# Pain Intensity and Analgesic Requirement After Caesarean Section: Effect of Daytime Variation

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**Abstract:** Introduction : Cesarean section is one of the most common surgeries occurring in the world. Pain after the surgery is an unavoidable complication which affects the recovery of the patient. Looking into the various factors affecting postoperative pain can improve the pain management. Many key processes occurring in our body have diurnal variation. Numerous methods and analgesics have been developed to manage postoperative pain, the incidence of moderate to severe pain after CS has reached approximately 50%. Objectives:To evaluate and compare the postoperative pain and to assess the requirement of analgesics in the postoperative period in patients undergoing caesarean section in the morning and afternoon.Methodology:In the retrospective study, depending on the time of the surgery, the participants were divided into two groups, namely the morning group (start time between 06:00 to 12:00) and afternoon group (start time between 12:00 to 18:00). The women who underwent cesarean section under spinal anaesthesia are noted. The frequency of analgesia requirement at postoperative period 0-8, 8-16, and 16-24 hr was respectively obtained, and the total frequency is calculated.Intensity of pain is continuously monitored in the post operative period. Pain intensity at rest and 24 hrs after the caesarean section is analysed using NRS score (0-10; 0 is defined as no pain and 10 is as unbearable pain). The extra analgesic requirement at 0, 4, 8, 12, 16, and 24 hr after the surgery is recorded. The study design of the study is retrospective and prospective study. Results:The pain intensity score was significantly higher in afternoon group at $8^{th}$,$12^{th}$ and $16^{th}$ hour than in the morning group. There was significant statistical difference in NRS at the $16^{th}$ hour for the afternoon group.Furthermore, the frequency of extra analgesic requirement is significantly higher in the afternoon group at $12^{th}$, $16^{th}$ and $24^{th}$ hour than those in the morning group.There was significant statistical difference in Analgesic requirement at $12^{th}$ and $16^{th}$ hour in the afternoon group.Conclusion:The afternoon group is more prone for higher pain score and extra analgesic requirement. Therefore, in our study it is observed that patients undergoing cesarean sections, pain intensity and analgesics are required more in the afternoon.

**Keywords:** analgesic requirement, caesarean section,pain intensity, retrospective study.

**Background (Introduction)**

Cesarean section (CS) is one of the most common surgeries occurring in the world. According to a census in 2018, almost one in three births is through cesarean section. Pain after the surgery is an unavoidable complication which affects the recovery of the patient. Additionally, it also adds to the longer hospital stay and cost for the patient.

Even though there are various treatment options available to reduce the postoperative pain, it still remains a problem in clinical practice.

Looking into the various factors affecting postoperative pain can improve the pain management, specifically targeting the patients who are a higher risk for moderate to severe post operative pain. This can be done by performing appropriate preoperative screening methods.[2]

Many key processes occurring in our body have diurnal variation. For example, according to a study, the incidence of major adverse cardiac events was lower in patients receiving cardiac surgery during the afternoon than in the morning.

**Lacuna in Knowledge**

Postoperative pain is an unavoidable complication of CS, seriously affecting the patient's recovery and satisfaction and increasing the postoperative length of stay and direct cost.
Numerous methods and analgesics have been developed to manage postoperative pain, the incidence of moderate to severe pain after CS has reached approximately 50%. Therefore, the treatment of post-CS pain remains a problem to be addressed in clinical practice.

After extensive research on the literature, it is found that there is not enough data available on the role of day time variation in post caesarean pain. Hence the present study will be done to compare the postoperative analgesic requirements between women undergoing caesarean section in the morning and afternoon.

**Objectives**

1) To evaluate and compare the postoperative pain in patients undergoing caesarean section in the morning and afternoon.
2) To assess the requirement of analgesics in the postoperative period in patients undergoing caesarean section in the morning and afternoon.

**Materials& Methods:**

Patients above 18 years of age undergoing caesarean section in the morning and afternoon will be prospectively included in the study after informed consent is taken.

