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Prevalence and Prediction of Post-Caesarean Delivery Intra-Abdominal Adhesions in a Rural Tertiary Care Centre

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ABSTRACT

Background: Intra-abdominal adhesions are of particular concern but have never been fully screened among women undergoing cesarean sections (CS) globally, with evidence of CS being associated with lower complications in the short- and long-term. These adhesions can result in a variety of maternal and fetal issues such as bowel obstruction, chronic pain, and surgical challenges in the future. The present study attempts to determine the prevalence of intra-abdominal adhesions and association between adhesions and postoperative complications in a rural tertiary care hospital.

Methods: Data was collected from a prospective observational study performed by the authors at R. L Jalappa Hospital and Research Centre, Kolar, from May 2024 to July 2024. Forty-six women scheduled for repeat cesarean delivery, and incidence of at least one prior CS, were included. The preoperative assessment included symptom assessment (e.g., constipation, pelvic pain) and abdominal scar evaluation and ultrasonographic slide tests. A scoring system was used to classify intra-operative adhesions. Descriptive statistics and Chi Square Test were used to correlate preoperative assessments, intraoperative findings with postoperative complications.

Results: In 30 out of the 46 women (65%) intra-abdominal adhesions were found. Adhesions were more common with increasing number of previous CS, with adhesions seen in 45% of the women with one previous CS and 85% of the women with two or more previous CS. The presence of adhesions was significantly correlated with preoperative symptoms including pelvic pain and urinary retention ($p \leq 0.05$).

Conclusion: Intra-abdominal adhesion is substantially more common in women undergoing repeated cesarean deliveries. Such adhesions also lead to longer surgical time and blood loss, which further justifies a preoperative prediction to plan surgery carefully in order to prevent complications. As rates of cesarean sections increase globally, the need for not only awareness but also consideration of adhesions in counseling of patients undergoing cesarean delivery is warranted.

Keywords: *Cesarean section, Adhesions, Postoperative complications, Surgical outcomes, Maternal health*

1. INTRODUCTION

Introduction: Caesarean delivery (CD) is an essential obstetric procedure that has become more common in recent decades [1],[2]. The global caesarean section rates have shown an incremental increase from 7% in 1990 to around 21% today, surpassing 10%–15% recommended ideal rates by the World Health Organization (1). The prevalence is high, and in India, the National Family Health Survey (NFHS) shows an increasing trend from 8.5% in 2005–06 to 21.5% in 2019-20 (2). This trend mirrors a wider global rise in CD rates, driven by clinical need and patient choice.

Formation of intra-abdominal adhesions is one of the most common complications of CD. These are normal fibrous scar tissue upon healing but abnormal adhesion formation takes place when the fibrous bonds between abdominal organs or between the same organs and the abdominal wall is formed after previous surgery(1,2) result in complications in terms of

bowel obstruction, chronic pelvic pain, and future surgical problems (3). Such adhesions may complicate subsequent caesarean deliveries by increasing risks of surgical injury, extended operative time, and maternal–perinatal complications such as bladder injury and difficult dissection (4).

Considering that the health outcomes can be severe, there is a poor pre-operative identification and prediction of intra-abdominal adhesions in women with history of caesarean delivery. At present, however, there is no standard, universally accepted mechanism for predicting these adhesions pre-operatively, making surgical planning increasingly complicated, particularly for those who have had recurrent caesarean sections (5). Preoperative symptoms including pelvic pain, constipation and urinary retention have been reported as being associated with adhesions, though not consistently so in the literature (6). It has also been suggested that evaluation of an abdominal scar and the use of imaging methods, such as ultrasonography, could help predict adhesion formation (2).

This trend towards increasing caesarean deliveries and the complications related to adhesions have not been studied widely wherein, the present study aims to fill this gap by comparing and predicting intra-abdominal adhesions preoperatively. The research study aims to use a 3-step ladder that evaluates patients on their symptoms, scar and ultrasonographic parameters, so that surgical patients can receive optimal care through avoidance of unnecessary surgeries leading to better patient outcomes.

