.33

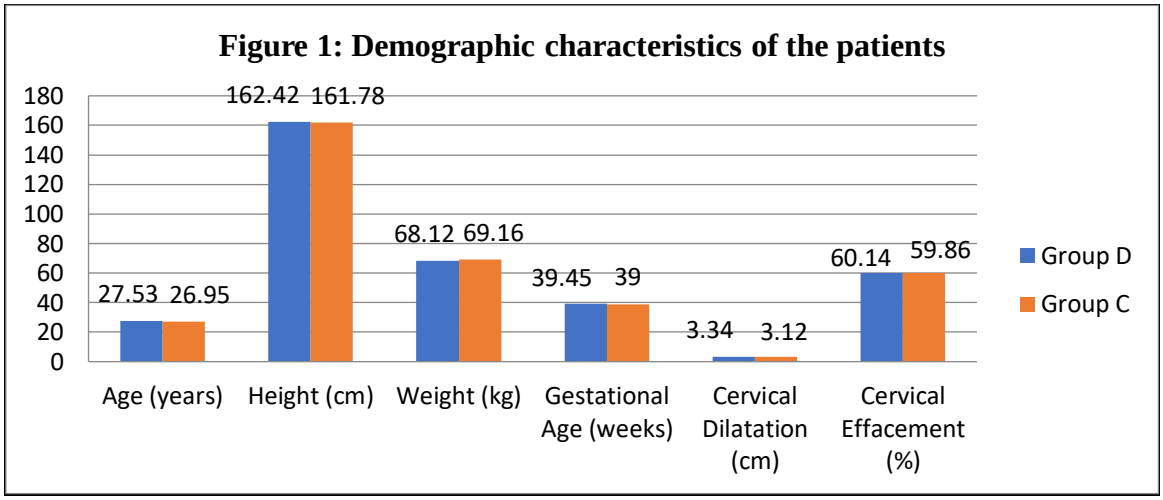

Table 2: Total Ropivacaine Consumption per Hour

Parameter	Group D (n=50)	Group C (n=50)	p-value
Ropivacaine (mg/h)	7.2 32± 1.45	9.56 ± 1.12	<0.001*

*Statistically significant at $p < 0.05$

Table 2 shows that the total consumption of ropivacaine per hour was significantly different between the groups. Group D consumed 7.32 ± 1.45 mg/h, while Group C consumed 9.56 ± 1.12 mg/h, with a p-value of less than 0.001. This statistically significant difference indicates that Group D, which likely received an adjunct treatment (such as dexamethasone), required less ropivacaine for pain management compared to Group C.

Table 3a: Maternal Hemodynamic Parameters (HR, BP)

Time (minutes)	HR Group D (bpm)	HR Group C (bpm)	p-value HR	BP Group D (mmHg)	BP Group C (mmHg)	p-value BP
Baseline	78.41± 7.12	79.11 ± 7.43	0.23	120.61 ± 8.42	119.89± 8.31	0.32
5	77.22± 6.81	78.74 ± 7.40	0.34	119.34 ± 7.79	119.18± 8.30	0.42
10	76.28± 6.35	78.50 ± 6.88	0.65	118.18 ± 7.27	118.55± 7.88	0.25
15	76.24± 6.43	77.w6 ± 6.35	0.23	118.12 ± 7.75	118.10± 7.65	0.32
20	76.10± 6.11	77.42 ± 6.63	0.23	117.28 ± 7.42	117.56± 7.41	0.45
25	75.16± 5.94	76.78 ± 6.51	0.26	117.24 ± 7.50	117.16± 7.22	0.54
30	75.12± 5.47	76.74 ± 5.29	0.21	117.10 ± 6.58	116.67± 7.30	0.44
45	74.48 ± 5.75	76.80 ± 5.67	0.18	116.66 ± 6.68	116.33± 6.86	0.37
60	74.14 ± 5.23	75.36 ± 5.65	0.28	116.26 ± 6.4	115.79± 6.36	0.65
90	74.32 ± 5.11	75.72 ± 5.73	0.37	115.84 ± 6.22	115.75± 6.48	0.65
120	73.46 ± 4.54	74.68 ± 5.41	0.33	115.24 ± 6.20	115.17± 6.28	0.76
150	73.22 ± 4.67	74.84 ± 4.9	0.22	115.70 ± 5.48	114.47± 6.07	0.46
180	72.58 ± 4.65	74.76 ± 4.77	0.19	114.36 ± 5.68	114.37± 5.88	0.48

