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The Causes of Intraoperative Pain among Elective Caesarean Section Patients under Sub-Arachnoid Block at the Tamale Teaching Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Intraoperative pain is a possible complication of neuraxial anaesthesia for caesarean delivery. Possible causes of intraoperative pain following caesarean section under spinal anaesthesia have been proposed. The potential consequences include inadequate anaesthesia, nerve injury during needle insertion, manipulation of internal organs during surgery, and psychological factors such as anxiety and fear. This study was conducted to assess the causes of intraoperative pain among patients undergoing elective caesarean section under sub-arachnoid block at the Tamale Teaching Hospital.

Methods: A descriptive cross-sectional research design was employed in this study. A total of 55 women who have had elective caesarean section under sub-arachnoid block were selected for the study. Data was collected using a structured questionnaire and analysed with the SPSS.

Results: Findings from the study showed a high incidence of intraoperative pain among women during elective caesarean section under sub-arachnoid block (96.4%). These were mainly sharp and aching pain. However, the levels of the pain experienced intraoperative were mild (52.7%) and moderate (43.6%). Increased length of time spent during surgery and ineffectiveness of medications/ injections given to prevent pain were the main factors contributing to intraoperative pain among patients during elective caesarean section under sub-arachnoid block.

Conclusions: The study found a substantial incidence of intraoperative pain during caesarean delivery. To mitigate intraoperative discomfort and enhance the overall surgical experience for patients having elective CS, it is crucial to address these issues by employing optimised anaesthesia techniques, implementing effective pain management measures, and utilising preoperative psychological therapies.

Keywords: Intraoperative; caesarean section; sub-arachnoid; pain management; surgical.

1. INTRODUCTION

Elective Caesarean section (CS) is a frequently conducted surgical surgery on a global scale, with varied rates across different countries [1-3]. CS rates in certain areas go as high as 40%, beyond the recommended level of 10-15% set by the World Health Organisation. Caesarean delivery (CD) is the most frequently performed surgery in Ghana and almost 90% of parturients undergoing elective CD receive spinal anaesthesia [4]. This anaesthesia is considered the gold standard because it allows the woman to see the newborn intraoperatively, can provide good postoperative analgesia, and obviates need for airway manipulation [5]. Common complications of spinal anaesthesia, including spinal hypotension, nausea and vomiting, have received much focus in the literature with subsequent recommendations for prophylaxis and treatment [6].

A substantial proportion of individuals with CS have elective treatments using sub-arachnoid anaesthesia (SA). Although spinal anaesthesia (SA) is generally regarded as a safe and effective method for administering anaesthesia during caesarean section (CS), the issue of intraoperative pain still worries many patients. Experiencing pain during caesarean section surgery can cause significant suffering and potentially result in increased maternal anxiety, discomfort, and unhappiness with the overall delivery process. Additionally, it can lead to physiological reactions such as increased heart rate and blood pressure, which might potentially impact the health of both the mother and the foetus [7]. The precise aetiology of intraoperative pain in elective caesarean section patients under spinal anaesthesia remains uncertain, despite advancements in anaesthesia procedures and perioperative care. Various factors have been suggested as potential triggers of intraoperative pain during caesarean section under spinal anaesthesia [7]. The potential complications encompass insufficient anaesthesia, nerve damage during needle insertion, manipulation of internal organs during surgery, and psychological elements such as anxiety and dread. Gaining a comprehensive understanding of these characteristics is essential for strengthening the treatment of pain during surgery and improving the overall birthing experience for individuals who choose to have a caesarean section [7].

Intraoperative pain during elective CS is influenced by various elements, including as physiological, psychological, and environmental aspects. Physiological factors, like the location of the incision, the kind of surgery, and the individual's pain tolerance, can all impact the intensity of pain that patients feel. Psychological

variables, including anxiety, fear, and past traumatic birth encounters, can also influence the way pain is perceived [7]. Moreover, the patient's perception of pain during CS can be influenced by environmental factors such as effective communication and support from the surgical team, as well as the accessibility of pain management measures. Although there have been improvements in anaesthesia and surgical methods, intraoperative pain continues to be a substantial problem for many elective caesarean section patients [7].