- Study Design: Prospective Observational Study
- Sample Size: 53 in each group (total sample size= 106 subjects)
- Duration of study: 6 months
- Study Participants: This study will be conducted on patients posted for elective caesarean section under spinal Anaesthesia at R.L. Jalappa Hospital and Research Centre, Tamaka, Kolar.
- Sampling Method: Computer generated random sequence of numbers and concealed by closed envelope technique.

**Inclusion criteria:**

- Patients more than 18 years of age with American Society of Anesthesiologists (ASA) physical status 2 posted for elective caesarean section under spinal anesthesia.

**Exclusion criteria:**

- Allergic to Local anesthetic
- Coagulopathy- platelet count < 80,000/mm3, INR > 1.5, PT > 4sec control and APTT > 10 sec control
- Infection at the site of injection
- Neurological deficits like paraplegia and paresis of lower limb

**Methodology:**

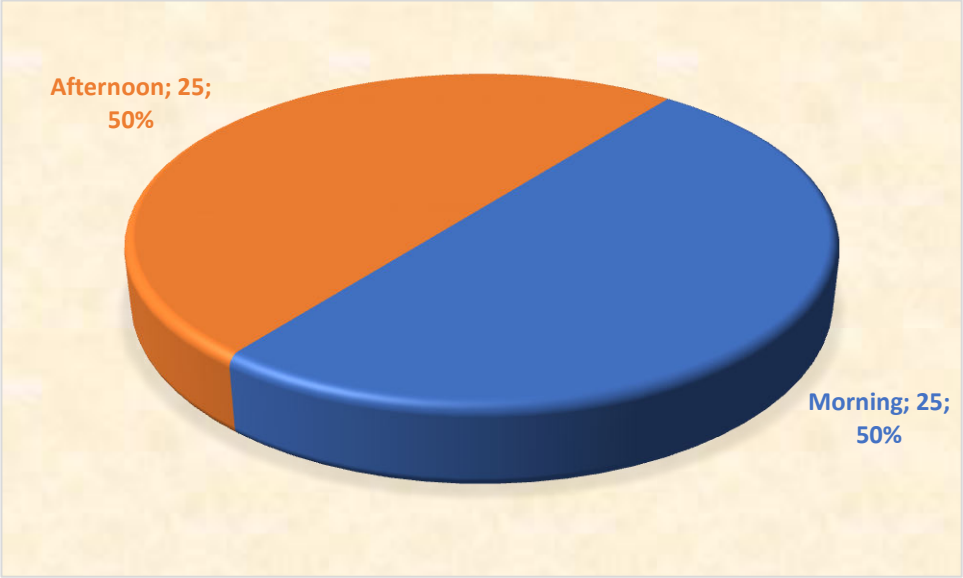
1. Detailed history of the patient
2. Complete physical examination will be done.
3. Routine investigations will be checked.
4. Intravenous line will be secured and IV fluids will be connected.
5. In the retrospective study, depending on the time of the surgery, the participants were divided into two groups, namely the morning group (start time between 06:00 to 12:00) and afternoon group (start time between 12:00 to 18:00).
6. The women who underwent cesarean section under spinal anaesthesia and received patient-controlled intravenous analgesia (PCIA) are noted. The additional requirement of analgesia is administered when the patient complains of pain and is documented.
7. Each patient's additional analgesic requirement at the different time intervals is noted. The frequency of analgesia requirement at postoperative period 0-8, 8-16, and 16-24 hr was respectively obtained, and the total frequency is calculated.
8. In the prospective study, patients will be premedicated with the following medications 15minutes before the procedure.
9. In the Operation Theatre, routine monitors like pulsoximeter, electrocardiogram, non-invasive blood pressure (NIBP), temperature monitoring will be connected and monitored throughout the procedure.
10. In the sitting position, L3-L4 interspace will be identified and 2% Xylocaine will be used for skin infiltration. Subarachnoid block will be performed using 25gauge Quincke's needle. After confirming the subarachnoid space and free flow of clear CSF, 2ml of 0.5% Hyperbaric Bupivacaine will be injected intrathecally.
11. Following the procedure, patient will be positioned supine with 15-20 degree left lateral tilt. Level of blockade will be assessed using pinprick test.
12. NIBP will be measured every 3 minutes until delivery and thereafter every 5 minutes during the intraoperative period.
13. After delivery Inj. Oxytocin 3 IU i.v stat will be given and infusion will be started at the rate of 10 IU/hour for 2 hours.
14. Postoperatively, PCIA will be initiated using an infusion pump with Inj Fentanyl at 2µg/kg kept at 2ml/hr.
15. When the NRS score is >=6, an additional analgesic (single dose of 0.1 ug/kg Fentanyl diluted to 5mL) is given.
16. Intensity of pain is continuously monitored in the post operative period. Pain intensity at rest and 24 hrs after the caesarean section is analysed using NRS score (0-10; 0 is defined as no pain and 10 is as unbearable pain.
17. The extra analgesic requirement at 0, 4, 8, 12, 16, and 24 hr after the surgery is recorded.

