

# Labor Analgesia: An Unmet Right of Laboring Women in India

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## ABSTRACT

Labor pain has been described as one of the worst pain experienced by women in their lives. Medical science has made a continuous effort in this field to find a better method to alleviate the pain of labor. Since the historical use of ether for labor analgesia (1847) various pharmacological and non-pharmacological methods for labor analgesia have been evolved, each having its own merits and demerits. But even today the hunt by medical science continues to find an ideal method for labor analgesia (simple, cheap, effective, easily available, and free of side effects). To date neuroaxial/regional analgesia remains the gold standard method for labor analgesia. More than 5 decades have passed since the establishment of its effectiveness and safety profile but even today it is not available to most laboring women in India, and the concept of labor analgesia is like a fairy tale story to them. High patient load in hospitals, high cost of equipment and poor doctor/patient ratio are important obstacles for this. Thus, providing labor analgesia which is a right of every woman remains an unmet need.

**Keywords:** Labor analgesia, Labor pain, Neuroaxial analgesia Epidural analgesia.

**How to cite this article:** Sharma S, Menia V, Bedi J, Dogra S. Labor Analgesia: An Unmet Right of Laboring Women in India. *J South Asian Feder Obst Gynae* 2013;5(1):26-32.

**Source of support:** Nil

**Conflict of interest:** None declared

## INTRODUCTION

Labor has been portrayed as a painful, life-threatening and fearsome event in woman's life since the earliest recorded history and has held that status until the last century. It is very difficult to quantify pain but many women describe it as worst pain they have experienced in their lives thus, making their memories of childbirth sour and bitter. Pain relief in labor has always been surrounded with myths and controversies. Hence, providing effective and safe analgesia during labor has remained an ongoing challenge. 'The delivery of the infant into the arms of a conscious and pain-free mother is one of the most exciting and rewarding moment in medicine' Moir.

## Physiology of Pain in Labor

Labor pain is the result of many complex interactions, physiological and psychological, excitatory as well as inhibitory. Pain during the first stage of labor is due to distention of the lower uterine segment, mechanical dilatation of the cervix and lastly due to stretching of excitatory nociceptive afferents resulting from the contraction of the uterine muscles.<sup>1</sup> The severity of pain parallels with the duration and intensity of contraction.<sup>2</sup>

In the second stage additional factors, such as traction and pressure on the parietal peritoneum, uterine ligaments, urethra, bladder, rectum, lumbosacral plexus, fascia and muscles of the pelvic floor increase the intensity of pain.

## History of Labor Analgesia<sup>3</sup>

Many members of the British clergy argued that human intervention in the miracle of birth was sin against the will of God. If God had wished labor to be painless, he would have created it so. James Young Simpson used diethyl ether to anesthetize a woman with a deformed pelvis for childbirth (1847). Queen Victoria undaunted by the clergy chose 1 day to use an anesthetic during labor (1853) and the clergy's position crumpled like the great wall of 'Berlin'. After initial reports of successful pain free childbirth, an era of conflict began predominantly between two groups, one against and the other for 'adapting pain-free childbirth'. The former group believed that childbirth pain originated when God punished Eve and her descendants for Eve's disobedience in the Garden of Eden and it was wrong to avoid the pain of divine punishment. On the other hand, there were others believing that disease and pain are biologic processes subject to study and control by new methods of science and technology. This prophecy has come to reality in the years that followed and the era of 'obstetric anesthesia' began to flourish.

In 1881 Stanislav Klikovitch described the use of nitrous oxide for labor in Russia.

In 1902 morphine and hyoscine was first used in labor.

In 1931 Eugen Bogdan Aburel, described continuous caudal plus lumbo-aortic plexus blocks in labor.

In 1940 Pethidine was first used.

In 1949 Cleland described continuous lumbar epidural block in labor.

In 1958 Ferdinand Lamaze published in his book that psychoprophylaxis could reduce pain.