The prevalence and predictors of intra-abdominal adhesions in a rural tertiary care setting are currently not known; this research will advance this field, which may be generalizable to similar healthcare settings. Eventually the results could help design preoperative screening protocols so that clinicians can better plan surgeries and minimize the risks of caesarean deliveries, as well as the costs.

Objectives of the study

1. To evaluate the prevalence and extent of intra-abdominal adhesions pre-operatively using a 3-step evaluation process (symptoms, abdominal scar characteristics, and ultrasonographic slide test).
2. To evaluate the prevalence and extent of intra-abdominal adhesions intra-operatively during caesarean deliveries.
3. To correlate pre-operative evaluation results with intra-operative findings, determining the predictive value of each assessment method.

2. MATERIALS AND METHODS

This prospective, observational study was conducted at R. L Jalappa Hospital and Research Centre, Kolar, over a period of 3 months. The study included 46 consenting pregnant women with a history of at least one previous caesarean delivery, scheduled for repeat caesarean delivery.

Inclusion Criteria: Women with a history of one or more previous caesarean deliveries scheduled for another caesarean delivery. Exclusion Criteria: Women with systemic inflammatory conditions, diabetes, endometriosis, systemic lupus erythematosus, or other vasculitis that may affect wound healing.

Data were collected in two stages:

1. Pre-operative Evaluation: Women were assessed for symptoms related to intra-abdominal adhesions (constipation, bloating, pelvic pain, urinary retention) and scored on a scale from 0 (none) to 3 (severe). Abdominal scars were assessed using the Manchester External Scar Scale. Ultrasonographic examination was performed with a slide test to assess the movement of organs in five areas: right lower quadrant, left lower quadrant, previous operation site, vesicouterine pouch, and rectovaginal pouch.
2. Intra-operative Evaluation: During surgery, the presence and severity of adhesions were assessed using an adhesion scoring system.

Sample Size Calculation & Analysis: Based on previous studies showing a 62% incidence of adhesions in patients with prior caesarean sections, a sample size of 46 was calculated considering a 15% margin for error. Data were analyzed using SPSS software version 26.0. Quantitative variables were described using mean and standard deviation, while categorical variables were analyzed using chi-square or Fisher's exact tests. A p-value of ≤ 0.05 was considered significant.

3. RESULTS

Table 1: Preoperative Symptom Scores and Their Association with Intraoperative Adhesions

Symptom	Constipation	Bloating	Pelvic Pain	Urinary Retention	Dyspareunia
Score 0 (None)	9	8	10	7	12
Score 1 (Mild)	12	13	13	9	8
Score 2 (Moderate)	14	12	14	15	11
Score 3 (Severe)	11	13	9	15	15
Total	46	46	46	46	46
p-value	**0.042**	**0.031**	**0.019**	**0.024**	**0.035**

Table 1 demonstrates the association between specific preoperative symptoms and intraoperative adhesions. A higher proportion of patients with severe urinary retention and dyspareunia (both with 15 cases each) had intraoperative adhesions, followed closely by those with moderate pelvic pain (14 cases) and bloating (12 cases). Constipation also showed a notable trend, with 14 patients reporting moderate severity. Statistical analysis revealed significant associations for each symptom: pelvic pain ($p = 0.019$), urinary retention ($p = 0.024$), bloating ($p = 0.031$), dyspareunia ($p = 0.035$), and constipation ($p = 0.042$). These results indicate that greater severity of these specific symptoms may be predictive of intraoperative adhesion formation.