**Results:**

**Table 1: Distribution of study participants by caesarean time**

| Group | Frequency | Percent |
|---|---|---|
| **Morning** | 25 | 50.0 |
| **Afternoon** | 25 | 50.0 |
| **Total** | 50 | 100.0 |

**Figure 1: Distribution of subjects by caesarean time**



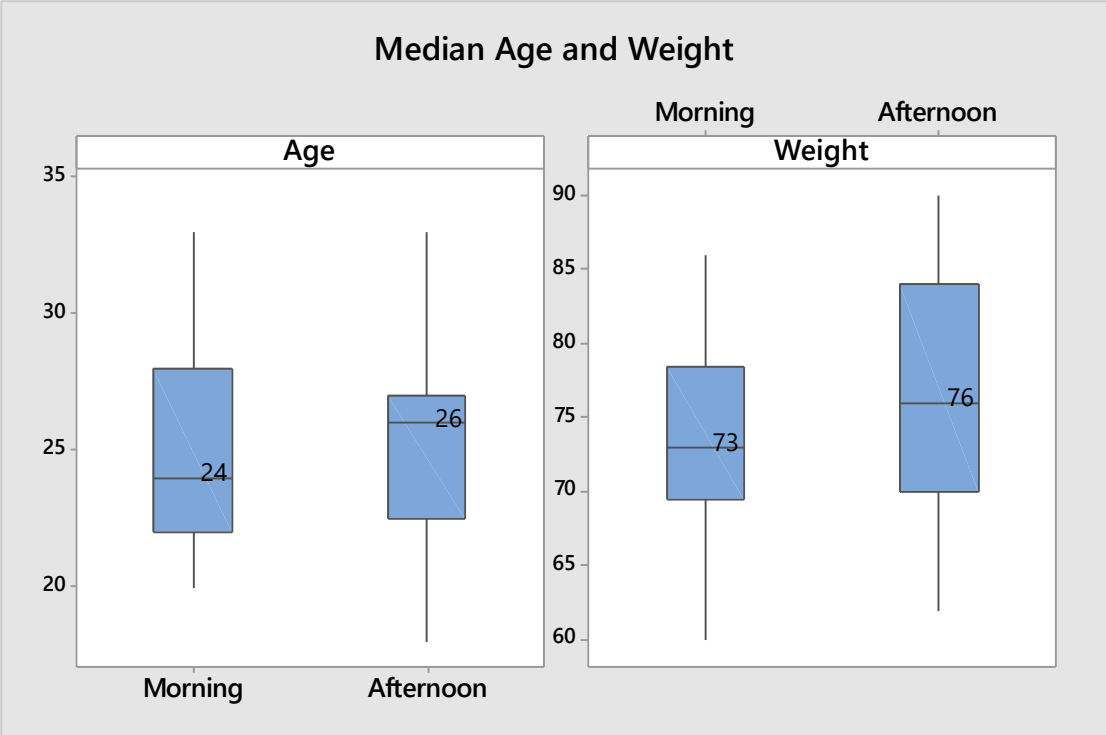

- There was no statistically significant difference in the demographic data among the two groups.