## Various Methods of Pain Relief in Labor

### A. Nonpharmacological methods

#### a. Psychological methods

- Hypnotherapy
- Psychoprophylaxis - The Lamaze technique
- Continuous labor support

#### b. Physical methods

- Acupuncture
- Transcutaneous electrical nerve stimulation (TENS)
- Aromatherapy
- Water (bath or shower)
- Positions, touch and massage
- Sterile water injections

## B. Pharmacological methods

- a. Systemic opioid analgesia
- b. Inhalation methods
- c. Pudendal and paracervical nerve block
- d. Neuroaxial or regional analgesia in labor
  - Epidural analgesia
  - Combined spinal/epidural analgesia (CSEA)

*Hypnotherapy:* Hypnobirthing utilizes techniques for fear release and relaxation. 'Women attempt to relieve all anxiety and reach a loose, limp, rag doll relaxed state....then the body can do what it was designed to do during birth, without constriction and resulting discomfort. This method attempts to modify the perception of pain through self hypnosis and post hypnotic suggestion. Hypnobirthing classes meet once a week starting at the 30th week of pregnancy for 4 to 5 weeks period.

*Limitations:* Longer mean duration of labor, more time required for hypnosis preparation and decreased memory of childbirth.<sup>4</sup>

*Lamaze technique:* Dr Grantley Dick Read encouraged women to give birth naturally by reducing the pain and fear of childbirth through knowledge and relaxation. The Lamaze Method of Childbirth (psychoprophylaxis) consists of continuous labor support (by the monitrice) and the use of a repertoire of relaxation and breathing strategies.<sup>5</sup>

*Continuous labor support:* Continuous labor support provided by a doula, a lay woman trained in labor support, consistently has decreased the use of obstetric interventions. A Cochrane meta-analysis found a decrease in operative vaginal deliveries, cesarean deliveries, and requests for pain medication when continuous labor support was given.

*Acupuncture:* In theory there are more than 365 points along the 12 'meridians' (energy paths) of the body. Interruptions of energy flow (surgery, labor, etc.) along meridians break up the harmony of the body producing feelings of pain. Very fine needles are placed just under the skin at strategic points to redirect energy to correct paths that has been interrupted by surgery or labor. These needles are often connected to a small electrical current to assist in pain control. It was found that women were less likely to request an epidural during labor or other types of pain relief when acupuncture was used.<sup>6</sup>

### Limitations

- Need of an acupuncture professional and risk of infection at needle site
- Placement in labor may limit the mobility of the mother
- Acupuncture has not been shown to decrease perception of pain.

*Transcutaneous electrical nerve stimulation (TENS):* TENS is the application of a very small electrical current to the skin to decrease the perception of pain elsewhere in the body. The current prevents pain signals from reaching the brain and might stimulate the body's production of higher levels of endorphins. Electrode pads are placed on the lower back or suprapubic area.

These pads are connected to a small control box, controlled by the mother.

*Limitations:* No change in the perception of pain or utilization of pain medications when compared to controls. However, most women found TENS helpful in dealing with pain. It has not been found to harm either mother or baby.<sup>4,7</sup>

*Aromatherapy:* It has garnered attention recently. There is no direct or indirect pain relief involved but the laboring mother may find aromatherapy helps reduce stress thereby allowing pain to be better tolerated. Essential oils of Rose, Lavender, Neroli, Chamomile Eucalyptus, and others are placed in baths, on face cloths, in massage oil, or directly on the laboring mother's skin. Many recommend different oils to use for different stages of labor, like calming oil for the first stage of labor and peppermint oil for stage 2 of labor.<sup>4,7</sup>

*Limitations:* There is no direct pain relief, some women may be allergic to particular oil preparations and some may enhance nausea and vomiting associated with labor.

