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Original Research Article

Study of effects of combined spinal epidural analgesia on the course of labour and feto maternal outcome in comparison with the parturients receiving no analgesia

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ABSTRACT

Background: The study was aimed to evaluate the effects of combined spinal epidural analgesia on the duration and outcome of labour in nulliparous parturients in comparison with parturients not receiving any analgesia.

Methods: It is a prospective clinical study. The present study was carried out in the labour ward, KIMS Hubli. Nulliparous parturients in early active labour were divided into two groups. CSE group (n=40) and non CSE group. In present study CSE was performed with intrathecal 1.25mg of levobupivacaine with 25mcg fentanyl initially and this was followed by epidural boluses of 10ml of 0.0625% Levobupivacaine with 2mcg/ml fentanyl through the epidural catheter whenever the patients' pain score is more than 4.

Results: Mean duration of active labour was 139±41.2min in CSE group and 251.1±57.9 min in non CSE group. The rate of cervical dilatation was 2.63±0.66cm/hr. in CSE group as compared to 1.45±0.38cm/hr in non CSE group. The duration of second stage of labour was similar in both groups. The spontaneous vaginal deliveries was 77.5% in CSE group as compared to 79.5% in non CSE group. Assisted vaginal deliveries were 15% in combined spinal epidural analgesia group compared to 10.3% in non CSE group which was statistically insignificant. LSCS was 7.5% in control CSE group compared to 10.3% in non CSE group. Maternal satisfaction was excellent in majority of parturients in CSE group. The perinatal outcome was not affected in CSE group. The incidence of complications were very minimal in present study.

Conclusions: Authors concluded that combined spinal epidural analgesia provides safe and excellent analgesia with no significant increase in the caesarean section and instrumental delivery rates. In addition, CSE decreases the duration of first stage of labour with no effect on perinatal outcome.

Keywords: Combined spinal epidural analgesia, Fentanyl, Levobupivacaine, Visual analog scale

INTRODUCTION

Labour is one of the most painful experiences in the life of a woman. "The delivery of the infant into the arms of a conscious and pain-free mother is one of the most exciting and rewarding moments in medicine" Moir. Pain relief in labour has always been surrounded with myths

and controversies. Hence, providing effective and safe analgesia during labour has remained an ongoing challenge.

The International Association for the Study of Pain (IASP) declared 2007-2008 as the 'Global Year against Pain in Women-Real Women, Real Pain'. The focus was

to study both acute pain and chronic pain in women. Labour pain was found to be a good study model for treating acute pain. Increasing knowledge of the physiology and pharmacotherapy of pain and the development of obstetric anaesthesia as a subspecialty has improved the training in obstetric anaesthesia, leading to an overall improvement in the quality of labour pain relief.

The updated guidelines for labour analgesia as proposed by American Society of Anaesthesiologists (ASA) task force and committee on Standards and practice parameters in 2016, recommend that choice of analgesia technique depend on the medical status of patient, anaesthetic risk factors, obstetric risk factors, patient's preferences, progress of labour and resources at facility.¹ With sufficient resources, neuraxial analgesic techniques should be offered among analgesic options for labour with primary goal of providing adequate analgesia with minimal motor block.¹

The use of neuraxial techniques such as Epidural and Combined spinal epidural analgesia has been shown to be the most effective modality for pain relief in labour.² In addition to providing analgesic benefit to mother, neuraxial analgesia can be converted to surgical anaesthesia if operative delivery is required.^{3,4}

This prospective study was conducted to study the effects of CSE on the duration of labour, mode of delivery, effects on the neonate and any adverse side effects. The primary outcome studied were duration of active phase, duration of second stage of labour, mode of delivery, rate of cervical dilatation, rate of instrumental delivery, rate of emergency caesarean and neonatal condition at birth.

The effectiveness of analgesia was assessed by noting the time for onset of analgesia, duration of action of intrathecal dose of anaesthesia, number of epidural top ups required, interval between onset of analgesia to delivery. In present study authors used visual analog scale to measure pain.

