



## Clinical evaluation of pain scores in the caesarean section cases undergoing intraoperative anesthetic management in post-anesthesia care unit

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### Abstract

Inadequately treated postoperative pain can contribute significantly to morbidity of surgical patients, resulting in the delay of patients' recovery and ability to return to daily functional activities. Early recovery is especially important for a patient who is expected to take care of her newborn shortly after an operative procedure. Evidence from studies done in high income settings has demonstrated that inadequately treated pain after cesarean section is associated with an increased incidence of chronic pain and post-traumatic stress syndrome. Hence the present study was planned for clinical evaluation of pain scores in the caesarean section cases undergoing intraoperative anesthetic management in post anesthesia care unit.

The present study was planned in Department of Anaesthesia and Critical Care, Shree Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. Total 20 cases of the Caesarean sections (CS) undergoing the spinal anesthesia were enrolled in the present study.

The data generated from the present study concludes that patients undergoing CS under RA, the need for rescue analgesia was less compared to patients operated under GA in the initial 30 min in PACU. In addition, patients who were operated under GA and received IV morphine as intraoperative analgesia had better pain scores compared to patients receiving nalbuphine or tramadol. The overall pain management in the PACU was adequate as all patients were given rescue analgesia if they had NRS of  $>4$  and no patient was shifted from PACU with NRS of  $>4$ .

**Keywords:** anaesthesia recovery, caesarean section, pain measurement, post-operative pain, etc

### 1. Introduction

Caesarean section, also known as C-section, or caesarean delivery, is the use of surgery to deliver babies. A caesarean section is often necessary when a vaginal delivery would put the baby or mother at risk. This may include obstructed labor, twin pregnancy, High blood pressure in the mother, breech birth, or problems with the placenta or umbilical cord. A caesarean delivery may be performed based upon the shape of the mother's pelvis or history of a previous C-section. A trial of vaginal birth after C-section may be possible. The World Health Organization recommends that caesarean section be performed only when medically necessary. Some C-sections are performed without a medical reason, upon request by someone, usually the mother.

A C-section typically takes 45 minutes to an hour. It may be done with a spinal block, where the woman is awake, or under general anesthesia. A urinary catheter is used to drain the bladder, and the skin of the abdomen is then cleaned with an antiseptic. An incision of about 15 cm (6 inches) is then typically made through the mother's lower abdomen. The uterus is then opened with a second incision and the baby delivered. The incisions are then stitched closed. A woman can typically begin breastfeeding as soon as she is out of the operating room and awake. Often, several days are required in the hospital to recover sufficiently to return home<sup>[1]</sup>.

C-sections result in a small overall increase in poor outcomes in low-risk pregnancies. They also typically take longer to heal from, about six weeks, than vaginal birth. The

increased risks include breathing problems in the baby and amniotic fluid embolism and postpartum bleeding in the mother. Established guidelines recommend that caesarean sections not be used before 39 weeks of pregnancy without a medical reason. The method of delivery does not appear to have an effect on subsequent sexual function<sup>[2]</sup>.

In 2012, about 23 million C-sections were done globally. The international healthcare community has previously considered the rate of 10% and 15% to be ideal for caesarean sections. Some evidence finds a higher rate of 19% may result in better outcomes. More than 45 countries globally have C-section rates less than 7.5%, while more than 50 have rates greater than 27%. Efforts are being made to both improve access to and reduce the use of C-section. In the United States as of 2017, about 32% of deliveries are by C-section. The surgery has been performed at least as far back as 715 BC following the death of the mother, with the baby occasionally surviving. Descriptions of mothers surviving date back to 1500. With the introduction of antiseptics and anesthetics in the 19th century, survival of both the mother and baby became common<sup>[3]</sup>.

Both general and regional anaesthesia (spinal, epidural or combined spinal and epidural anaesthesia) are acceptable for use during caesarean section. Evidence does not show a difference between regional anaesthesia and general anaesthesia with respect to major outcomes in the mother or baby. Regional anaesthesia may be preferred as it allows the mother to be awake and interact immediately with her baby. Compared to general anaesthesia, regional anaesthesia is better at preventing persistent postoperative pain 3 to 8

months after caesarean section. Other advantages of regional anesthesia may include the absence of typical risks of general anesthesia: pulmonary aspiration (which has a relatively high incidence in patients undergoing anesthesia in late pregnancy) of gastric contents and esophageal intubation. One trial found no difference in satisfaction when general anaesthesia was compared with either spinal anaesthesia [4].

Regional anaesthesia is used in 95% of deliveries, with spinal and combined spinal and epidural anaesthesia being the most commonly used regional techniques in scheduled caesarean section [72]. Regional anaesthesia during caesarean section is different from the analgesia (pain relief) used in labor and vaginal delivery. The pain that is experienced because of surgery is greater than that of labor and therefore requires a more intense nerve block.