*Water (bath or shower):* With water bath, laboring women experience lesser pain and more soothing effect. Women who has entered the active phase of labor is placed in a warm water bath with water near body temperature (37-38°C), and water level below nipples so that proper body cooling can occur. Studies have shown no increase in infection or antibiotic use with intralabor bathing in cases of PROM.<sup>4,7</sup>

*Limitations:* Prolonged exposure of the fetus to elevated temperatures may increase fetal morbidity thus it is recommended that water temperature not exceed 37°C and duration limited to less than 2 hours per bathing period.

*Position, touch and massage:* During labor women find some positions (upright, squatting, side, hands and knees) and movements more comfortable than others. Movements and positioning in labor may be recommended to rotate a malpositioned baby or correct slow labor progress in dilation or descent. Many studies suggest walking or sitting more upright speeds the rate of labor. Recently birthing balls have been used during labor. The mother can sit, rock, bounce, or stretch on them to ease pain or increase the rate of delivery.

*Touch and massage* by a loved one or supporter is often appreciated by women in labor. It includes variety of interventions ranging from therapeutic massage to light caressing and hair stroking. Pain relief may occur through stress reduction, distraction, or through the stimulation of other receptors.

*Limitations:* It has not been shown to decrease the utilization of pain medications. The pain relief in birth appears to last approximately 30 minutes when massage or deep pressure is used. Therefore massage may work best when given in 30-minute intervals with breaks in between.

*Sterile water injections:* Intradermal injections of sterile water in the sacral area may be used to decrease back pain in labor. Sterile-water injection causes a burning sensation that is much more painful than saline injection and is thought to relieve labor

pain by counter irritation. Sterile water (0.1 ml) is injected into four sites two over each posterior superior iliac spine (PSIS) and two 3 cm below and 1 cm medial to the PSIS. Studies have found significant reduction in back pain for 45 to 90 minutes.<sup>4,7</sup>

**Inhalation anesthetics:** Inhalation analgesia labor has historically been with ether, chloroform halothane, enflurane, isoflurane, etc. but only nitrous oxide has passed the test of time. It is least toxic, analgesic, reliable, fast and its most notably has strong analgesic and weak anesthetic effect. It has minimal impact on the fetus, does not affect the contractions of labor, blood pressure is stable and no stimulation of the respiratory tract.<sup>8</sup> The main disadvantages are dizziness, irritability, nausea, regurgitation and aspiration.

**Systemic opioid analgesia:** Systemic opioids have been used since 1840s and are the most widely used medications for labor analgesia. Unfortunately, dosage and effect are limited by maternal and neonatal side effects, so that only moderate pain relief could be obtained with these drugs.

- Pethidine has become the most commonly used and widely investigated systemic opioid in labor. It is principally a  $\mu$ -agonist of a low potency and reduces labor pain by about 25%. Delayed gastric emptying, underventilation between contractions and convulsant properties are some side effects.<sup>9</sup>
- Morphine fell from favor in the first half of the twentieth century, because of its association with 'twilight sleep', addictive side effects and neonatal side effects.<sup>9,10</sup>
- Buprenorphine is a partial  $\mu$ -agonist. It is about 20 times as potent as morphine, has a high affinity for opioid receptors and slow dissociation from them. It appears to have a long duration of action and though side effects are rare, when nausea and respiratory depression do occur they can be exceedingly persistent and difficult to reverse.
- Nalbuphine is a synthetic mixed  $\mu$ -agonist/antagonist and a kappa-agonist. Maternal or foetal respiratory depression is less likely with nalbuphine due to the ceiling effect. The chief disadvantages of this drug are sedation and dysphoria.
- Tramadol is a pethidine-like synthetic OPIOID having low affinity for  $\mu$ -receptors. Its potency is 10% that of morphine. It has no clinically significant respiratory depression at usual doses of 1 to 2 mg/kg body weight. Compared with pethidine, mothers receiving tramadol had higher pain scores.<sup>9</sup>
- Fentanyl is a highly lipid-soluble synthetic opioid with analgesic potency 100-times that of morphine and 800-times that of pethidine. It has rapid onset and short duration of action and with no major metabolites makes it superior for labor analgesia.<sup>11</sup> Because of its pharmacokinetics and pharmacodynamics, it is suitable to be administered by patient-controlled intravenous analgesia (PCA).
- Remifentanyl is an ultra-short acting synthetic potent opioid. It has a rapid onset of action and is readily metabolized by plasma and tissue esterases. The effective analgesia half-life is 6 minutes thus, allowing effective analgesia for consecutive uterine contractions. Because of its pharmacokinetic profile, this agent has an advantage over other opioids for labor PCA.