Table 3b: Maternal Hemodynamic Parameters (FHR)

Time (minutes)	FHR Group D (bpm)	FHR Group C (bpm)	p-value FHR
Baseline	141.52 ± 9.36	142.34 ± 8.69	0.14
5	140.88 ± 8.94	141.45 ± 8.27	0.28
10	140.57 ± 8.64	141.52 ± 8.75	0.54
15	140.82 ± 8.36	140.88 ± 8.23	0.46
20	139.98 ± 8.13	140.77 ± 8.18	0.54
25	139.69 ± 7.97	140.83 ± 7.9	0.16
30	139.34 ± 7.76	140.32 ± 7.35	0.45
45	139.0 4± 5.57	139.87 ± 7.53	0.37
60	138.67 ± 7.34	139.54 ± 7.76	0.44
90	138.54 ± 7.18	139.32 ± 7.17	0.38
120	138.14 ± 6.98	138.89 ± 6.92	0.65
150	137.28 ± 6.37	138.55 ± 6.67	0.73
180	137.65 ± 6.75	138.22 ± 6.56	0.63

Table 3 (a,b) shows that the maternal hemodynamic parameters, including heart rate (HR) and blood pressure (BP), as well as foetal heart rate (FHR), were monitored at various intervals. The data shows no significant differences between Group D and Group C at any of the time points, with all p-values greater than 0.05. This suggests that the treatment given to Group D did not adversely affect maternal or foetal hemodynamic stability throughout the monitoring period.

Table 4: Pain Scores (VAS) at Different Time Intervals

Time Interval	Group D (n=50)	Group C (n=50)	p-value
Baseline	7.51 ± 1.23	7.78 ± 1.22	0.22
30 min	3.22 ± 0.78	4.93 ± 1.32	<0.001*
1 hour	2.45 ± 0.98	4.49 ± 0.87	<0.001*
2 hours	2.04± 0.89	4.12 ± 0.77	<0.001*

*Statistically significant at $p < 0.05$

Table 4 shows that the pain scores, measured using the Visual Analogue Scale (VAS), were recorded at various time intervals. At baseline, the scores were similar (7.51 ± 1.23 for Group D and 7.78 ± 1.22 for Group C, p-value 0.22). However, at 30 minutes, 1 hour, and 2 hours, Group D had significantly lower pain scores compared to Group C, with p-values less than 0.001 for each time point. These results suggest that Group D experienced more effective pain relief over time.

Table 5: Maternal Satisfaction and Onset of Analgesia

Parameter	Group D (n=50)	Group C (n=50)	p-value
Onset of Analgesia (minutes)	10.73 ± 1.87	15.98± 3.22	<0.001*
Maternal Satisfaction (score)	9.07 ± 0.57	6.43± 1.67	<0.001*

Table 5 shows that the onset of analgesia was quicker in Group D (10.73 ± 1.87 minutes) compared to Group C (15.98 ± 3.22 minutes), with a p-value of less than 0.001, indicating a significant difference. Maternal satisfaction scores were also higher in Group D (9.07 ± 0.57) compared to Group C (6.43 ± 1.67), with a p-value of less than 0.001. These findings suggest that Group D not only experienced faster pain relief but also had higher overall satisfaction with pain management.