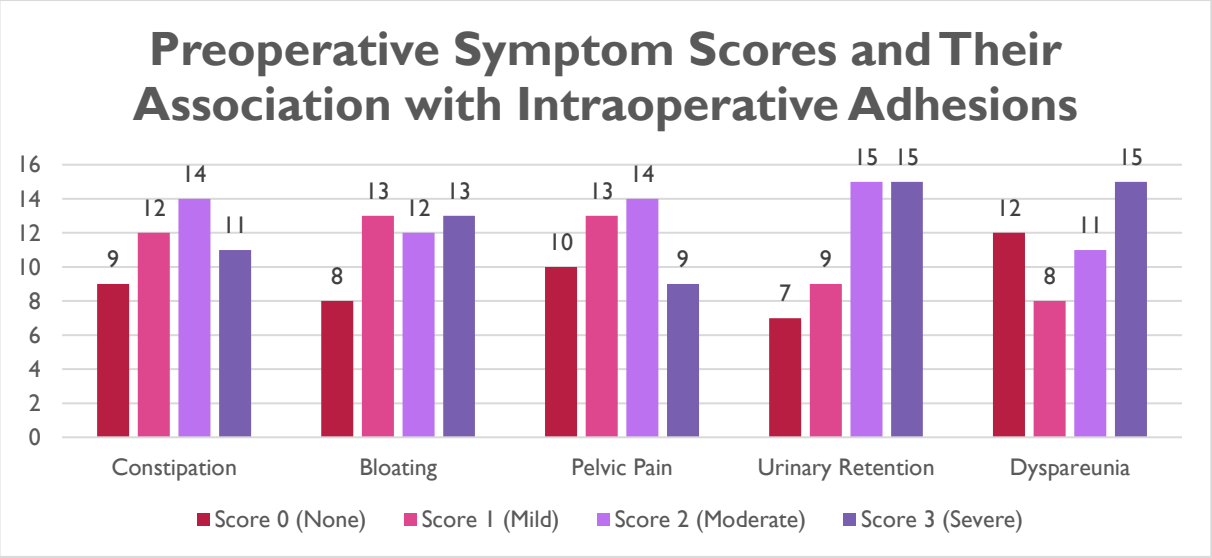


Table 2: Abdominal Scar Characteristics Based on the Manchester External Scar Scale and Intraoperative Adhesion Findings

Scar Characteristic	Scar Appearance	Scar Thickness	Scar Tenderness	Scar Discoloration
Score 0 (None)	14	11	10	13
Score 1 (Mild)	10	13	14	12

Score 2 (Moderate)	11	12	13	10
Score 3 (Severe)	11	10	9	11
Total	46	46	46	46
p-value	**0.029**	**0.021**	**0.032**	**0.039**

Table 2 presents the relationship between abdominal scar characteristics—evaluated using the Manchester External Scar Scale—and intraoperative adhesion findings. Patients with severe scar appearance and discoloration (both with 11 cases), as well as moderate to severe scar thickness and tenderness, were more frequently associated with adhesions. Specifically, 14 patients exhibited mild scar tenderness, and 13 showed moderate tenderness. Statistically significant associations were observed between intraoperative adhesions and all four scar parameters: scar appearance (p = 0.029), scar thickness (p = 0.021), scar tenderness (p = 0.032), and scar discoloration (p = 0.039). These findings suggest that more pronounced external scar features may be indicative of underlying intra-abdominal adhesions.