Molina et al. [8] found out that in 2012, about 23 million caesarean sections were done globally. The international healthcare community has previously considered the rate of 10% and 15% to be ideal for caesarean sections [9]. However, Molina et al. [8] concluded that a rate higher than 19% may result in better outcomes. More than 45 countries globally have caesarean section rates less than 7.5% while more than 50 have rates higher than 27%. There are efforts to both improve access to and reduce the use of caesarean section [8]. In the United States about 33% of deliveries are by caesarean section [10]. Caesarean section may be done with a sub-arachnoid block so that the woman is awake or under general anaesthesia [11-13].

Sub-arachnoid block, also called spinal block, intradural block and intrathecal block [14] is a form of regional block involving the injection of a local anaesthetic into the subarachnoid space. The spinal anaesthesia is the technique of choice for caesarean section as it avoids a general anaesthetic and the risk of failed intubation. It also means the mother is awake and the partner could be present at the birth of the child [15-17]. The sub-arachnoid block offers post-operative analgesia with the addition of intrathecal opioids in addition to non-steroidal anti-inflammatory drugs [18-23].

Both general and regional anaesthesia (spinal, epidural or combined spinal and epidural anaesthesia) are acceptable for use during caesarean section. Regional anaesthesia is preferred as it allows the mother to be awake and interact immediately with her baby [24]. Other advantages of regional anaesthesia include the absence of typical risks of general anaesthesia. These risks include pulmonary aspiration (which has a relatively high incidence in patients undergoing anaesthesia in late pregnancy) of gastric contents and oesophageal intubation [25]. Regional anaesthesia is used in 95% of caesarean deliveries, with sub-arachnoid block and combined spinal and epidural anaesthesia being the most commonly used regional techniques in scheduled caesarean section [26]. Regional anaesthesia during caesarean section is different from the analgesia used in labour and vaginal delivery. The pain that is experienced because of surgery is greater than that of labour and therefore requires a more intense nerve block [27-31].

This study seeks to investigate the underlying factors contributing to intraoperative pain in elective caesarean section (CS) patients under spinal anaesthesia (SA). The primary objective is to identify potential risk factors and devise effective ways for the prevention and management of this pain. By acquiring a more comprehensive comprehension of the factors that contribute to intraoperative pain, medical professionals can devise more efficient pain management techniques and improve the entire delivery experience for women undergoing elective caesarean sections.

2. MATERIALS AND METHODS

Study design: This study utilised a descriptive cross-sectional research approach. Descriptive designs, as stated by Burns and Grove [32], serve the purpose of elucidating a phenomenon within an authentic context. Furthermore, it facilitates the process of drawing broader conclusions from the obtained results. The chosen design will be used to evaluate the factors contributing to intraoperative discomfort in patients who are undergoing elective caesarean section under a sub-arachnoid block at Tamale Teaching Hospital.

Study Setting: The research was carried out at the Obstetrics and Gynaecology department of the Tamale Teaching Hospital.

2.1 Population

The study focused on patients who were receiving care at the Obstetrics and Gynaecology Unit of the Tamale Teaching Hospital.

2.2 Inclusion Criteria

The inclusion criteria include of women who underwent elective caesarean section with a sub-arachnoid block.

2.3 Exclusion Criteria

The study excluded women who had undergone elective caesarean section deliveries without sub-arachnoid block.

2.4 Sampling Technique and Size

The study employed the approach of convenient sampling to select the subjects. The convenient sampling method is a type of non-probability sampling approach where respondents who are readily available and willing to participate in the study are picked. The selection criteria for this study were choosing exclusively women who had undergone elective caesarean section deliveries under sub-arachnoid block. These women were specifically from the obstetrics and gynaecology unit and were present during the data collecting period. Additionally, they expressed their willingness to participate in the study. The study included a sample size of 55 women who underwent elective caesarean sections under sub-arachnoid block.

2.5 Data Collection Instrument

A self-administered structured questionnaire was designed and utilised to collect data. The survey consisted of three distinct portions. The initial portion encompassed the demographic characteristics of the participants, such as their age, religion, marital status, parity, and level of education. The second and third portions focused on the occurrence of pain after elective caesarean section under sub-arachnoid block and the factors that contribute to this discomfort.