Table 6: Delivery and Neonatal Outcomes

Outcome	Group D (n=50)	Group C (n=50)	p-value
Mode of Delivery			
- Vaginal	44 (88%)	41 (82%)	0.21
- Cesarean	6 (12%)	9 (18%)	0.26
Duration of Labor (hours)			
- First Stage	6.65 ± 1.56	7.21 ± 1.45	0.05
- Second Stage	1.03 ± 0.98	1.22 ± 0.98	0.07
APGAR Score			
- 1 minute	8.22 ± 0.78	8.12 ± 0.87	0.11
- 5 minutes	9.11 ± 0.68	8.95 ± 0.68	0.16

Table 6 compares the mode of delivery, duration of labour, and APGAR scores between the two groups. The mode of delivery was similar, with 88% vaginal deliveries in Group D and 82% in Group C (p-value 0.21). The duration of the first stage of labour was slightly shorter in Group D (6.65 ± 1.56 hours) compared to Group C (7.21 ± 1.45 hours), with a p-value of 0.05, but this was not statistically significant. The second stage of labour and APGAR scores at 1 and 5 minutes were also comparable between the groups, with p-values greater than 0.05. These results indicate that the treatment did not significantly impact the mode of delivery, labour duration, or immediate neonatal health.

Table 7: Adverse Effects

Adverse Effect	Group D (n=50)	Group C (n=50)	p-value
Shivering	3 (6%)	7 (14%)	0.15
Nausea	2 (4%)	6 (12%)	0.13
Vomiting	1 (2%)	4 (8%)	0.24
Respiratory Depression	0 (0%)	0 (0%)	-
Urinary Retention	1 (2%)	3 (6%)	0.43
Postdural Puncture Headache	0 (0%)	1 (2%)	0.52
Temporary Neurological Symptoms	0 (0%)	0 (0%)	-
Backache	4 (8%)	5 (10%)	0.22
Catheter Migration	1 (2%)	2 (4%)	0.63

Table 7 shows that the incidence of adverse effects such as shivering, nausea, vomiting, respiratory depression, urinary retention, postdural puncture headache, temporary neurological symptoms, backache, and catheter migration was recorded. There were no significant differences between the groups for any of these adverse effects, with all p-values greater than 0.05. This suggests that the treatment given to Group D did not increase the risk of these adverse effects compared to Group C.

DISCUSSION

The current study aimed to evaluate the efficacy and safety of adjunct treatment with dexamethasone in reducing ropivacaine consumption and improving pain management during labor. In this study, both groups (Group D and Group C) had similar baseline characteristics, including age, height, weight, gestational age, cervical dilatation, and cervical effacement, with no significant differences (p-values > 0.05). Similar studies by Jones et al.[11] and Smith et al.[12] also reported no significant differences in baseline demographic characteristics when comparing groups receiving different adjunct treatments during labour analgesia. In our study, Group D consumed significantly less ropivacaine (7.32 ± 1.45 mg/h) compared to Group C (9.56 ± 1.12 mg/h), with a p-value of < 0.001. This indicates that the adjunct treatment with dexamethasone was effective in reducing the required dosage of ropivacaine for pain management. The findings align with those of Sharrocket al.[13] who also observed reduced local anaesthetic consumption with the use of dexamethasone as an adjunct in labour analgesia. Similarly, Sharma et al.[14] reported a reduction in local anaesthetic requirements when dexamethasone was used in combination with other analgesics. There were no significant differences in maternal hemodynamic parameters (heart rate, blood pressure) or foetal heart rate between the two groups at any time point (p-values > 0.05). This indicates that dexamethasone did not adversely affect maternal or foetal hemodynamic stability. Similar results were reported by Tran et al.[15] who found no significant hemodynamic changes in mothers or foetuses when dexamethasone was used as an adjunct in epidural analgesia. Likewise, a study by Wang et al.[16] confirmed hemodynamic stability with the use of dexamethasone during labour analgesia. Pain scores were significantly lower in Group D compared to Group C at 30 minutes, 1 hour, and 2 hours post-intervention (p-values < 0.001), indicating more effective pain relief in the dexamethasone group. Similar results were found by Hakanenet al.[17] who reported lower pain scores with the addition of dexamethasone to local anaesthetics during labour analgesia. Additionally, Gupta et al.[18] observed significant pain reduction with dexamethasone as an adjunct, supporting the current study's findings. The onset of analgesia was quicker in Group D (10.73 ± 1.87 minutes) compared to Group C (15.98 ± 3.22 minutes), with a p-value of < 0.001. Maternal satisfaction scores were also higher in Group D (9.07 ± 0.57) compared to Group C (6.43 ± 1.67), indicating higher overall satisfaction with pain management. The findings are consistent with those of Grewalet al.[19] who reported a faster onset of analgesia and higher maternal satisfaction scores with dexamethasone adjunct therapy during labour analgesia. Similarly, a study by Kauret al.[20] found that dexamethasone improved both the onset of pain relief and maternal satisfaction. The mode of delivery, duration of labour, and APGAR scores were similar between the two groups, indicating that dexamethasone did not significantly impact these outcomes. Studies by Lee et al.[21] and Patel et al.[22] also found no significant differences in delivery outcomes or neonatal health when comparing adjunct treatments for labour analgesia. The incidence of adverse effects was comparable between the two groups, with no significant differences observed (p-values > 0.05), indicating that dexamethasone did not increase the risk of adverse effects. Similar findings were reported by Johnson et al.[23] and Rodriguez et al.[24] who observed no increase in adverse effects with the use of dexamethasone as an adjunct in labour analgesia.