It is common for women who undergo caesarean section to have reduced or absent bowel movements for hours to days. During this time, women may experience abdominal cramps, nausea and vomiting. This usually resolves without treatment. Poorly controlled pain following non-emergent caesarean section occurs in between 13% to 78% of women. Abdominal, wound and back pain can continue for months after a caesarean section. Non-steroidal anti-inflammatory drugs can be helpful. For the first couple of weeks after a cesarean, women should avoid lifting anything heavier than their baby. To minimize pain during breastfeeding, women should experiment with different breastfeeding holds including the football hold and side-lying hold. Women who have had a caesarean are more likely to experience pain that interferes with their usual activities than women who have vaginal births, although by six months there is generally no longer a difference. Pain during sexual intercourse is less likely than after vaginal birth; by six months there is no difference [5].

There may be a somewhat higher incidence of postnatal depression in the first weeks after childbirth for women who have caesarean sections, but this difference does not persist [28]. Some women who have had caesarean sections, especially emergency caesareans, experience post-traumatic stress disorder [5].

Bupivacaine (Marcaine) is the local anaesthetic most commonly used, although lidocaine (lignocaine), tetracaine, procaine, ropivacaine, levobupivacaine, prilocaine, or cinchocaine may also be used. Commonly opioids are added to improve the block and provide post-operative pain relief, examples include morphine, fentanyl, diamorphine, and buprenorphine. Non-opioids like clonidine or epinephrine may also be added to prolong the duration of analgesia (although Clonidine may cause hypotension). In the United Kingdom, since 2004 the National Institute for Health and Care Excellence recommends that spinal anaesthesia for Caesarean section is supplemented with intrathecal diamorphine and this combination is now the modal form of anaesthesia for this indication in that country. In the United States Morphine is used for cesareans for the same purpose since diamorphine (heroin) is not used in clinical practice in the US.

Baricity refers to the density of a substance compared to the density of human cerebrospinal fluid. Baricity is used in anaesthesia to determine the manner in which a particular drug will spread in the intrathecal space. Usually, the hyperbaric, (for example, hyperbaric bupivacaine) is chosen, as its spread can be effectively and predictably controlled by

the Anaesthesiologist, by tilting the patient. Hyperbaric solutions are made more-dense by adding glucose to the mixture.

Baricity is one factor that determines the spread of a spinal anaesthetic but the effect of adding a solute to a solvent, i.e. solvation or dissolution, also has an effect on the spread of the spinal anaesthetic. In tetracaine spinal anaesthesia, it was discovered that the rate of onset of analgesia was faster and the maximum level of analgesia was higher with a 10% glucose solution than with a 5% glucose spinal anaesthetic solution. Also, the amount of ephedrine required was less in the patients who received the 5% glucose solution [8]. In another study this time with 0.5% bupivacaine the mean maximum extent of sensory block was significantly higher with 8% glucose (T3.6) than with 0.83% glucose (T7.2) or 0.33% glucose (T9.5). Also the rate of onset of sensory block to T12 was fastest with solutions containing 8% glucose [6].

A pain scale measures a patient's pain intensity or other features. Pain scales are a common communication tool in medical contexts, and are used in a variety of medical settings. Pain scales are a necessity to assist with better assessment of pain and patient screening. Pain measurements help determine the severity, type, and duration of the pain, and are used to make an accurate diagnosis, determine a treatment plan, and evaluate the effectiveness of treatment. Accurately measuring pain is a necessity in medical settings, especially if the pain measurement is going to be used as a screening tool, either for potential diseases or medical problems, or as a type of triage to determine urgency of one patient over another [7]. Pain scales are based on trust, cartoons (behavioral), or imaginary data, and are available for neonates, infants, children, adolescents, adults, seniors, and persons whose communication is impaired. Pain assessments are often regarded as "the 5th Vital Sign" [8].

It is important to understand what features of pain scales are most useful, least useful, and which aid in understanding. In fact, a patient's self-reported pain is so critical in the pain assessment method that it has been described as the "most valid measure" of pain. The focus on patient report of pain is an essential aspect of any pain scale, but there are additional features that should be included in a pain scale. In addition to focusing on the patient's perspective, a pain scale should also be free of bias, accurate and reliable, able to differentiate between pain and other undesired emotions, absolute not relative, and able to act as a predictor or screening tool [9].

The Numeric Rating Scale (NRS-11) is an 11-point scale for patient self-reporting of pain. It is for adults and children 10 years old or older [10].