**Table 2: Age and weight statistics of study participants**

| Group | | Mean | Std. Deviation | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| **Morning** | **Age** | 25.1 | 4.0 | 24 | 20 | 33 |
| | **Weight** | 73.8 | 6.7 | 73 | 60 | 86 |
| **Afternoon** | **Age** | 25.4 | 3.8 | 26 | 18 | 33 |
| | **Weight** | 77.1 | 7.9 | 76 | 62 | 90 |
| **Total** | **Age** | 25.2 | 3.9 | 26 | 18 | 33 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Weight** | 75.4 | 7.5 | 75 | 60 | 90 |

**Figure 2: Age and weight statistics of study participants**



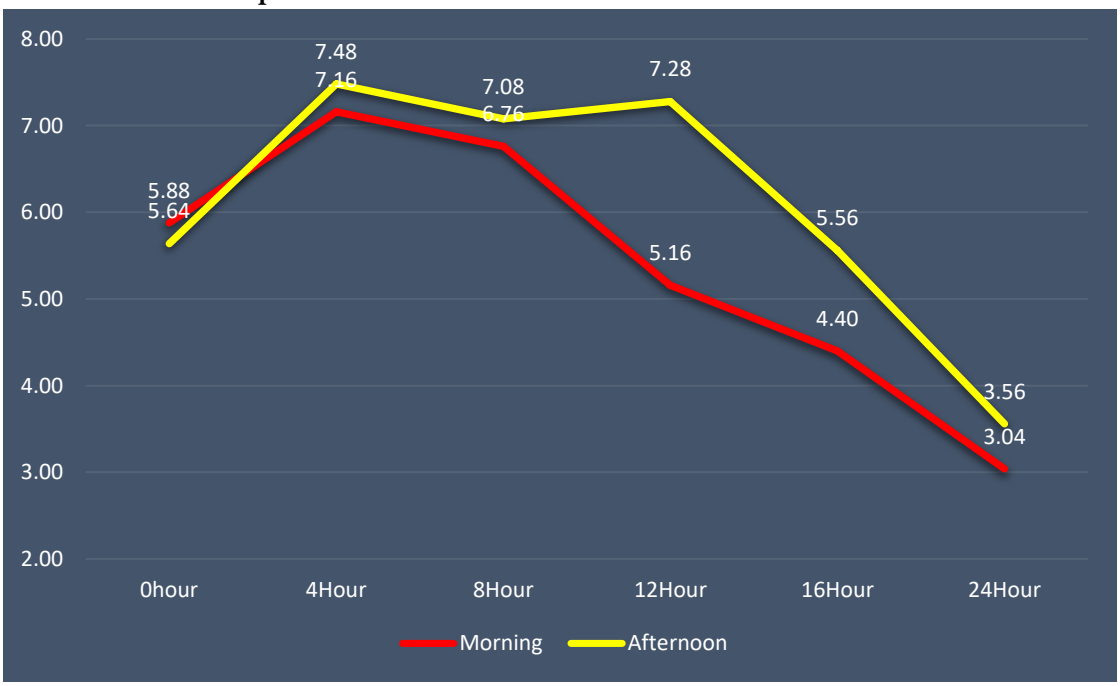

- The pain intensity score was significantly higher in afternoon group at 8th,12th and 16th hour than in the morning group. There was significant statistical difference in NRS at the 16th hour for the afternoon group.

