

The Expectation–Experience Disparity in Pain During Spinal Needle Insertion for Elective Lower Segment Caesarean Section: A Prospective Observational Study

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ABSTRACT:

Spinal anaesthesia is the preferred technique for caesarean section, but anxiety of needle pain and fear of backache may lead to refusal of needle insertion. Further, pregnant patients have elevated anxiety and anticipated pain levels. The aim of the study was to evaluate the anticipated and experienced pain at the site of spinal needle insertion in patients undergoing elective lower segment caesarean section. Other objectives included assessing the anxiety associated with pain, and the correlation of anxiety with anticipated pain. Using the Numeric Pain Rating (NPR) Scale, the anticipated pain was noted at the pre-operative stage, and experienced pain at the post-operative stage. Anxiety before the procedure was noted using the Amsterdam Preoperative Anxiety and Information (APAI) Scale. 42.5% subjects were categorized as anxious based on the APAI scale. Significant difference was observed between the average anticipated pain score (6.3 ± 1.2) and average experienced pain score (2.1 ± 0.7) ($p < 0.05$), as per the NPR scale. Statistically significant association was found between anxiety level and pain at $p < 0.05$. A large difference between anticipated and experienced pain levels was observed, with patients overestimating the anticipated pain. Preoperative anxiety may be associated with higher anticipated pain, and higher postoperative experienced pain. Counselling and routine evaluation of pre-operative anxiety may help provide support for better acceptance and reduced anxiety.

PERSPECTIVE:

The findings of the present study suggest that pregnant women overestimate pain associated with spinal needle insertion. Higher anxiety levels also lead to higher anticipated pain, as well as actual experienced pain, suggesting strong association of anxiety with perceived pain.

KEYWORDS:

Spinal anesthesia, Caesarean section, Anxiety, Pain

INTRODUCTION:

Spinal anaesthesia has become the preferred technique for caesarean section due to its superior safety profile compared to general anesthesia, with decreased postoperative morbidity and mortality. Despite its advantages, approximately 20% of pregnant patients refuse spinal anesthesia due to fear of spinal needle insertion and associated complications. ⁽¹⁾ Common concerns include anticipated needle pain, fear of post-regional backache, inadequate anesthesia, and intraoperative awareness. ⁽²⁾

Pregnant patients typically experience elevated anxiety levels and tend to overestimate anticipated pain levels. ⁽³⁾ Studies have consistently shown that patients' expectations of pain are significantly higher than what they actually experience. This discrepancy between anticipated and experienced pain can lead to unnecessary anxiety and refusal of beneficial medical interventions.

The subjective experience of pain is heavily influenced by expectations and psychological factors. Expectations of decreased pain can powerfully reduce both the subjective experience of pain and activation of pain-related brain regions, while negative expectations may amplify pain perception. ⁽⁴⁾ Understanding this relationship between anticipated and experienced pain is crucial for improving patient care and reducing procedural anxiety.

Despite the clinical significance of this issue, limited research has been conducted specifically examining the difference between anticipated and experienced pain at the site of spinal needle insertion in patients undergoing caesarean section. This study aimed to evaluate this difference and assess the relationship between preoperative anxiety and pain perception in women undergoing elective lower segment caesarean section.

METHODS:

This was a prospective, cross-sectional observational study conducted over a period of six months after getting approval from the Institutional Ethical Committee and Clinical Trials Registry – India registration. The study was conducted in the Obstetric Ward, Labor Room, and Obstetrics and Gynaecology Operating Theatre of a tertiary care hospital. The study population comprised of 40 pregnant women aged 18-35 years belonging to American Association of Anaesthesiologists Physical Status (ASA-PS) Grades II and III undergoing spinal anesthesia for elective lower segment caesarean section. Patients who refused to participate, had any contraindications for spinal anesthesia, were unable to comprehend the information, had any previous history of chronic lower back pain, any previous spinal anesthesia experience, needed more than 2 attempts for successful spinal anesthesia, had a spinal conduct duration of more than 20 minutes or needed the use of cutting spinal needle of more than 25-gauge size were excluded from the study. Sample size was calculated using the formula $n = Z^2 \alpha / 2 \times p(1-p) / d^2$, where for 90% confidence level, $d = 10\%$ (margin of error), and $p = 0.18$ (standard deviation), yielding approximately 40 participants.

A total of 52 patients were assessed for eligibility, from which 12 participants were excluded (6 for emergency caesarean section, 4 for inability to comprehend information, and 2 for requiring >2 attempts) (Figure 1).