**Paracervical block:** This method can provide complete pain relief in first stage of labor in about 80% of patients. It serves to relieve the pain of uterine contractions, but because the pudendal nerves are not blocked, additional analgesia is required for delivery.

**Limitations:** Fetal bradycardia, acidosis and neonatal depression are common.<sup>12</sup> Transient paresthesia, numbness and anesthesia of the leg can occur.<sup>13</sup>

**Pudendal block:** Mostly used during second stage of labor to alleviate the pain from distension of lower vagina, vulva and perineum. This block also provides anesthesia for episiotomy and low forceps delivery.

**Limitations:** Incomplete perineal analgesia because of overlap from genital branch of the genitofemoral nerve and perforating branch of posterior cutaneous nerve of thigh. It is ineffective for analgesia in first stage of labor. Unintentional intravascular injection can induce dysrhythmias and cardiovascular collapse. The needle may pierce and damage the rectum, vagina or fetus. Hematoma in the ischio-rectal and paravaginal can rarely occur. Abscess and periosteal infections have also been reported.<sup>13,14</sup>

**Neuroaxial or regional analgesia in labor:** It is the most versatile and the gold standard technique for pain control in obstetrics that is currently available. In obstetric patients, regional analgesia refers to partial or complete loss of pain sensation below the T8 to T10 spinal level. In addition, a varying degree of motor block may be present, depending on the agents used. Advantages of regional analgesia include the following:

- Provides superior pain relief in first and second stages of labor
- Facilitates patient cooperation during labor and delivery
- Provides anesthesia for episiotomy and instrumental delivery
- Allows extension of anesthesia for cesarean delivery
- Avoids opioid-induced maternal and neonatal respiratory depression from intravenous opioids.

## Indications

Maternal request is a sufficient medical indication for pain relief during labor.<sup>15</sup>

Analgesia is indicated for patients with certain risk factors even in the absence of maternal request.

- Marked obesity
- Obstetric complications with potential for operative delivery (e.g. placenta previa, high order multiple gestation)
- Severe pre-eclampsia
- Severe edema, trauma, surgery or anatomical abnormalities of the face, neck or spine
- Abnormal dentition, small mandible or difficulty opening mouth
- Extremely short stature, short neck or arthritis of the neck
- Goiter
- Prior history of anesthesia complications, such as malignant hyperthermia

- Cardiovascular, neurological or respiratory disease
- Hyper-reflexia in parturients with a high spinal cord lesion (prevention or treatment).

### Contraindications

Regional anesthesia is contraindicated in the presence of actual or anticipated serious maternal hemorrhage, refractory maternal hypotension, coagulopathy, untreated bacteremia, raised intracranial pressure, skin or soft tissue infection at the site of the epidural or spinal placement and anticoagulant therapy.<sup>16</sup>

Other maternal conditions, such as aortic stenosis, pulmonary hypertension, or right-to-left shunts and neurological diseases, are also relative contraindications to the use of regional analgesia. For patients with mitral stenosis, regional analgesia (epidural) is the preferred method.