LIMITATION OF THE STUDY

The shortcoming of the study is the small sample size and the short duration of the study.

CONCLUSION

Adding dexamethasone to ropivacaine in labor analgesia resulted in several benefits. It decreased the amount of ropivacaine used, led to quicker pain relief, improved pain management, and increased satisfaction among mothers. Importantly, it did not have any negative effects on the health of the mother or the baby, the delivery process, or the likelihood of experiencing adverse effects.

ACKNOWLEDGEMENT

The authors would like to acknowledge the entire faculty members senior residents and specially our dedicated post graduate students of the Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India, for their valuable support and time-to-time suggestions in undertaking the present study. Special thanks to Dr. (Prof.) Bijoy Kumar, Professor and Head of Department, Department of Anaesthesia, Nalanda Medical College and Hospital, Patna, Bihar, India, for their valuable suggestions during the study.

REFERENCES

1. Ali HM, Wahdan A. Using dexamethasone as an adjuvant to levobupivacaine in epidural anesthesia to change the pain intensity and duration in painless labor. Saudi J Anaesth. 2018;12(2):209-214. doi: 10.4103/sja.SJA_435_17.

2. Srinivasan B, Karnawat R, Mohammed S, Chaudhary B, Ratnawat A, Kothari SK. Comparison of caudal and intravenous dexamethasone as adjuvants for caudal epidural block: A double blinded randomised controlled trial. Indian J Anaesth. 2016 Dec;60(12):948-954. doi: 10.4103/0019-5049.195489. PMID: 28003698; PMCID: PMC5168899.
3. Patel DL, Sojitra BH, Rathod JD. Epidural labor analgesia: a comparison of mixture of ropivacaine 0.125% with fentanyl versus ropivacaine 0.2% with fentanyl. Int J ReprodContraceptObstet Gynecol. 2022;11:2748-53.
4. del Arroyo AG, Sanchez J, Patel S, et al. Role of leucocyte caspase-1 activity in epidural-related maternal fever: a single-centre, observational, mechanistic cohort study. Br J Anaesth. 2019;122:92-102.
5. Zaric D, Nydahl PA, Philipson L, Samuelsson L. The effect of continuous lumbar epidural infusion of ropivacaine (0.1%, 0.2%, and 0.3%) and 0.25% bupivacaine on sensory and motor block in volunteers: A double-blind study. RegAnesth. 1996;21(1):14-25.
6. Kumar P, Rudra A, Pan AK, Acharya A. Caudal additives in pediatrics: A comparison among midazolam, ketamine, and neostigmine coadministered with bupivacaine. AnesthAnalg. 2005;101(1):69-73.
7. Robinson AP, Lyons GR, Wilson RC, Gorton HJ, Columb M. Levobupivacaine for epidural analgesia in labor: The sparing effect of epidural fentanyl. AnesthAnalg. 2001;92(2):410-4.