In present country, the awareness is still lacking and, except few centres that run a comprehensive labour analgesia programme, the national awareness or acceptance of pain-relieving options for women in labour virtually does not exist.

METHODS

The comparative clinical study was conducted to study the effects of combined spinal epidural analgesia on the course of labor, effects on the fetus and neonate also the effectiveness of analgesia. The present study was carried out in labour ward in patients fulfilling the inclusion criteria. Nulliparous parturients who are fulfilling inclusion criteria are divided into 2 groups. CSE group (n=40) women who are given combined spinal epidural analgesia at 3-5 cm of cervical dilatation. Non CSE group

(n=40) women who were not administered any type of analgesia.

Inclusion criteria

- Nullipara fulfilling the following criteria
- Age group between 18-30 years
- Height above 145cm
- Single live gestation with term gestation with vertex presentation
- Women with spontaneous onset of labour, in active phase (cervical dilatation 3-5 cm)
- Women giving informed written consent.

Exclusion criteria

- Multigravida
- Age less than 18 years or above 30 years
- High risk pregnancy such as severe anemia, preeclampsia, gestational diabetes etc.
- Women with other comorbid conditions such as hypertension, diabetes, cardiac diseases, neurovascular diseases
- Malpresentation, cephalopelvic disproportion
- cervical dilatation more than 5cm
- Presence of contraindications for epidural analgesia.

The parturients were first examined by obstetrician, a detailed obstetric history was taken and fetal presentation was confirmed by clinical examination. The parturients in active phase of labour (cervical dilatation 3-4cm, regular uterine contractions) who consented for CSE analgesia were enrolled into CSE group and those declining consent were enrolled into non CSE group. CSE parturients who demanded for labour analgesia were evaluated by the anaesthetist. Informed written consent was taken. An 18G IV cannula was inserted and the patient was started on RL solution. The patient was positioned in sitting position, under aseptic precautions, the skin over the lower thoracic and lumbar region was cleaned and the area draped. The best inter-lumbar space between L3- L4 or L4-L5 was identified and infiltrated with 2% lignocaine. A pre-packed set containing 18-gauge epidural needle, 20-gauge epidural catheter and 27-gauge spinal needle was used. The epidural space was identified using the loss of resistance to saline technique, after which the spinal needle was inserted through the epidural needle. Upon visualization of backflow of cerebrospinal fluid, an intrathecal dose of 1.25mg of levobupivacaine with 25mcg fentanyl was given. The epidural catheter was then inserted 3-5 cm into the epidural space and secured. The parturient was then positioned supine with left uterine displacement. The level of sensory blockade was checked to ensure the sensory level was \geq T10. Efficacy and the side effects of CSE (hypotension, motor block etc) were watched in coordination with the attending anaesthetist. Continuous monitoring of fetal heart sound was done and partograph was used to record the progress of labour.

Mother's vital parameters were recorded throughout the study, every 5 minutes for at least 15 min after the administration of the drug and then every 15 min thereafter. Hypotension was planned to be treated with IV fluid administration and vasopressor. Degree of pain relief-analgesia was measured using verbal numerical rating scale. Assessment of motor block was done as per Bromage score.

Analgesia was maintained with low dose intermittent epidural top ups administered on demand. Bolus of 10 ml of 0.0625% Levobupivacaine with 2 mcg/ml of fentanyl will be given through the epidural catheter when verbal numerical rating score (VAS) for pain is more than 4. Duration of action of epidural top ups and number of top ups given were noted. Assessment of progress of labour was done. Cervical dilatation, effacement, station of head, uterine contraction and FHR were noted. Fetal monitoring was done with electronic fetal monitor and auscultation of FHR every 15 min with fetal Doppler. Obstetric management was similar in both groups. Amniotomy was done if membranes were intact and oxytocin augmentation was started. Pelvic examination was done at regular interval as per labour protocol to assess the progress of labour.