### Controversies

In severe pre-eclampsia analgesia is controversial but over the past 2 to 3 decades, most obstetric anesthesiologists have come to favor epidural blockade for labor analgesia in women with severe pre-eclampsia.<sup>17</sup>

*Thrombocytopenia:* Several studies have reported no complications in women with platelet counts between 50,000 and 100,000 who received epidural analgesia.<sup>18,19</sup>

*Anticoagulant therapy:* Regional anesthesia could be safely administered to patients taking aspirin or unfractionated heparin prophylaxis.<sup>20</sup>

Patients taking therapeutic doses of unfractionated heparin should discontinue the medication the night before a planned induction or cesarean delivery, or with the spontaneous onset of labor. The clinician should ensure that aPTT and platelets are within normal limits.<sup>20</sup>

Patients on low molecular weight heparin need to wait for 12 hours following the last prophylactic dose and at least 24 hours following the last therapeutic dose prior to receiving a regional block.<sup>20</sup>

*Nonreassuring fetal heart tone* is not a contraindication to regional analgesia. The prior placement of a functioning epidural catheter may allow rapid extension of the block, should cesarean delivery be required for fetal distress.

Various classes of analgesics used for epidural and spinal analgesia include local anesthetics, opioids and adrenergic agonists. Local anesthetics alone can provide adequate analgesia throughout labor but, the concentration of local anesthetic needed to maintain analgesia often results in motor block. The administration of an opioid alone provides inadequate analgesia during labor, with significant adverse effects. When an opioid is used in combination with a local anesthetic, it provides faster onset of effective analgesia throughout labor with minimal adverse effects.

### Local Anesthetics

Bupivacaine is used most often for spinal analgesia. It has a favorable sensory motor differential block at low

concentrations. This results in analgesia with motor sparing, thus enabling ambulation. Bupivacaine cardiotoxicity is particularly difficult to reverse,<sup>21</sup> thus concentrations >0.5% is not recommended in obstetric patients.

Ropivacaine is a bupivacaine isomer and is used most often for epidural analgesia. Like bupivacaine, the favorable sensory-motor differential block at low concentrations has made it a popular choice for labor analgesia. It causes less motor block and cardiotoxicity than bupivacaine.<sup>21</sup> If cardiotoxicity occurs with ropivacaine, it is more amenable to treatment.<sup>21,22</sup>

Lidocaine is used less often today as the primary agent to provide labor analgesia. The disadvantages of lidocaine include (1) less differential block, (2) shorter duration of action, and (3) higher association with transient neurological symptoms and Cauda Equina syndrome.<sup>23</sup>

### Opioids

Good analgesia can be achieved in labor with low doses of a combination of opioid and local anesthetic. Side effects from neuraxial opioid administration include nausea, pruritus, urinary retention and respiratory depression. The respiratory depression may be delayed, particularly when less lipid soluble opioids are used such as diamorphine. Of the opioids used most often for regional analgesia, fentanyl and sufentanil are more lipid-soluble. This solubility results in a faster onset of analgesia, a short duration of action and minimal adverse effects.

- Fentanyl
- Sufentanil
- Diamorphine
- Pethidine

*Adrenergic agonists:* The addition of adrenaline at a concentration of 1:200,000 to 1:800,000 to local anesthetic solution hastens, intensifies and prolongs the neural blockade. Thus, it decreases the requirement of higher concentration of local anesthetics. It more highly associated with motor block and has potential tocolytic effect, making it less popular for neuroaxial use.<sup>24</sup>

Clonidine is a more selective alpha 2-agonist than adrenaline. It potentiates the action of spinal opioids and does not enhance motor blockade. It does not lead to respiratory depression, pruritis or nausea. It can, however, produce hypotension, bradycardia and sedation after its administration epidurally.

### Technique of Administering Epidural Analgesia

Obtain informed consent, ensure adequate venous access, prehydrate with 500 to 1,000 ml of crystalloid and set up patient monitoring as follows:

- Blood pressure recording at baseline prior to administration of regional anesthetics; then every 1 to 2 minutes for 15 minutes after giving a bolus of local anesthetic; then at every 5 to 15 minutes interval until the block wears off
- Continuous maternal and fetal heart rate monitoring during induction of analgesia.