**Table 3 : Table 3: NRS Pain score comparison between Morning and afternoon cases**

| NRS | Morning | Afternoon | Mann-Whitney U | P-value |
|---|---|---|---|---|
| 0hour | 5.88±2.70 | 5.64±2.51 | 287.0 | 0.611 |
| 4Hour | 7.16±1.60 | 7.48±1.64 | 271.5 | 0.407 |
| 8Hour | 6.76±1.45 | 7.08±1.68 | 279.0 | 0.504 |
| 12Hour | 5.16±1.49 | 7.28±1.43 | 108.0 | <0.001 |
| 16Hour | 4.40±1.32 | 5.56±1.19 | 168.0 | 0.004 |
| 24Hour | 3.04±1.72 | 3.56±2.20 | 277.5 | 0.485 |

** P-values based on Mann-Whitney U test*

**Figure 3: NRS Pain score comparison**




- Furthermore, the frequency of extra analgesic requirement is significantly higher in the afternoon group at 12th, 16th and 24th hour than those in the morning group.

  There was significant statistical difference in Analgesic requirement at 12th and 16th hour in the afternoon group.

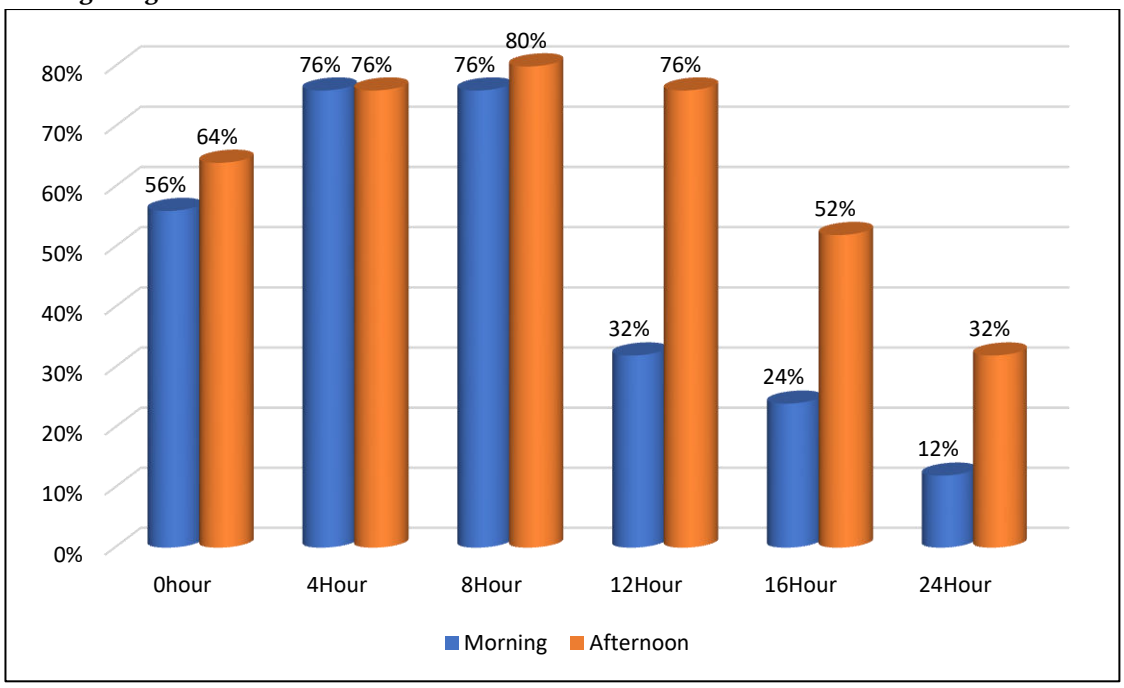
**Table 4: Comparison of analgesia requirement between the groups**