Duration of active phase of first stage of labour and second stage of labour were noted. Mode of delivery-spontaneous vaginal/ assisted vaginal/ caesarean section and the indication for the same was noted. Assisted vaginal delivery/ caesarean section was considered if abnormal FHR tracing, caesarean section is considered for dystocia, if arrest of cervical dilatation in 1st stage or

arrest of descent in 2nd stage. APGAR score was assessed at 1 min and 5 min following delivery. Complications, side effects if any were noted and treated accordingly.

Throughout labour, sensory level, motor block and pain score were assessed at hourly intervals. The degree of motor block was assessed using the Modified Bromage Score (MBS) where 1 means complete block i.e. unable to move feet or knee; 2 means almost complete block i.e. able to move feet only; 3 is partial block i.e. just able to move the knees; 4 means detectable weakness of hip flexion while supine and 5 is no detectable weakness of hip flexion while supine. Parturients with MBS ≤ 2 and/or sensory level $\geq T6$ was regarded as having an excessively dense or high epidural block respectively and managed accordingly. Pain was assessed using Visual Analogue Scale with scores ranging from 0, indicating no pain to 10, being the worst pain imaginable. Breakthrough pain was managed by administering additional epidural bolus doses.

RESULTS

Present study included 80 nulliparous women. They were divided into two groups, CSE group (n=40) women who were given combined spinal epidural analgesia at 3-4 cm of cervical dilatation and non CSE group (n=40) women who were not given any form of analgesia throughout the labour. The outcomes measured were hemodynamics of the patient, pain score, bolus requirement, mode of delivery, duration of labour, neonatal outcome and complications if any.

Table 1: Demographic profile and vital parameters.

Variables	CSE ^a group (n=40)		Non-CSE group (n=39)		t-value	p-value
	Mean	SD	Mean	SD		
Age (in years)	22.23	2.1	22.36	1.9	0.29	0.71
Height (in cm)	155.43	2.8	154.9	2.7	0.83	0.70
Weight (in kg)	56.48	3.3	56.10	4.1	0.44	0.25
BMI (kg/m ²)	23.37	1.16	23.38	1.56	0.02	0.97
Pulse rate (per minute)	83.20	3.9	83.23	3.4	0.03	0.28

Independent t-test used; ^a-combined spinal epidural analgesia; p-value <0.05 is significant.

Majority of the patients were between the age group was 18-25 years. Mean age was 22.23 in group A and 22.36 in group B. Mean height in group A was 155.43 and in group B was 154.9.

The p value was <0.05 which was statistically insignificant. The mean weight in group A was 56.48 kg and 56.1 kg in group B. Mean BMI was comparable in both groups and p value was statistically insignificant.

The hemodynamics of the parturients were monitored continuously starting at baseline (before CSE), 5 min, 10 min, 15 min, 30 min, 45 min, 1, 1.5, 2, 3, 4, 5, 6 hours. Parturients monitored in both groups till they deliver. In present study none of the parturient had hypotension as side effect in CSE group.

The mean pulse rate was 83.2 \pm 3.9 in CSE group as compared to 83.23 \pm 3.4 in non CSE group.

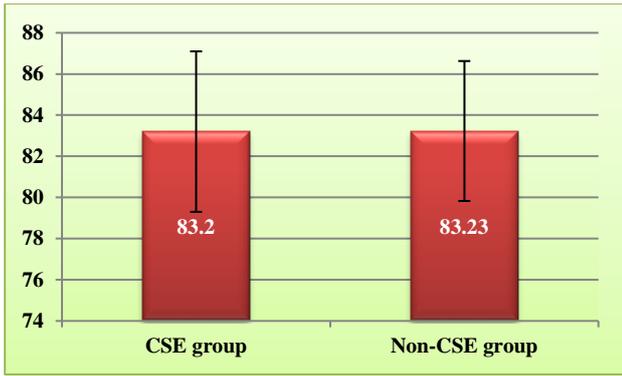


Figure 1: Mean distribution of mother's pulse rate.

The mean systolic BP was 123.85 mmHg in CSE group and it was 124.21mmHg in non CSE group.