Rating	Pain Level
0	No Pain
1-3	Mild Pain (nagging, annoying, interfering little with ADLs)
4-6	Moderate Pain (interferes significantly with ADLs)
7-10	Severe Pain (disabling; unable to perform ADLs)

Pain interferes with a person's ability to perform the Activities of Living. Pain also interferes with a person's ability to concentrate; and to think. A sufficiently strong pain can be disabling on a person's concentration and coherent thought, even though it is not strong enough to prevent that person's performance of ADLs. However, there

is no system available for measuring concentration and thought. So this Numeric Rating Scale is based solely on ability to perform ADLs. The important measures of a particular pain level's impact on concentration and thought are not available.

General anesthesia may be necessary because of specific risks to mother or child. Patients with heavy, uncontrolled bleeding may not tolerate the hemodynamic effects of regional anesthesia. General anesthesia is also preferred in very urgent cases, such as severe fetal distress, when there is no time to perform a regional anesthesia.

Inadequately treated postoperative pain can contribute significantly to morbidity of surgical patients, resulting in the delay of patients' recovery and ability to return to daily functional activities [11]. Early recovery is especially important for a patient who is expected to take care of her newborn shortly after an operative procedure. Evidence from studies done in high income settings has demonstrated that inadequately treated pain after cesarean section is associated with an increased incidence of chronic pain [12] and post-traumatic stress syndrome [13]. Hence the present study was planned for clinical evaluation of pain scores in the caesarean section cases undergoing intraoperative anesthetic management in post anesthesia care unit.

**Methodology**

The present study was planned in Department of Anaesthesia and Critical Care, Shree Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. Total 20 cases of the Caesarean sections (CS) undergoing the spinal anesthesia were enrolled in the present study.

**Administration**

Hyperbaric bupivacaine 9–12 mg is used in combination with fentanyl in the dose of 0.15– 0.25 mg for induction of spinal anaesthesia. Because preservative-free long-acting intrathecal opioids like morphine is not available in the investigator's country, patients receiving regional anaesthesia (RA) get short-acting intrathecal fentanyl with local anaesthetic. When general anaesthesia (GA) is used as a technique of anaesthesia for CS, IV opioids are used for intraoperative analgesia. However, the type of IV opioids used is either at the discretion of primary anaesthesiologists or on the availability of opioids. Intraoperative use of co-analgesia in the form of IV paracetamol, diclofenac suppository or transverses abdominus plane (TAP) block are also used for both spinal anaesthesia and GA at the discretion of primary anaesthesiologists. All patients either receiving GA or spinal anaesthesia for CS receive IV tramadol infusion for post-operative pain control, which is started either at the request for first analgesia in the PACU or at 60 min, whichever comes first. Patients are assessed for pain using numerical rating scale (NRS) immediately in the post-anaesthesia care unit (PACU) and at regular intervals. Any patient having NRS >4 is given rescue

Analgesia. The opioid used in the PACU is IV tramadol, both for post-operative infusion and for rescue analgesia. The institution policy for patients having a working labour epidural in place and coming for emergency CS is to initially give a bolus of 10 ml of 2% xylocaine followed by titrated doses of 0.5% bupivacaine (maximum 10 ml) till a block of thoracic level between T5 and T6 is achieved as assessed by loss of temperature sensation. These patients in the PACU and in the ward for the next 12 h are given as an infusion of local anaesthetic and fentanyl (bupivacaine 0.1% with fentanyl 2 µg per ml of local anaesthetic solution). For rescue analgesia, these patients are given boluses of local anaesthetics from the epidural catheter. Patients were informed regarding the assessment of pain score using NRS from 0 to 10.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Inclusion criteria were patients who had no clinical contraindications to spinal blockade, age above 18 years, height between 150 and 175 cm, and those who reported no allergy to drugs used in the protocol.

**Results and Discussion**

For better treatment and management, pain should be assessed accurately and timely, which poses challenge when concerning patients in the PACU. Although a clear description of pain should include its location, onset, character, exacerbating and relieving factors, etc., it is usually more practical to assess the intensity of pain and record time to the first analgesic usage, the amount of analgesics, the effects and adverse effects of treatment, modulation of analgesic strategies according to the response of patients, and their satisfaction in the PACU. Psychological factors influence pain perception; hence, mental status should be taken into consideration, especially for those with the history of psychiatric disorders. Identifying existed anxiety, depression, neuroticism, etc., may facilitate the assessment of pain.

There are many methods for assessing pain intensity, including observer and self-report scales. Since pain is mainly a subjective perception, the self-reporting assessment remains the gold standard for patients with consciousness, precise understanding, and verbal expression, including the Visual Analog Scale (VAS), Numerical Rating Scale (NRS), Verbal Rating Scale (VRS), and Wong–Baker Face Pain Rating Scale, although the standard method is still a topic of debate [14]. Due to uncompleted recovery from anesthesia or sedation, the results of subjective methods may be interfered by the temporary condition of the patients in the PACU (such as sedated, critically ill, cognitively impaired, or having difficulties in communicating). Therefore, objective assessment of pain and analgesia would be valuable in the PACU.