2.6 Data Collection Procedure

The study obtained ethical clearance from the ethical review board of Tamale Teaching Hospital. Official consent was also obtained from the administration of the Hospital and the officer responsible for the obstetrics and gynaecology unit in order to enroll participants for the study. The personnel at the obstetrics and gynaecology unit assisted the researcher in identifying eligible female participants for the study and facilitated the researcher's introduction to these individuals. Subsequently, the women were notified on the study. Each individual who agreed to participate was provided with a questionnaire to complete and given sufficient time to return it once finished. They were also notified of their right to decline to complete the questionnaire or any specific question(s). To maintain anonymity, the names of the respondents were omitted from their questionnaires. Individuals who were unable to finish the questionnaire were given permission to submit it on the subsequent day. This was done to provide them with sufficient time to finish the questionnaire. Individuals lacking literacy in the English language had their inquiries read out to them and their answers documented.

2.7 Data Analysis

It involved inputting the questionnaire responses into the SPSS (version 16.0) software, following the coding of the individual items. Subsequently, standard deviation was used, and the findings were displayed through frequency distribution tables, pie charts, and bar graphs.

2.8 Ethical Issues

To guarantee ethical standards in research, all participants were adequately informed about the study. Prior to administering the questionnaires, written informed consent was obtained from all participants. Participation in the study was voluntary for all individuals. The questionnaires were distributed to the participants individually to guarantee confidentiality. The participants were informed that they had the freedom to withdraw from the study at any moment, without providing any explanations, if they had personal reasons to discontinue. In order to maintain the anonymity of their responses, it was not necessary for them to provide their names or any kind of identification on the questionnaire. To maintain confidentiality, the completed surveys were securely stored and only accessible to the researcher and their supervisor.

2.9 Validity and Reliability

To ensure validity, the questionnaire was specifically created to encompass all topics related to the study's aims. Additionally, the task was completed with the assistance of a specialist and in collaboration with the supervisor. To verify accuracy, a pre-test of the questionnaire was conducted on five surgical staff members at the hospital. Subsequently, the replies were evaluated and any questions that were unclear or open to interpretation were restated in a more precise manner.

3. RESULTS

3.1 Introduction

The results from analysis are presented in this section. This has been organized according to the objectives of the study.

3.2 Demographic Data

Fig. 1 shows that most, 25 (45.5%) of the respondents were 31-35 years old and 11 (20%)

were 36-40 years old. The rest were 26-30 years old, 8 (14.5%), 21-25 years old, 7 (12.7%) 16-20 years old, 2 (3.6%) and 41-45 years old, 2 (3.6%).

Table 1 shows that more than half, 32 (58.2%) of the respondents were married and about a quarter, 13 (23.6%) were single. The rest were divorced, 6 (10.9%), widowed, 2 (3.6%) and cohabiting, 2 (3.6%).

Table 1. Marital status of respondents

Marital status	Frequency	Percent
Married	32	58.2
Single	13	23.6
Divorced	6	10.9
Widowed	2	3.6
Cohabiting	2	3.6
Total	55	100.0

As shown in Fig. 2, majority, 42 (76.4%) of the respondents had tertiary education and 9(16.4%) had secondary education.

Majority, 40 (73%) of the respondents were Christians and 15 (27%) were Muslims. This is illustrated in Fig. 3.

It can be seen from Fig. 4 that 33 (60%) of the respondents were government employees. However, 11 (20%) were private/ non-governmental employees, 9 (16.4%) were self-employed and 2 (3.6%) were unemployed.

3.3 Incidence of intraoperative Pain

As shown in Fig. 5, majority, 53 (96.4%) of the respondents experienced some form of pain during elective caesarean section under sub-arachnoid block. Just a few 2 (3.6%) reported no pain.

Sharp pain (π= 1.47, SD= 0.99) and Aching pain (π= 1.24, SD= 0.99) were the common types of pain experienced by the respondents who felt pain during the procedure. This is shown in Table 2.

3.3.1 Level of intraoperative pain

The level of intraoperative pain experienced during elective caesarean section under sub-arachnoid block was mainly mild pain, 29 (52.7%). However, 24 (43.6%) of the respondents also experienced moderate intraoperative pain.