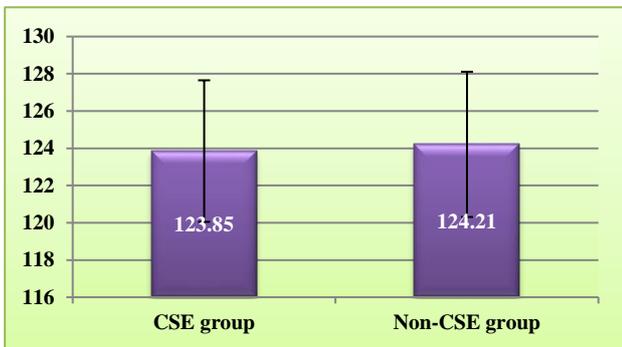


Figure 2: Mean systolic BP among parturients.

The mean diastolic BP was 82.85 mmHg in CSE group and 80.97mmHg in non CSE group.

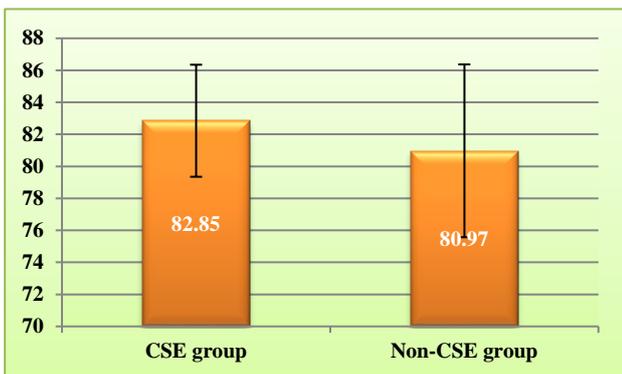


Figure 3: Mean diastolic BP among parturients.

The mean initial cervical dilatation was 3.76cm in CSE group and 3.67cm in non CSE group at the time of inclusion for study. The duration of active phase of labour in CSE group was 139±41.2 min as compared to 251.1±57.9 min in non CSE group. Mean duration of active phase of labour was shorter in CSE group as compared to non CSE group which was statistically significant. Among the parturients delivered vaginally/underwent caesarean section or instrumental delivery at

the second stage, the shortest duration of active phase was 1hr 30min in CSE group as compared to 2-hour 30 min in non CSE group. The longest duration was up to 4 hours in CSE group and 6hr in non CSE group.

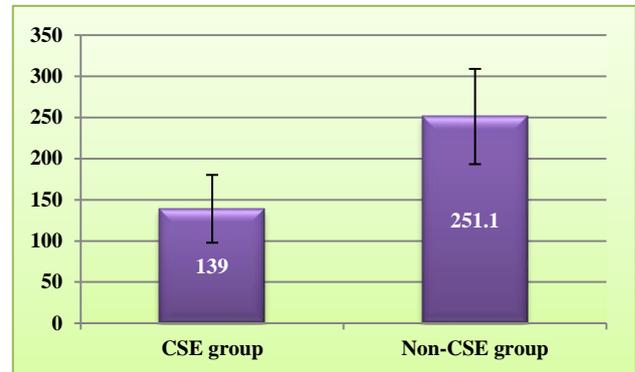


Figure 4: Comparison of duration of active phase of labour (in minutes).

The rate of cervical dilatation was 2.63±0.66cm/hr in CSE group and 1.45±0.38cm/hr in non CSE group. The difference was statistically significant.

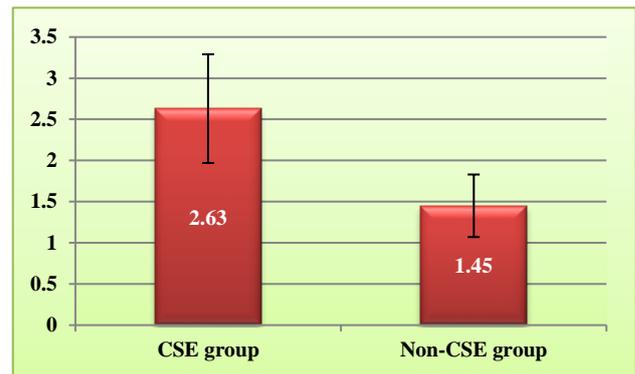


Figure 5: Comparison of rate of cervical dilatation (in cm/hr).