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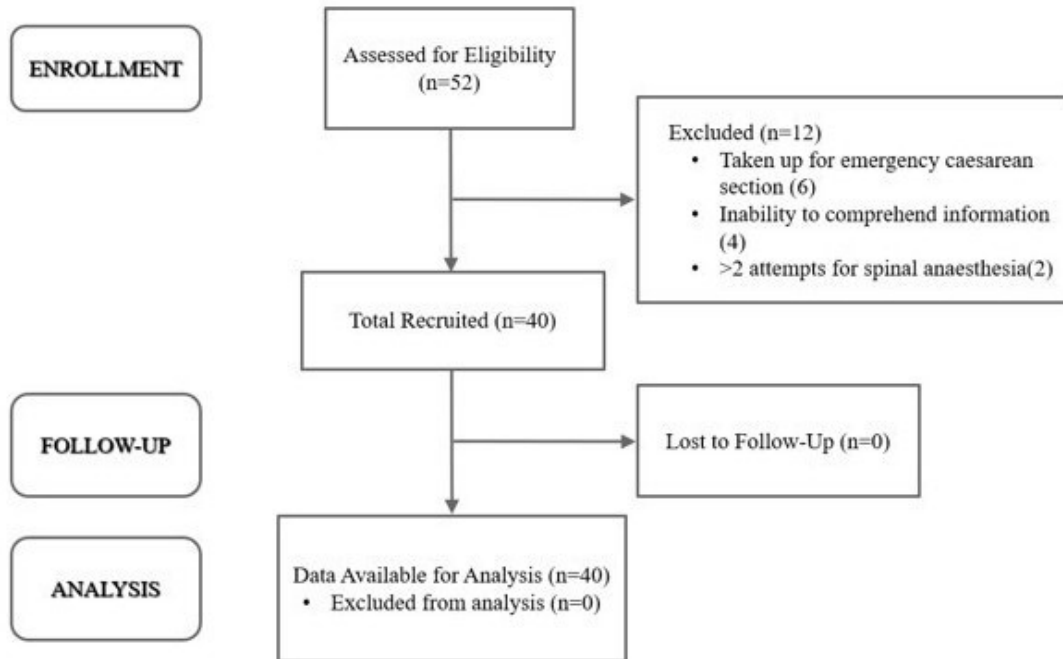


Figure 1: Patient recruitment flow diagram using STROBE - Strengthening the Reporting of Observational Studies in Epidemiology

Patient information sheet was provided and written informed consent was obtained from all patients enrolled in the study, according to the inclusion criteria. On the day before surgery, patients were explained about the anesthesia procedure and evaluated for preoperative anxiety and anticipated pain levels, and postoperative pain was assessed at defined intervals.

Duration of spinal conduct was defined as the time from the start of skin preparation to needle withdrawal, and an attempt was defined as the insertion of the spinal needle until complete withdrawal from the skin. The Amsterdam Preoperative Anxiety and Information Scale (APAIS) (Figure 2) was used for anxiety assessment, while the Numerical Pain Rating Scale (NPRS) (Figure 3) was employed for pain evaluation.