Help the patient assume a seated or lateral decubitus position. Clean the lumbar area with appropriate antiseptic and drape the area. Palpate the lumbar spinous process and choose the widest interspace below L3. Place a hollow epidural needle (17 or 18 ga) in the intervertebral ligaments characterized by a high degree of resistance to penetration. Slowly advance the needle while feeling for resistance. A sudden loss of resistance is felt as the epidural needle enters the epidural space. Aspirate for blood or cerebrospinal fluid. Administer 3 to 5 ml of preservative-free normal saline or dilute local anesthetic to facilitate passage of the catheter. Advance an epidural catheter into the epidural space at least 4 cm into the epidural space. Withdraw the needle over the tubing.

After careful aspiration and uterine contraction, inject a test dose of 3 ml bupivacaine 0.25% with epinephrine 1:200,000. If the test dose is negative (i.e. absence of tachycardia), inject the anesthetic in 2 to 3 small boluses to achieve a cephalad sensory level of approximately T10. Initial block options include the following:

- Bupivacaine 0.125 to 0.25% (10-15 ml)
- Bupivacaine 0.125% (10-15 ml) with fentanyl 50 to 100 µg
- Fentanyl 50 to 100 µg (or sufentanil 10-15 µg) in 10 ml normal saline.

After 15 to 20 minutes, assess sensation using loss of sensation to cold or pinprick. When loss of sensation is confirmed, secure the catheter to the patient's back with adhesive dressing. Solutions of a local anesthetic, opioids or a combination of the two can now be administered through the catheter. Aspirate the catheter for blood or CSF before each top-up dose. It has four subtypes.

- Single epidural shot it is short lasting, thus not usually practiced.
- The intermittent bolus technique, although still used, is currently out of favor because of noncontinuous analgesia and requires frequent provider intervention.
- Continuous infusion epidural results in a smoother analgesia, fewer provider interventions, less motor block and hypotension. It may be adjusted to individualize analgesia. An epidural catheter can also be used, if a larger dose of local anesthetic is needed for instrumental or cesarean delivery or for pain control postpartum.
- Patient-controlled epidural analgesia (PCEA) differs from the continuous infusion technique in that the parturient herself is given the means to fine-tune the dose of analgesic she receives. Compared to continuous epidural infusion, PCEA results in a lower total dose of local anesthetics used,<sup>25</sup> decreased need for the physician to administer additional doses and a lower incidence of motor block.<sup>26</sup>

*Combined spinal/epidural analgesia:* It has evolved in an attempt to optimize the advantages of each separate technique which include more rapid onset of pain relief and good perineal analgesia and less motor block. The disadvantages are an increased risk of complications due to two procedures as opposed to one.

*Technique:* Same as in epidural analgesia till needle enters epidural space. After this place a long spinal needle ( $\leq 24$  ga and  $\geq 124$  mm) into the subarachnoid space through the epidural needle. The spinal needle should extend 10 to 15 mm beyond the tip of the epidural needle. Withdraw the spinal needle after a single bolus of opioid into the subarachnoid space. Place an epidural catheter to permit administration of continuous or repeated doses of analgesics.

For labor analgesia an opioid, such as fentanyl 10 to 25 µg or sufentanil 2.5 to 10 µg may be injected alone or with a local anesthetic, such as bupivacaine 1 to 2.5 mg into the intrathecal space. This combination provides analgesia for approximately 90 minutes. After the effect of spinal drugs wear off, initiate an epidural infusion with a bolus of bupivacaine 0.0625 to 0.125% with fentanyl (2 µg/ml) or an equivalent dose of ropivacaine.