3.4 Factors Contributing to Intraoperative Pain among Patients During Elective Caesarean Section under Sub-Arachnoid Block

As shown in Table 4, the main factors contributing to intraoperative pain among patients during elective caesarean section under

Table 2. Types of intraoperative pain

Type	Minimum	Maximum	Mean	Std. Deviation
Throbbing	0	2	.71	.809
Shooting	0	3	.49	.791
Sharp	0	3	1.47	.997
Stabbing	0	3	.78	.956
Cramping	0	3	.82	.819
Gnawing	0	2	.56	.688
Hot-burning	0	3	.93	.997
Aching	0	3	1.24	.816
Splitting	0	3	.78	.875

Table 3. Level of intraoperative pain

Level	Frequency	Percent
No pain	2	3.6
Mild pain	29	52.7
Moderate pain	24	43.6
Total	55	100.0

sub-arachnoid block were "long time spent during surgery" (π= 2.05, SD= 0.76) and "ineffectiveness of medications / injections given to prevent pain" (π= 2.00, SD= 0.67).

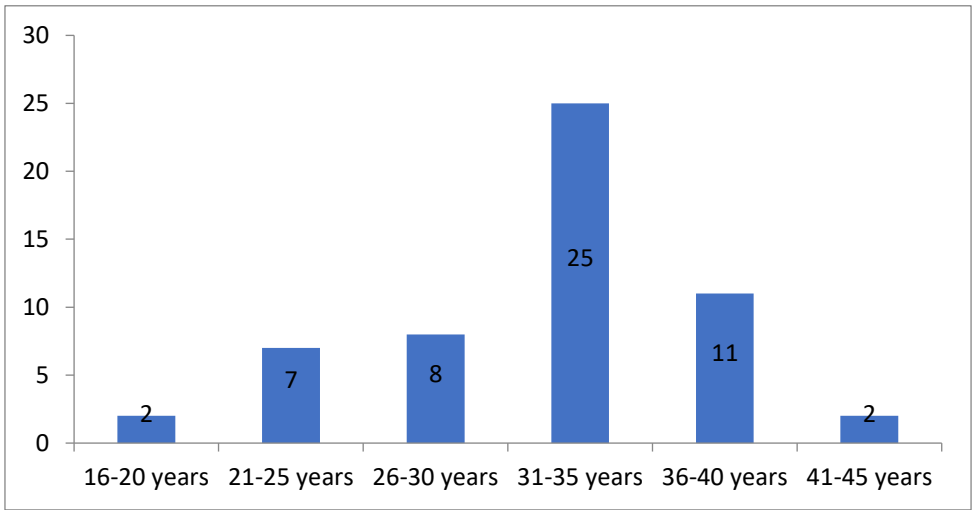

Fig. 1. Age distribution of respondents

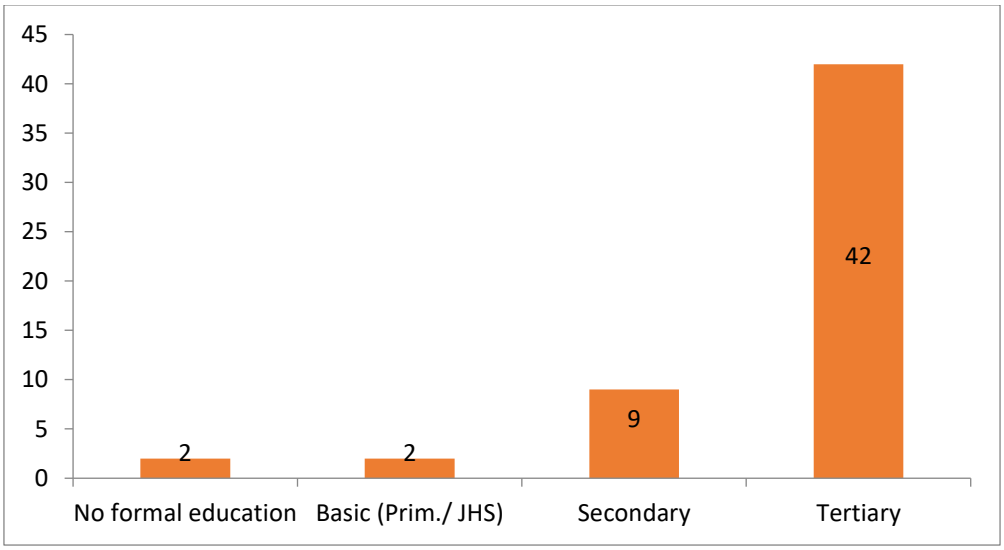

Fig. 2. Level of education of respondents

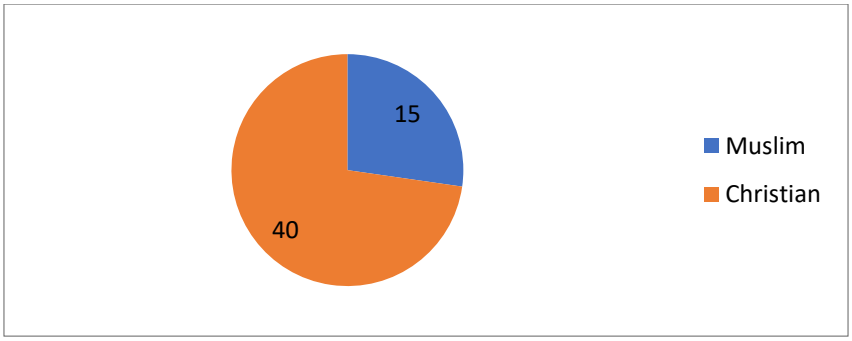

Fig. 3. Religion of respondents

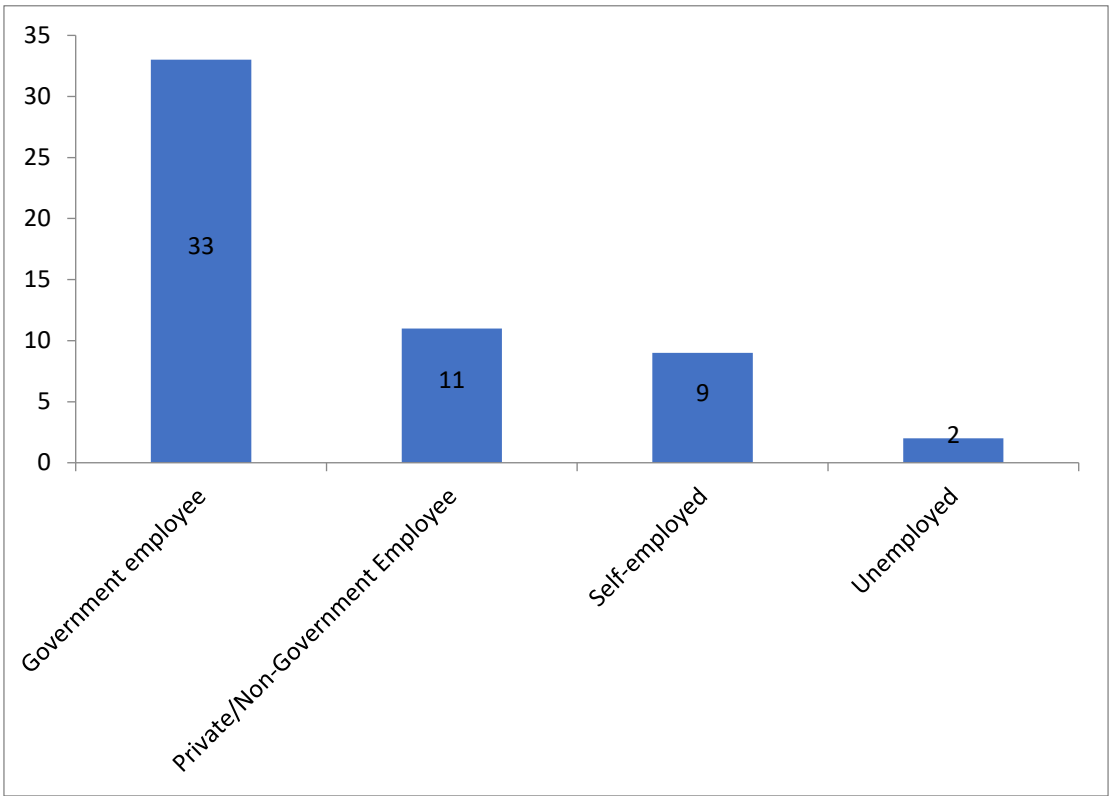

Fig. 4. Employment status of respondents

Table 4. Contributory factors contributing in intraoperative pain

Factors	Minimum	Maximum	Mean	Std. Deviation