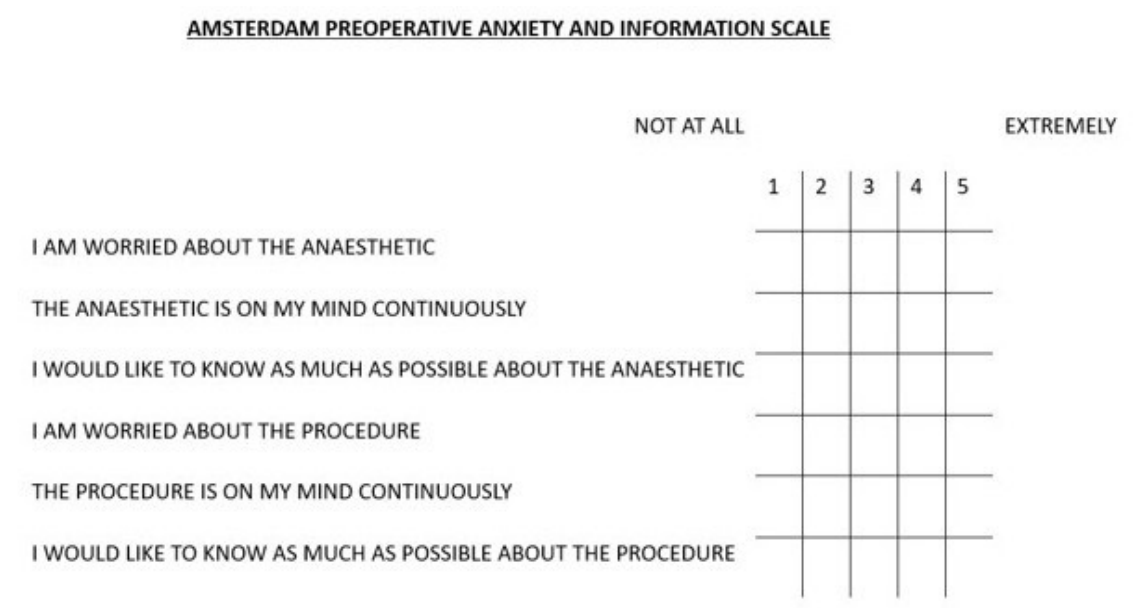


Figure 2: Amsterdam Preoperative Anxiety and Information Scale



Figure 3: Numerical Pain Rating Scale

No preoperative anxiolytics were administered. Spinal anesthesia was performed by consultant anaesthesiologists or residents with more than 2 years of experience. A 20G IV cannula was secured, and routine monitoring included heart rate, non-invasive blood pressure, and oxygen saturation was connected. Crystalloids (Ringer Lactate or 0.9% Normal Saline) were administered for preload.

With the patient in sitting position, under aseptic precautions, the L3-L4 intervertebral space was identified. Local anesthesia with 2% lidocaine was infiltrated into the skin and subcutaneous tissue. A 25G Quincke needle was used to pierce the dura mater, and after confirmation of free cerebrospinal fluid flow, 0.5% heavy bupivacaine (10-14mg) and fentanyl (10-15mcg) was injected into the subarachnoid space. After completion of spinal anesthesia, patients were placed supine and spinal block level was confirmed. Postoperatively, patients were shifted to Post Anesthesia Care Unit and postoperative pain levels were assessed.

Data was analyzed using SPSS 22. For descriptive analysis, categorical variables were analyzed using percentages and continuous variables by calculating mean $\pm$ standard deviation. For inferential analysis, t-test was applied with $p < 0.05$ considered as statistically significant. Karl Pearson's correlation coefficient was used to assess the relationship between preoperative anxiety and anticipated pain.

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RESULTS:

The mean age of participants was 26.6±4.2 years. Obesity was the most common comorbidity, affecting 62.5% of participants. Other comorbidities included anaemia (37.5%), gestational diabetes mellitus (27.5%), hypothyroidism (12.5%), and gestational hypertension (10.0%). With respect to ASA PS grading, 90% were classified as Grade II. (Table 1)

Table I. General details of study participants

Variables	Frequency	%
ASA grading		
Grade II	36	90
Grade III	04	10
Co-morbid		
GDM	11	27.5
G.HTN	04	10
Hypothyroidism	05	12.5
Anemia	15	37.5
Overweight/Obese	25	62.5
Attempts for block		
1	33	82.5
2	07	17.5
Block duration		
≤10 minutes	37	92.5
11-15 minutes	03	7.5

ASA: American Society of Anesthesiologists; **GDM:** Gestational Diabetes Mellitus; **G.HTN:** Gestational Hypertension

Single attempt for needle insertion was successful in 82.5% of cases, with 17.5% requiring multiple attempts. The duration of spinal conduct was less than 10 minutes in 92.5% of cases and 11-15 minutes in 7.5% of cases.

The anticipated pain score (6.3±1.2) was significantly higher than the average experienced pain score (2.1±0.7) ($p<0.001$). (Table 2)

Table 2. Anticipated pain vs expected pain for spinal anesthesia

Variables	Mean±SD	Anticipated pain vs Experienced pain	p Value
Anticipated pain	6.3±1.2	-	-
Experienced pain at the end of 1 hour	3.4±1.1	-2.1	<0.001*
Experienced pain at the end of 4 hours	2.6±0.8	-3.7	<0.001*

Experienced pain at the end of 8 hours	1.9±0.8	-4.4	<0.001*
Experienced pain at the end of 12 hours	1.5±0.7	-4.8	<0.001*
Experienced pain at the end of 24 hours	1.3±0.5	-5.0	<0.001*
Average experienced pain	2.1±0.7	-4.2	<0.001*

*Statistically significant

Experienced pain scores decreased progressively over time, with significant reductions observed at each time point, from 3.4±1.1 at 1 hour, 2.6±0.8 at 4 hours, 1.9±0.8 at 8 hours, 1.5±0.7 at 12 hours, and 1.3±0.5 at 24 hours. There were statistically significant differences between experienced and anticipated pain at each time point ($p<0.001$).