### Complications of Regional Anesthesia

- *Cardiovascular toxicity:* Hypertension, tachycardia, cardiac arrhythmia, cardiac arrest, or (commonly) hypotension.<sup>27</sup>
- *Central nervous system:* Dizziness, tinnitus, metallic taste, numbness of tongue and mouth, slurred speech, bizarre behavior, muscle fasciculation and excitation, convulsion, or loss of consciousness.<sup>28</sup>
- Postdural puncture headache (PDPH) most likely results from cerebral vasodilatation or from the traction of cranial structures due to leakage of cerebrospinal fluid from the site of dural puncture.<sup>29</sup>
- Pruritus is a commonly seen with regional opioid administration. The etiology appears to be modulation of nociceptive reception, not histamine release. Treatment is opioid antagonist, such as naloxone (40-100 µg) or the opioid agonist-antagonist nalbuphine (5-10 mg).
- Nausea and vomiting occur due to decrease in blood pressure affecting the area postrema in the medulla or the cephalad spread of opioids to chemoreceptor trigger zone. Treatment includes administration of an opioid antagonist and correction of hypotension.
- Local tenderness at the site and transient backache are relatively common. This usually clears within several days to 3 weeks and may be related to superficial irritation of the skin or periosteal irritation or damage.<sup>30</sup>
- Labor is slightly prolonged with epidural analgesia.<sup>31</sup> The first stage is prolonged by nearly 30 minutes, and the second stage by 15 minutes, increased need for instrumental delivery,<sup>31</sup> higher frequency of persistent occipitoposterior presentation.<sup>14</sup>
- Fetal bradycardia occurs in 8% of cases. It may result from decreased cardiac output, decreased uterine perfusion.<sup>32</sup> Treatment includes to administer oxygen and to correct hypotension. Use left lateral position to avoid aortocaval compression. Terbutaline 0.25 µg SC can be used for uterine hyperactivity.
- Respiratory depression is a serious adverse effect that can occur with spinal or epidural analgesia, more with

hydrophobic opioids (e.g. morphine) and less lipid-soluble opioids (fentanyl and sufentanil). Treatment includes administration of naloxone.<sup>33</sup>

- Urinary retention during labor is not uncommon, but it appears to be more likely with regional analgesia.<sup>33</sup>
- Inadequate or failed block, unilateral epidural block, prolonged epidural block and high spinal block can occur as a complication.
- Chemical meningitis or epidural abscess or hematoma.

## RECENT ADVANCES

*Sevox—Patient-controlled inhalation analgesia:* Sevoflurane in the concentration of 0.8% with oxygen, appears to be the better-suited inhalational agent for labor analgesia and can be administered as patient-controlled inhalation analgesia because of its short onset and offset of action.<sup>34</sup>

*CSEA technique and low-dose epidural regimes:* It combines the rapid, reliable onset of profound analgesia resulting from spinal injection with the flexibility and longer duration of epidural techniques.<sup>35</sup>

*PCEA:* It is a novel method of the drug delivery system, providing several advantages, including the ability to reduce the drug dosage, self-control and self-esteem.<sup>36</sup>

*Computer-integrated PCEA:* Lim et al in their center have developed a computer-integrated PCEA (CI-PCEA) that controls background infusion rates depending on the previous hour's demand boluses.<sup>37</sup>

*Continuous spinal analgesia with microcatheters:* The Food and Drug Administration (FDA) has restricted the use of spinal microcatheters due to an association with the Cauda Equina syndrome, which is not fully proved yet.<sup>38</sup>

## CONCLUSION

Tremendous advancement has been made in the field of labor analgesia and still there is scope of improvement. Regional analgesia has become the most accepted, effective, relatively safe and the gold standard method of labor analgesia over the last decade. Places where regional analgesia is not available, other methods of pain relief can be considered and adopted to decrease the suffering and pain of laboring women. In countries like India where only rare institutions routinely administer labor analgesia, a lot of effort needs to be made by health care system, to make labor analgesia universally available in health institutions across the country.

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