Poor anaesthetic assessment/education before the surgery	1	3	1.62	.680
Ineffectiveness of medications/ injections given to prevent pain	1	3	2.00	.667
Not enough medications/ injections given to prevent pain	1	3	1.89	.567
Too many attempts on injection at the back before surgery	1	3	1.76	.793
Long time spent during surgery.	1	3	2.05	.756
Too much pulling by the surgeon	1	3	1.84	.631
Lack of experience by the surgeon	1	3	1.51	.791
Uncomfortable position in bed during surgery	1	3	1.87	.795
Previous surgical/anaesthetic history of patient	1	3	1.49	.635

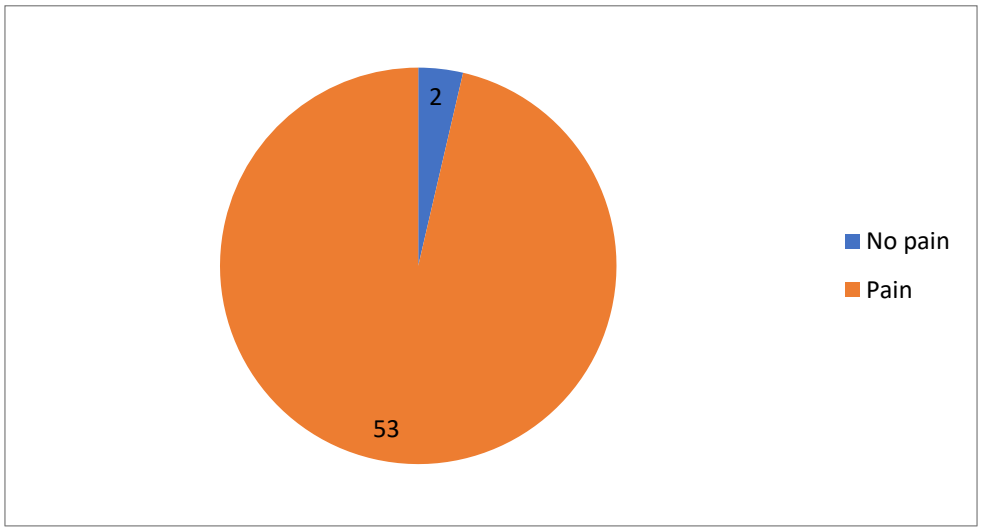

Fig. 5. Incidence of intraoperative pain

4. DISCUSSION

The study sought to evaluate the frequency and intensity of intraoperative pain experienced by patients undergoing elective caesarean section under sub-arachnoid block. The study also examined factors related to intraoperative discomfort experienced by patients undergoing elective caesarean section under sub-arachnoid block. The study included a sample of fifty-five women who underwent elective caesarean delivery using a sub-arachnoid block. The majority of individuals were young adults between the ages of 31 and 40 (65.5%). This accounts for the fact that the majority (58.2%) of them were married. The vast majority (76.4%) of the women possessed tertiary education, which serves as clear evidence of the high literacy rate among women. Consequently, the vast majority (96.4%) of them secured employment. This suggests that the ladies may have the ability to cover their own medical costs.

The study's findings on the occurrence of intraoperative pain in women undergoing elective caesarean section with sub-arachnoid block revealed that nearly all (96.4%) of the women encountered some degree of discomfort throughout the procedure. Their physical, emotional, and spiritual wellness is expected to be adversely affected [33]. This phenomenon may be associated with the dosage level, as shown by Irabayashi et al. [34] in their research conducted in Japan. Their study found that higher doses of anaesthetic drugs yielded a greater analgesic effect compared to lesser doses. Hocking and Wildsmith [35] state that the efficacy of a local anaesthetic is primarily determined by its dosage.

The predominant categories of pain reported by the participants who experienced pain throughout the procedure were acute pain (π= 1.47, SD= 0.99) and persistent pain (π= 1.24, SD= 0.99). This phenomenon could be attributed to the traction effect caused by the surgical technique and the positioning of the ladies during the administration of the sub-arachnoid block.