The mean duration of second stage of labour was 47.1±19.4 min in CSE group and it was 42.3±15.2 min in non CSE group which is not statistically significant.

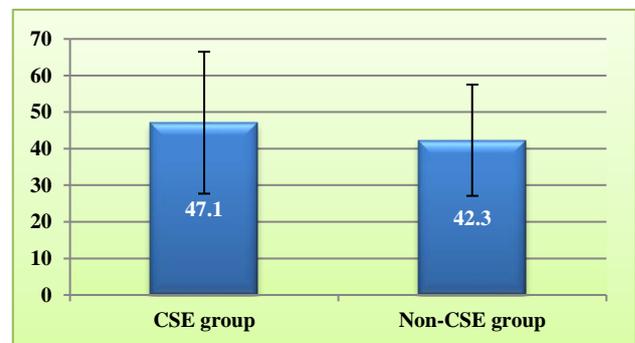


Figure 6: Duration of second stage of labour (in minutes).

The mean VAS score in CSE group was 1 as compared to 7 in non CSE group. Excellent pain relief was observed in CSE group which is statistically significant.

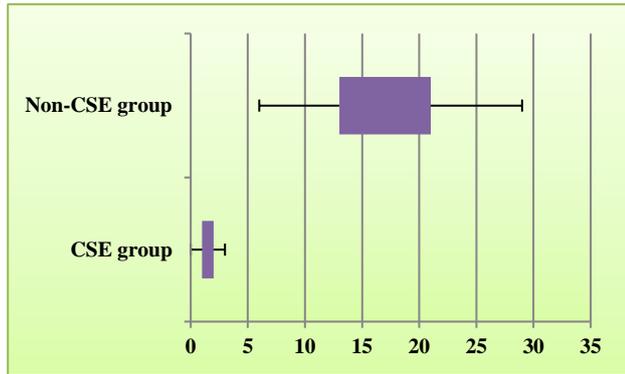


Figure 7: Comparison of intensity of labour pain using Visual Analogue Scale (VAS) among the parturients.

Majority of the parturients in both the groups delivered vaginally without any instrumentation, 77.5% in CSE group and 79.5% in non CSE group.

Increased number of instrumental deliveries were observed in CSE group (15%) as compared to non CSE group (10.3%). However, it is not statistically significant.

There is no much difference in the rate of caesarean delivery, in CSE group it was 7.5% and 10.3% in non CSE group which is not statistically significant.

In CSE group 2 parturients underwent LSCS in view of non-progress of labour and 1 parturient underwent LSCS in view of fetal distress.

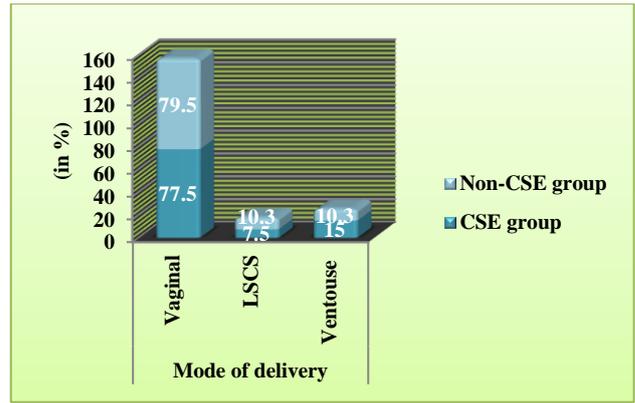


Figure 8: Relationship between modes of delivery between the groups.

There is no significant variability of FHR changes among the two groups.