The total APAI score was 15.275±1.24, with the anxiety component (questions 1, 2, 4, 5) scoring 10.5±1.16 and the desire for information component (questions 3, 6) scoring 4.775±0.82. 42.5% of participants were categorized as anxious as per the APAI scale. (Table 3)

Table 3. Anxiety based on the Amsterdam Preoperative Anxiety and Information Scale among study participants

Topic	Mean±SD	Individual item vs Total score	p Value
Q1) Worried about the anesthetic	3.0±0.6	0.5	<0.001*
Q2) Thinking of the anesthetics continually	2.5±0.6	0	1
Q3) Knowing much about the anesthetic	2.4±0.6	-0.1	0.320
Q4) Worried about the procedure	3.3±0.6	0.8	<0.001*
Q5) Thinking about the procedure continually	1.8±0.5	-0.7	<0.001*
Q6) Kowing much about the procedure	2.4±0.7	-0.1	0.387

*Statistically significant

Significant factors affecting anxiety ($p<0.05$) included being worried about the anaesthetic, worried about the procedure, and thinking continuously about the procedure. A statistically significant positive correlation was found between the preoperative anxiety level and anticipated pain ($r=0.33$, $p<0.05$) (Figure 4) (Table 4).

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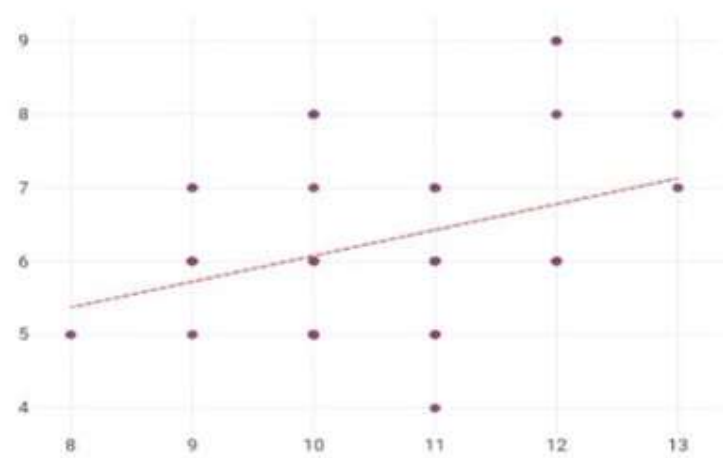


Figure 4: Scatter plot showing relationship between anxiety and pain scores

Table 4. Scatter plot showing relationship between anxiety and pain scores

Variable		Anxiety score	Anticipated pain score
Anxiety score	Pearson correlation	1	0.33
	Sig. (2-tailed)	-	0.04
	n	40	40
Anticipated pain score	Pearson correlation	0.33	1
	Sig. (2-tailed)	0.04	-
	n	40	40

(Correlation is significant at the 0.05 level)

Additionally, a statistically significant positive correlation was observed between the anticipated and experienced pain ($r=0.62$, $p<0.01$) (Figure 5) (Table 5).

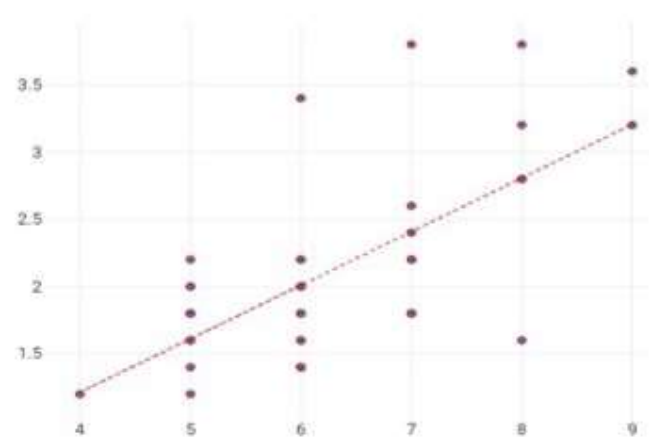


Figure 5: Scatter plot showing relationship between anticipated and expected pain scores

Table 5. Scatter plot showing relationship between anticipated and expected pain scores

Variable		Anticipated pain	Experienced pain
Anticipated pain score	Pearson correlation	1	0.62
	Sig. (2-tailed)	-	0
	n	40	40
Expected pain score	Pearson correlation	0.62	1
	Sig. (2-tailed)	0	-
	n	40	40

(Correlation is significant at the 0.01 level)

These results suggest that higher anxiety leads to higher anticipated pain, which subsequently leads to higher experienced pain.