One of the study's goals was to evaluate the degree of intraoperative discomfort reported following elective caesarean section performed under sub-arachnoid block anaesthesia. The study revealed that a majority of the women (52.7%) had mild pain, while 43.6% experienced significant pain during the surgery. This indicates that although nearly all (96.4%) of the women had some level of discomfort during the treatment, it was neither intense or profound. The occurrence of pain during a planned C-section procedure, performed under sub-arachnoid block (spinal anaesthesia), can have a substantial effect on the patient's perception and the overall success of the surgery. Gaining insight into the underlying factors responsible for this discomfort is crucial in order to devise efficacious approaches to alleviate it. The subsequent analysis examines multiple factors that contribute to intraoperative pain in this particular context:

Insufficient administration of anaesthesia or limited distribution: An insufficient dosage or incorrect distribution of the anaesthetic agent is a major factor contributing to intraoperative pain

during a C-section performed under a sub-arachnoid block. Spinal anaesthesia is the process of administering a local anaesthetic into the sub-arachnoid area to obstruct nerve signals, resulting in the numbing of sensation and alleviation of pain in the lower body. Pain in certain regions during surgery may occur if the dosage is inadequate or the distribution is uneven.

Challenges Encountered During the Administration of Anaesthesia: The efficacy of providing spinal anaesthesia can be affected by technical problems, such as the difficulty in accurately identifying the precise injection location or the need for several punctures. Inadequate pain control during the surgery might occur because to poor technique, which may result in incomplete or failed blocks.

Factors pertaining to the patient: The efficacy of the spinal block can be influenced by patient-specific factors, such as anatomical variations (e.g., scoliosis), obesity, or prior spinal procedures. These characteristics can hinder the attainment of an ideal distribution of the anaesthetic drug, resulting in pain during surgery.

Factors related to surgery: Intraoperative pain can be influenced by both the surgical method employed and the level of experience of the surgeon. Extended or intricate surgical procedures can heighten the probability of experiencing pain, as the analgesic impact may lessen over time. Moreover, an excessive amount of manipulation or strain on tissues during surgery might result in discomfort and agony.

Anxiety and Psychological Factors: Anxiety and psychological stress can intensify the experience of pain. Patients undergoing scheduled caesarean sections may experience substantial anxiety, which might intensify their pain sensitivity. Alleviating psychological elements through preoperative counselling and creating a soothing environment can effectively decrease intraoperative pain.

Maternal Positioning refers to the specific posture or position adopted by a mother during pregnancy or childbirth. The distribution of the anaesthetic agent can be affected by incorrect maternal positioning during the administration of spinal anaesthesia or during surgery. Ensuring accurate alignment can contribute to a more consistent block and decrease the occurrence of pain during surgery.

Application of Adjuvants: Adjuvants, such as opioids or clonidine, can augment the analgesic efficacy of spinal anaesthesia. Insufficient use of these adjuvants or neglecting to employ them when required can lead to less-than-optimal pain management.

Finally, unsuccessful or Partially Executed Block: Occasionally, the spinal block may experience a total failure or be partially ineffective, resulting in notable pain during the surgery. This can arise from mechanical malfunctions, discrepancies in patient anatomy, or the patient's resistance to the anaesthetic medication.

5. CONCLUSION

This study is a descriptive cross-sectional examination that attempted to assess the intensity of pain experienced by women following elective caesarean surgery under sub-arachnoid block, as well as determine the factors associated with this pain. The study revealed that a substantial proportion of women (96.4%) encountered intraoperative pain when undergoing elective caesarean section under sub-arachnoid block. The discomfort was mostly characterised by intense and pulsating sensations. However, the levels of discomfort seen during the surgery were categorised as mild (52.7%) and severe (43.6%). Inadequate pain relief can occur due to variations in patient anatomy, inaccurate estimate of the necessary anaesthetic amount, and technical challenges in administering the sub-arachnoid block. Technical malfunctions during the execution of the block, such as inaccurate needle positioning or incomplete block, also have a crucial impact. Future research should prioritise the development of standardised protocols and the exploration of novel anaesthetic agents or techniques to better optimise patient comfort and safety.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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