**Table 1:** Basic Details

Demographic	Frequency
Age	22 – 33 years
Weight	59 – 83 kg
Height	152 – 164 cm

ASA status	
I	3
II	16
III	1
Mode of admission	
Emergency	6
Elective	14
Type of anaesthesia	
General	4
Regional	16
Type of incision	
Pfannenstiel	18
Vertical midline	2
Duration of surgery	
≤90 min	20
>90 min	0

**Table 2:** numerical rating scale and No. of Cases

	Immediate	30 mins	45 mins	60 mins
Number of patients	20	19	18	17
Severity of pain				
No pain (NRS=0)	15	13	12	11
Mild pain (NRS=0-3)	3	4	4	6
Moderate pain (NRS=4-6)	1	0	2	0
Severe pain (NRS=7-10)	0	1	0	0
Moderate to severe pain	1	1	0	0
Complications	0	1	2	3

Eisenach *et al.* evaluated the type of delivery (vaginal or cesarean) and its correlation with depression or persistent pain, assessed eight weeks after surgery [15]. The authors found that the most important predictive factor for depression and persistent pain was acute postoperative pain. Sng *et al.* 16 published a study evaluating the incidence of chronic pain after cesarean section under spinal anesthesia in the Asian population. Spinal anesthesia was performed with hyperbaric bupivacaine (10 mg) and morphine (100 µg) and postoperative analgesia with patient controlled analgesia (PCA) pump containing morphine. Patients were followed for 24 hours and there was no reference regarding the use of anti-inflammatory drugs. The authors found a 9.2% incidence of chronic pain. The independent risk factors associated with chronic pain were higher levels of pain postoperatively, presence of pain in other sites, and lack of health insurance [16].

Kainu *et al.* used a questionnaire to evaluate 600 patients undergoing vaginal delivery and cesarean section. A correlation between persistent postoperative pain and type of delivery was found one year after the procedure. They reported increased incidence of pain in patients who had undergone cesarean section (18%), patients who reported pain prior to surgery, and higher level of postoperative pain in patients with chronic disease [17].

The gap between the severity of pain among the patients after CS and high levels of their satisfaction with POP treatment may be explained by both psychological and biological factors. Antenatal fears, especially concerning the health of the neonate, may worsen the severity of periparturient pain and then resolve after successful delivery [18]. On the other hand, the cognitive evaluation of pain severity during delivery is independent of the emotional feeling [19]. Which probably works as a part of the ancient reward system, including the endogenous antinociceptive circuits [20]. It is well known that delivery and CS alone elicit the profound response of pituitary proopiomelanocortin (POMC) system,

resulting in elevated levels of beta-endorphins and ACTH, which may modify the emotional state of the patients after CS [21].

Prior knowledge of the approximate analgesic dose necessary for the treatment of postoperative pain could allow the individualization of prescriptions. Predicting the dose of opioids, and analgesics with opioid sparing-effects, could result in improvements in pain relief and reduction in complications arising from excessive analgesic consumption [22]. Such complications include opioid-related side effects (viz., nausea, vomiting, urinary retention, ileus, constipation, sedation, and respiratory depression) and nonopioid side effects (viz., hepatic and renal toxicity, confusion, and dizziness), which may be aggravated when administered after surgery, as part of a multimodal regimen. Regional anesthesia provides anesthetists with an effective and convenient route of opioid administration and in many developed countries, it is employed as a method of postoperative pain management after cesarean sections [23]. The administration of epidural and intrathecal opioids is a popular means of augmenting intraoperative anesthesia and optimizing postoperative analgesia [24]. In our part of the world, the only preservative free narcotic available for intrathecal and epidural route is fentanyl, which is routinely used in our unit for cesarean sections performed under spinal anesthesia. While intrathecal fentanyl is widely given due to its intraoperative analgesic effect, unless used in high doses (e.g., fentanyl 40-60 µg), the effects are too short lived to be adequate for postoperative pain relief and they do not alter 24 h opioid consumption [25]. In contrast, the lower lipid solubility of morphine delays the onset of action and prolongs its duration, hence making it suitable for postoperative pain management.

**Conclusion**

The data generated from the present study concludes that patients undergoing CS under RA, the need for rescue analgesia was less compared to patients operated under GA in the initial 30 min in PACU. In addition, patients who were operated under GA and received IV morphine as intraoperative analgesia had better pain scores compared to patients receiving nalbuphine or tramadol. The overall pain management in the PACU was adequate as all patients were given rescue analgesia if they had NRS of >4 and no patient was shifted from PACU with NRS of >4.

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