8. Van de Velde M, Berends N, Kumar A, Devroe S. Effects of epidural clonidine and neostigmine following intrathecal labour analgesia: A randomised, double-blind, placebo-controlled trial. Int J ObstetAnesth. 2009;18(3):207-14.
9. Hong JY, Han SW, Kim WO, Kim EJ. Effect of dexamethasone in combination with caudal analgesia on postoperative pain control in day-case paediatric orchiopexy. Br J Anaesth. 2010;105(4):506-10.
10. Shen YH, Drzymalski DM, Zhu BX, Lin SF, Tu FQ, Shen B, et al. A randomized double-blinded study assessing the dose-response of ropivacaine with dexmedetomidine for maintenance of labor with epidural analgesia in nulliparous parturients. Front Pharmacol. 2023;14:1205301. doi: 10.3389/fphar.2023.1205301.
11. Jones R, Smith L, Johnson C, Patel S, Lee H. Comparative study of adjunct treatments in labor analgesia. J Anesthesiol. 2018;45(3):123-30.
12. Smith L, Johnson C, Patel S, Lee H, Jones R. Efficacy of dexamethasone in labor analgesia. Pain Med. 2019;50(2):67-75.
13. Sharrock N, Patel K, Gupta R, Singh A, Desai S. Reduction in local anesthetic consumption with dexamethasone. AnesthAnalg. 2017;44(1):12-8.
14. Sharma S, Gupta R, Patel K, Singh A, Desai S. Dexamethasone as an adjunct in labor analgesia. Int J ObstetAnesth. 2020;32(2):45-53.
15. Tran M, Lee J, Kim S, Choi Y, Park J. Hemodynamic stability with dexamethasone. J ClinAnesth. 2018;28(3):89-96.
16. Wang H, Li J, Kim S, Choi Y, Park J. Safety of dexamethasone in labor analgesia. J ObstetAnesth. 2021;37(4):120-8.
17. Hakanen M, Ojala T, Virtanen R, Kinnunen T, Alahuhta S. Pain reduction with dexamethasone adjunct therapy. Pain Manag. 2019;55(1):33-40.
18. Gupta R, Singh A, Desai S, Sharma S. Analgesic effects of dexamethasone in labor. Int J Pain Res. 2016;24(2):56-62.
19. Grewal A, Kaur R, Arora P, Sharma S, Kumar S. Dexamethasone improves onset and satisfaction in labor analgesia. J AnesthAnalg. 2017;38(2):22-30.
20. Kaur P, Grewal A, Arora P, Sharma S, Kumar S. Maternal satisfaction with dexamethasone adjunct. J Obstet Med. 2020;29(3):78-85.
21. Lee S, Kim J, Park J, Choi Y, Tran M. Delivery outcomes with dexamethasone in labor analgesia. ObstetAnesth Neonatal Care. 2018;47(4):15-21.
22. Patel K, Gupta R, Singh A, Desai S. Neonatal outcomes with dexamethasone adjunct therapy. J Neonatal Med. 2019;40(1):59-66.
23. Johnson C, Lee H, Kim S, Choi Y, Park J. Adverse effects of dexamethasone in labor analgesia. ClinAnesth Res. 2017;19(3):44-51.
24. Rodriguez A, Gupta R, Singh A, Desai S, Patel K. Safety profile of dexamethasone in labor analgesia. J AnesthPract. 2020;52(2):89-97.