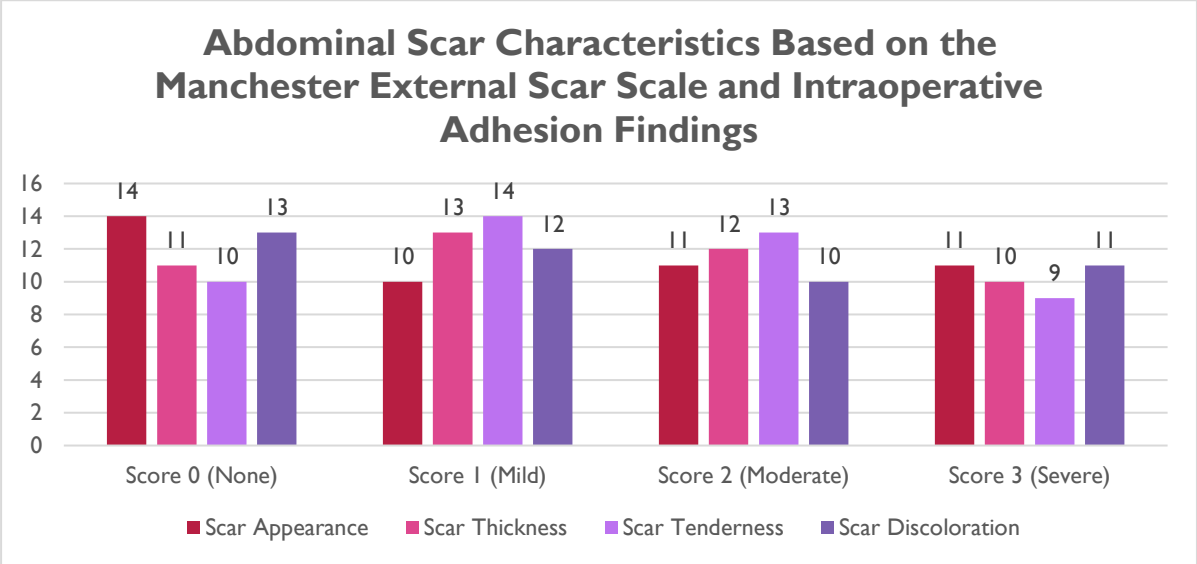
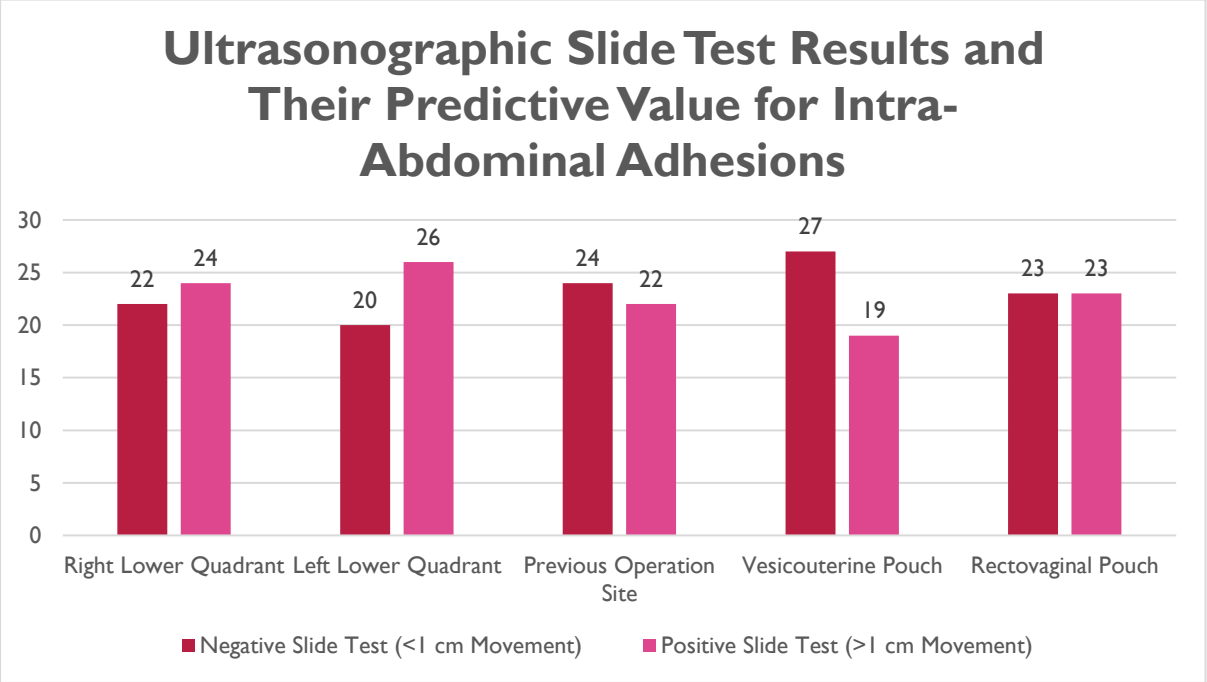