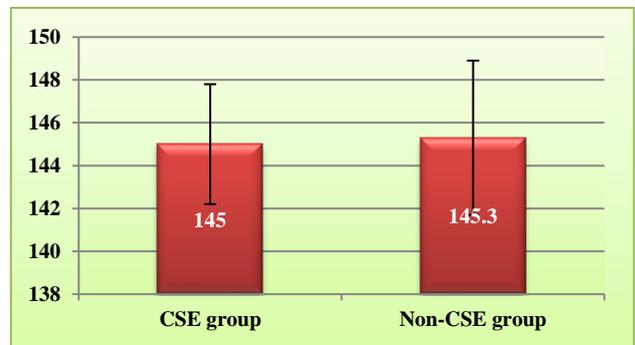


Figure 9: Comparison of mean fetal heart rate between the groups (in beats/min).

All the neonates had good APGAR score at birth.

Table 2: Comparison of APGAR score of neonates among two groups.

Variables	CSE group (n=40)		Non-CSE group (n=39)		p-value
	Mean	SD	Mean	SD	
Pre-delivery^a					
Fetal Heart Rate (in beats/min)	145.0	2.8	145.3	3.6	0.13
	Median	IQ range	Median	IQ range	p-value
Post-delivery^b					
APGAR 1 st minute	9	9,9	9	9,9	0.09
APGAR 5 th minute	9	9,9	9	9,9	0.16

^a-Independent t-test used; ^b-Mann Whitney U test used; p-value <0.05 is significant.

Effectiveness of analgesia: The time taken for onset of analgesia was assessed by noting the time taken for VAS score to become less than 4. In present study mean time taken for the onset of analgesia following intrathecal dose was 252.5±65.8 seconds.

The analgesia following intrathecal dose lasted for 74.5±15.6min. The parturient was given epidural top up

once VAS score was more than 4. The mean duration of action of epidural top up dose was 66±8.8 min. Mean number of top ups required until delivery were 1.5±0.6. 2 parturients delivered with nil top ups.

Majority of the parturients required 2 top ups until delivery. The mean interval between analgesia and delivery was 187±42.9 min.

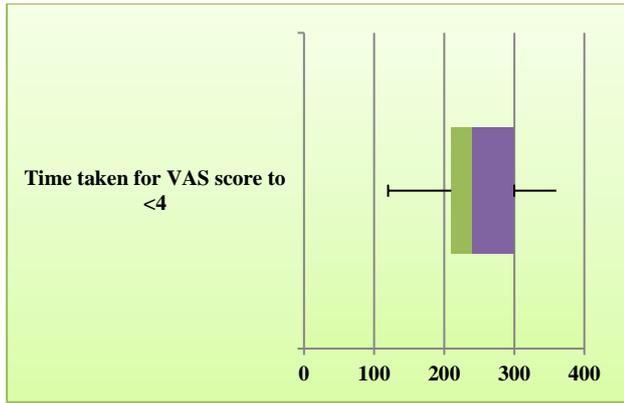


Figure 10: Time for onset of analgesia (in seconds).

Maternal side effects observed: 12 patients in the CSE group had pruritus immediately after the intrathecal dose of anaesthetic which subsided after symptomatic treatment. One patient had vomiting. None of the parturients had hypotension or motor blockade in present study.

Comparison of satisfactory level between the two groups: The maternal satisfaction was assessed in both groups postnatally. Majority of the parturients in the CSE group had excellent satisfaction compared to non CSE group. More number of parturients 18% had poor satisfaction and 25.6% had average satisfaction in non CSE group.

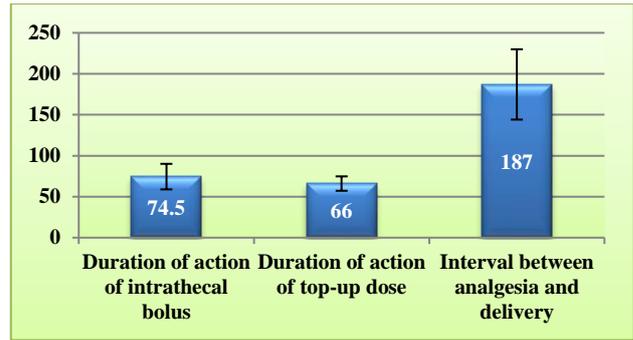


Figure 11: Duration of action of intrathecal and epidural top up dose (in minutes).