DISCUSSION:

This study showed that the average anticipated pain score was significantly higher than the average experienced pain score, confirming previous findings in the literature ^(1,5-7). The magnitude of this difference (6.3 ± 1.2 vs. 2.1 ± 0.7) represents a substantial overestimation of pain by patients undergoing spinal anaesthesia for caesarean section.

Our findings are consistent with similar studies in literature. Ghaffar et al. ⁽¹⁾ reported a median anticipated pain of 7 and median experienced pain of 2 ($p < 0.05$), with significantly low experienced pain as compared to anticipated pain. Ellerkmann et al. ⁽⁷⁾ found that mean post-procedure pain (as per Visual Analogue Scale) of 2.23cm was significantly lower than the anticipatory pain of 4.35cm ($p < 0.05$). These studies collectively support the concept that patients consistently overestimate the pain associated with medical procedures, specifically spinal anaesthesia.

The positive correlation between preoperative anxiety and anticipated pain ($r = 0.33$, $p < 0.05$) aligns with previous research by Suresh et al. ⁽⁵⁾, who found that postoperative pain correlated with higher levels of preoperative anxiety ($r = 0.25$, $p < 0.01$). This relationship suggests that anxious patients are more likely to anticipate higher pain levels, which can subsequently influence their actual pain experience.

The finding that 42.5% of participants were categorized as anxious highlights the need for routine preoperative anxiety assessments. The strong correlation between anticipated and experienced pain ($r = 0.62$, $p < 0.01$) suggests that interventions targeting pain expectations could significantly improve patient outcomes by aligning them with reality, and potentially reducing anxiety ⁽⁸⁾.

Brain imaging studies have shown that expectation-related activation overlaps with pain-processing regions, including the anterior insula and anterior cingulate cortex ^(9,10). This neurobiological basis supports the clinical observation that expectations powerfully influence pain perception and suggests that addressing unrealistic pain expectations could be therapeutically beneficial ^(9,10).

One of the strengths of this study is that anxiety and pain was measured using reliable and validated scales (APAIS and NPRS). Standardizing the patient population and surgery helped minimize confounding factors. The anaesthetic technique and postoperative pain management was standardized across all participants.

However, the limitations of our study should also be acknowledged. Spinal anaesthesia was not administered by the same anaesthesiologist, which may lead to variable technique. The findings may not be applicable to general public due to the relatively small sample size of 40 participants. As the study was conducted at a single institution, it may not reflect the practices at other centers.

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Future research investigating the effectiveness of preoperative interventions designed to reduce anxiety and adjust pain expectations may be done. Such interventions could include detailed preoperative counselling, provision of educational materials, cognitive-behavioural therapy sessions or teaching anxiety-reduction techniques⁽⁸⁾. Furthermore, larger multi-center studies can provide more concrete evidence for confirming clinical practice guidelines.

This study confirms that patients significantly overestimate the pain associated with spinal needle insertion for caesarean section. Preoperative anxiety is associated with higher anticipated pain, which subsequently influences higher experienced pain. The significant difference between anticipated and experienced pain levels suggests that targeted interventions tackling unrealistic pain expectations may improve patient outcomes.

Routine evaluation of preoperative anxiety and comprehensive patient counselling should be incorporated into standard care protocols. Providing detailed and accurate information about the anaesthetic and surgical procedures throughout the antenatal period may help reduce anxiety and improve patient acceptance of spinal anaesthesia. Healthcare providers should keep in mind that patient education and alleviating anxiety can significantly impact pain perception and overall patient satisfaction.

These findings have important implications for clinical practice, suggesting that dealing with psychological factors such as anxiety and unrealistic pain expectations can improve the overall experience of patients undergoing spinal anaesthesia for caesarean section. The strong correlations observed between anxiety, anticipated pain, and experienced pain provide a scientific basis for researching about and implementing comprehensive preoperative counselling programs.

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CONFLICT OF INTEREST: NIL

DATA STATEMENT: Open materials statement

STUDY REGISTRATION: Study was registered prospectively in the Clinical Trials Registry – India, CTRI/2025/01/078959

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