| Analgesia | Morning | Afternoon | Total | Chi-square, P-value |
|---|---|---|---|---|
| **0hour** | 14 (56.0%) | 16 (64.0%) | 30 (60.0%) | 0.333, 0.564 |
| **4Hour** | 19 (76.0%) | 19 (76.0%) | 38 (76.0%) | 0.000, 1.00 |
| **8Hour** | 19 (76.0%) | 20 (80.0%) | 39 (78.0%) | 0.117, 0.733 |
| **12Hour** | 8 (32.0%) | 19 (76.0%) | 27 (54.0%) | 9.742, 0.002* |
| **16Hour** | 6 (24.0%) | 13 (52.0%) | 19 (38.0%) | 4.160, 0.041* |

| | | | | |
|---|---|---|---|---|
| **24Hour** | 3 (12.0%) | 8 (32.0%) | 11 (22.0%) | 2.914, 0.088 |

** Statistically significant at P<0.05*

**Figure 4: Analgesia given**




**Conflict of Interest- Nil**

**Discussion:**

According to this retrospective analysis, individuals having CS in the afternoon (12:00–18:00) needed postoperative analgesia more frequently than those having CS in the morning (6:00–12:00).In a follow-up prospective investigation, we discovered that the severity of postoperative pain 24 hours following afternoon CS was considerably higher than following morning CS.[1]

Afternoon CS may result in decreased pain threshold and increased exposure to stressful stimuli linked to excruciating postoperative pain.[1,2]

Through retrospective study based on hospital medical records, preliminary data to support our clinical hypotheses was gathered. The 100 eligible participants in this study were split into two groups according to whether their CSs were done from 12:00–18:00 or from 6:00–12:00. The findings indicated that the groups who had their CSs done in the afternoon had significantly higher rates of extra analgesic demand during the 24 hours following the procedure. Additionally, the post-matching analysis revealed that patients undergoing CS in the afternoon required more postoperative analgesia than those doing it in the morning.[1,2,3]

We created a prospective observational study with stringent controls on patient enrollment, postoperative analgesia, and ongoing pain evaluation based on this retrospective analysis. The greatest pain experienced by participants in the afternoon group was considerably greater than that of the morning group, as the results demonstrate.[2,3]

We also computed the AUC of pain NRS to assess the difference in postoperative pain outcomes caused by morning and afternoon CS. The findings indicated that the afternoon CS procedure resulted in significantly higher overall pain intensity.[2,3]

Retrospective and prospective data together showed that not all patients could benefit from the present one-size-fits-all approach to analgesic management following CS. More analgesic intervention is required for afternoon CS because there may be a higher rate of postoperative pain undertreatment in this population. On the other hand, when treating postoperative pain in the morning, it is important to take into account the potential negative effects of analgesics.[3]

The findings showed that the morning group's post-CS endogenous opioid levels, particularly those of β-endorphin, dramatically dropped. Given that the systemic stress response is linked to the production of endogenous opioid peptides from the pituitary gland into circulation, the current finding suggests that stress levels may have been lowered in the morning group following spinal anaesthesia. This aligns with other prior research investigations that shown a significant decrease in β-endorphin expression in the peripheral blood of expectant mothers following spinal anaesthesia, a decrease linked to lowered stress response levels.[3,4]
Furthermore, it was discovered that the afternoon group's altered serum IL-6 level was noticeably higher than that of the morning group. Postoperative discomfort is positively linked with increased expression of IL-6 after surgery.[4,5]

**Conclusion:**

The afternoon group is more prone for higher pain score and extra analgesic requirement. Therefore, in our study it is observed that patients undergoing cesarean sections, pain intensity and analgesics are required more in the afternoon.

**Limitations:**

- The sample size of the study was small. It could have been better with larger population size.
- Most surgeries were performed during the daytime, this study only included women who underwent elective CS from 6:00–18:00. Thus, the potential difference at other time points needs further study, especially for women who underwent emergency CS with uncertain surgery times.

Abbreviations:

- NRS – Numerical rating score
- CS – caesarean section
- AUC – Area under the curve

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