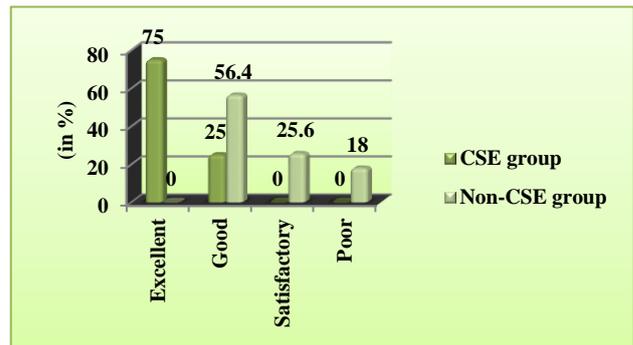


Figure 12: Comparison of maternal satisfaction between the groups.

Table 3: Effect of CSE on delivery and outcome.

Variables	CSE group (n=40)		Non-CSE group (n=39)		χ^2	p-value
	No.	%	No.	%		
Mode of Delivery^a						
Vaginal	31	77.5	31	79.5	0.53	0.76
LSCS	3	7.5	4	10.3		
Ventouse	6	15.0	4	10.3		
Side effects (pruritis, vomiting)^a						
Present	13	32.5	0	0.0	15.1	<0.001
Absent	27	67.5	39	100.0		
Maternal satisfaction^b						
Excellent	30	75.0	0	0.0	60.6	<0.001
Good	10	25.0	22	56.4		
Satisfactory	0	0.0	10	25.6		
Poor	0	0.0	7	18.0		
Statistical comparison of clinical parameters						
Variables	CSE group		Non-CSE group		t-value ^c	p-value
	Mean	SD	Mean	SD		
Duration of active labour (minutes)	139.0	41.2	251.1	57.9	9.8	0.015
Duration of 2 nd stage labour (minutes)	47.1	19.4	42.3	15.2	1.19	0.08
Cervical dilatation rate (cm per hour)	2.63	0.66	1.45	0.38	9.29	0.009
Statistical comparison of patient satisfaction						
Variables	CSE group		Non-CSE group		u-value	p-value
	Median	IQ range	Median	IQ range		
Visual Analogue Scale ^d	1	0,1	7	6,8	16.1	<0.001

a indicates Pearson Chi-square test used; b indicates Fisher’s exact test used; c indicates Independent t-test used; d indicates Mann Whitney U test used; p-value <0.05 is significant.

DISCUSSION

As noted by ASA and ACOG, 'there is no other circumstance where it is considered acceptable for a person to experience severe pain amenable to safe intervention while under a physician's care.'⁵ Unfortunately, labour represents one of few circumstances in which provision of effective analgesia is alleged to interfere with parturients and obstetricians' goal. Neuraxial block technique is currently the gold standard for labour analgesia. In present study authors have evaluated the effects of combined spinal epidural analgesia on the course of labour and fetomaternal outcome in relation to parturients not receiving any analgesia. Authors have also assessed the effectiveness of combined spinal epidural analgesia. Levobupivacaine 1.25mg with 25mcg fentanyl was given intrathecally followed by bolus of 10ml of 0.0625% Levobupivacaine with 2mcg/ml of fentanyl given through the epidural catheter when VAS score is more than 4. The parturients were comparable in regard to age, parity, weight and cervical dilatation in both groups.