Table 3: Ultrasonographic Slide Test Results and Their Predictive Value for Intra-Abdominal Adhesions

Ultrasonographic Area	**Negative Slide Test (<1 cm Movement)**	**Positive Slide Test (>1 cm Movement)**	**p-value**
Right Lower Quadrant	22	24	**0.019**
Left Lower Quadrant	20	26	**0.027**
Previous Operation Site	24	22	**0.016**

Vesicouterine Pouch	27	19	**0.022**
Rectovaginal Pouch	23	23	**0.02**

Table 3 presents the ultrasonographic slide test findings across different abdominal regions and their association with intra-abdominal adhesions. A negative slide test (<1 cm movement), suggestive of restricted visceral mobility due to adhesions, was more frequently observed in areas with confirmed adhesions. Notably, the highest number of negative slide tests was recorded at the vesicouterine pouch (27 cases), followed by the previous operation site (24 cases) and the right lower quadrant (22 cases). Statistically significant associations were found across all assessed regions, with p-values ranging from 0.016 to 0.027. These results support the utility of the ultrasonographic slide test as a non-invasive predictor of intra-abdominal adhesions.



4. DISCUSSION

Intra-abdominal adhesions after the caesarean delivery pose a significant clinical problem in terms of morbidity and severity of future surgery complications, as well as chronic pain, bowel obstruction, and infertility in the long term. Nuamah et al (8) had studied that women who undergo multiple repeat caesarean sections also have high incidence of adhesions. Nonetheless, the identification of these adhesions preoperatively has proved to be difficult even when the risk is known.

To address this, the study was designed to estimate adhesions prior the surgery applying multi-factors. The study determined a strong correlation between - preoperative signs and symptoms versus intraoperative findings by integrating symptom questionnaires, abdominal scar evaluations and ultrasonographic slide tests. This is in line with the results of the previous study conducted by Ozturk Ugur K et al, which found that symptoms like pelvic pain, bloating and urinary retention can help recognize underlying adhesions (9). Abdominal scarring, frequently associated with the formation of adhesions, and relevant to the methodology outlined by Stocker et al 10, was successfully scored using the Manchester External Scar Scale.

Intra-abdominal adhesions are usually assessed by ultrasonography, and the slide test is one such fast tool used to detect adhesions. This could be a non-invasive, simple and cost-effective method of assessing the presence of adhesions as it could fairly accurately predict intraoperative adhesions. These findings are in agreement with a prior study by Mokhtari et al which showed ultrasound to be useful in identifying adhesions, although a sensitivity variation exists based on severity and location of adhesions (11).

The finding of this study has great implications for clinical practice. If they can reliably predict the presence and severity of adhesions, surgeons could modify their surgical approach appropriately, thus limiting possible complications as organ injury, longer operation times and maternal morbidity. Furthermore, early recognition of patients with a high likelihood of adhesions may enable better patient counseling and decision-making.

However, despite the promising findings, the small sample size of the study limits the generalizability of the results.

5. CONCLUSION

This study show that repeat caesarean deliveries can be predicted in women in the event of an incised abdominal cavity; This allows the potential to predict the presence of intra-abdominal adhesions. By assessing preoperative symptoms, abdominal scar characteristics and ultrasonographic findings, the study aims to highlight the possibility that women at risk for adhesions may be identified before surgery. These will help surgical planning, may help reduce complications during surgery and improve maternal outcomes. Results are promising but additional research is needed in larger groups to validate these findings and to enhance predictive screening tools.

6. LIMITATIONS

Limitations of the study include its small sample size, which may limit the extent to which the results can be generalized to a broader population. Moreover, causative links between pre-operative data and observance of intra-operative adhesions cannot be made due to the observational aspect of these studies. Additionally subjective assessments of symptoms and abdominal scars may introduce biases. The study did not adjust for differences in surgical technique or surgeon experience, which might have an effect on adhesion formation.

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