In present study mean initial cervical dilation when CSE was administered to the patients was 3.76cm \pm 0.29 cm. In 2004, ACOG had published epidural analgesia may be delayed until a cervical dilation of 4-5cm is reached. However, Wong et al, in an RCT of 750 nulliparous parturients concluded that there was no difference in operative delivery or caesarean rates when neuraxial analgesia was administered early in labour (2cm) when compared with the group where epidural analgesia was administered late in labour (4-5cm) and revised the statement as 'maternal request is a sufficient indication for pain relief'.^{6,7}

Indeed, given the complicated neurohumoral and mechanical processes involved in childbirth it would be unreasonable to expect that neuroblockade of lower half of the body would not have an effect on this process. However maternal, fetal factors and obstetric management-not the analgesia are the most important determinants of outcome of labour.^{8,9} New evidence suggests that genetic polymorphism in oxytocin receptor, Catecholamine- O-Methyl transferase, beta 2 adrenergic receptor, ADR B2genes affect the progress of labour.^{8,9} Whether these genotypes interact with neuraxial analgesia to affect the progress of labour requires further study with large number of parturients

The rate of cervical dilatation was 2.63 \pm 0.66 cm/hour in CSE group as compared to 1.45 \pm 0.38 cm/hour in Non CSE group which was statistically significant. In a RCT, Tsen et al, observed a higher rate of cervical dilatation in women who received CSE analgesia than in those who received only epidural analgesia.¹⁰ The duration of first stage of labour will be determined by the intensity of uterine contraction, the rate of dilatation of cervix and the descent of the presenting part. A RCT by Morgan-Ortiz et al, showed decrease in the duration of first stage of labour

in parturients who received labour analgesia.¹¹ Another study by Agarwal D et al showed the shorter mean duration of labour in epidural group compared to control group.¹² In present study the mean duration of active phase of labour in CSE group was 139 \pm 41.2 min and that in the control group was 251.1 \pm 57.9 min. It is well documented that there is a correlation between endogenous plasma epinephrine and cortisol levels with labour progression.¹³ The decrease in alpha and beta receptor stimulation following intrathecal analgesia may enhance uterine perfusion leading to a more effectual contraction pattern.^{14,15}

The duration of second stage of labour was 47.1 \pm 19.4 min in CSE group as compared to 42.3 \pm 15.2 min in non CSE group. The difference was statistically insignificant. Though epidural analgesia has been claimed to be associated with prolonged second stage because of concomitant weakness of pelvic floor muscles that reduces effective maternal pushing, this is not the case nowadays with the use of very low concentration of anesthetic agents combined with opioids. This is confirmed by a recently published meta-analysis on the effect of low concentration versus high concentration local anesthetics for labour analgesia on obstetric and anesthetic outcome.¹⁶

The rate of instrumental delivery and caesarean section were similar in both the groups. CSE provides faster, excellent and safe analgesia with no significant increase in the caesarean section and instrumental delivery rates. In present study fetal heart rate during labour analgesia was within normal limits. There was no incidence of post epidural bradycardia. There was no significant difference between NICU admissions in both the groups. The most common side effect with CSE analgesia was pruritus seen in 32.5% of parturients. However, it was transient and subsided with symptomatic treatment. The mean pain score was 1 in CSE group as compared to 7 in non CSE group. Excellent pain relief was observed in CSE group. A recent study comparing it with traditional epidural analgesia also showed that although both techniques were excellent analgesic options, CSE provided significantly faster and better pain relief during first stage of labour.¹⁷ In addition CSE decreases the duration of first stage of labour with no effect on perinatal outcome.

In present country, the awareness is still lacking and, except few centers that run a comprehensive labour analgesia programme, the national awareness or acceptance of pain-relieving options for women in labour virtually does not exist.

CONCLUSION

Authors concluded that combined spinal epidural analgesia with 1.25mg of levobupivacaine with 25mcg fentanyl given intrathecally and bolus of 10ml of 0.0625% Levobupivacaine with 2mcg/ml of fentanyl given through the epidural catheter when VAS score is

more than 4 provides safe and excellent analgesia with no significant increase in the caesarean section and instrumental delivery rates. In addition, CSE decreases the duration of first stage of labour with no effect on perinatal outcome.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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