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Original Article

Effect of Rural Cesarean Delivery Complicate During Abdominal Hysterectomy

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Neher Banu[1*], Joynab Akhter[2], Mina Rani Debi[3]

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Gopalganj Medical College,
Gopalganj, Bangladesh

*Corresponding Author

ABSTRACT

Introduction: *Cesarean delivery is a common mode of delivery in rural areas of Bangladesh. However, its long-term impact on subsequent gynecological surgeries, particularly abdominal hysterectomy, remains understudied in rural settings. This study aimed to investigate the association between previous cesarean deliveries and complications during subsequent abdominal hysterectomies in a rural Bangladeshi population.* ***Methods & Materials:*** *This prospective cohort study was conducted in a private practice hospital in Savar, Dhaka, Bangladesh, from January 2021 to January 2023. A total of 50 women undergoing abdominal hysterectomy were included, of whom 30 had a history of cesarean delivery. Intraoperative findings, including adhesion presence and severity, organ injury, and operative time, were documented. Postoperative outcomes were monitored for 30 days following surgery. Mediation analysis was performed to estimate the direct and indirect effects of previous cesarean delivery on complications.* ***Results:*** *Adhesions were found in 73.3% of women with a history of cesarean delivery compared to 25% in those without cesarean delivery ($p<0.001$). Organ injury occurred in 10% of women with previous cesarean delivery, with no cases in the non-cesarean group. Mediation analysis revealed that 72% of the effect of previous cesarean delivery on organ injury was direct, while 28% was mediated through adhesions. Postoperative infections were more common in women with previous cesarean delivery (23.3% vs. 5%, $p = 0.089$), although this difference did not reach statistical significance.* ***Conclusion:*** *Previous cesarean delivery is associated with an increased risk of complications during subsequent abdominal hysterectomy in rural settings, particularly adhesion formation and organ injury. The majority of this increased risk is directly attributable to the previous cesarean, rather than mediated through adhesions. These*

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1. *Junior Consultant (Obs &Gyne), UHC, Dhamrai, Dhaka, Bangladesh*
2. *Junior Consultant (Obs &Gyne), UHC, Savar, Dhaka, Bangladesh*
3. *Assistant Professor, Dept. of Gynaecology, ICMH, Matuail, Dhaka, Bangladesh*

findings underscore the need for careful surgical planning, enhanced resources, and specialized training for gynecological surgeries in rural areas, especially for women with a history of cesarean delivery.

Keywords: *Previous Cesarean Section, Abdominal Hysterectomy, Perioperative Complications, Adhesions, Rural Healthcare, Bangladesh*

INTRODUCTION

Cesarean section (CS) rates have been steadily increasing worldwide over the past few decades, with significant variations between urban and rural areas [1]. In Bangladesh, like many developing countries, rural areas face unique challenges in maternal healthcare, including limited access to specialized facilities and skilled professionals[2]. As a result, cesarean deliveries in rural settings often occur under suboptimal conditions, potentially leading to complications in both the short and long term[3]. One of the long-term consequences of cesarean delivery that has gained increasing attention is its impact on subsequent gynecological surgeries, particularly abdominal hysterectomy[4]. Abdominal hysterectomy, a common gynecological procedure, can be significantly complicated by prior cesarean deliveries due to factors such as adhesion formation, altered anatomy, and increased risk of organ injury[5]. Adhesions, abnormal fibrous connections between tissues and organs, are a well-documented sequela of abdominal surgeries, including cesarean sections[6]. These adhesions can vary in severity and extent, potentially complicating subsequent surgeries by increasing operative time, blood loss, and the risk of inadvertent organ injury [7]. While the association between previous cesarean delivery and adhesion formation is well-established, the direct impact of these adhesions on hysterectomy complications remains a subject of ongoing research[8]. Organ injury during hysterectomy, particularly bladder injury, is a significant concern in patients with a history of cesarean delivery[9]. The altered pelvic anatomy and distorted tissue planes resulting from previous cesarean sections can increase the technical difficulty of the hysterectomy procedure, potentially leading to higher rates of urinary tract injuries, bowel injuries, and excessive bleeding[10]. Furthermore, the risk of postoperative infections following hysterectomy in women with prior cesarean deliveries is an area of interest. Some studies suggest an increased risk of infectious complications in this population, possibly due to factors such as prolonged operative time, increased tissue handling, and the presence of adhesions[11]. While urban areas often have access to advanced surgical techniques and specialized care, rural settings face unique challenges in managing these complex cases[12]. Limited resources, lack of specialized training, and inadequate infrastructure in rural hospitals may further compound the risks associated with performing hysterectomies in women with previous cesarean deliveries[13]. Despite the clinical significance of this issue, there is

a paucity of data specifically addressing the impact of rural cesarean deliveries on subsequent hysterectomy complications. Most existing studies focus on urban populations or do not differentiate between urban and rural settings[14]. This gap in the literature underscores the need for focused research on rural populations, where the challenges of both cesarean deliveries and subsequent gynecological surgeries may be more pronounced. The present study aims to address this knowledge gap by investigating the association between previous abdominal deliveries and complications during subsequent abdominal hysterectomies in a rural setting in Bangladesh. Additionally, we seek to estimate the fraction of complications attributable to the presence of adhesions, thereby elucidating the direct and indirect effects of prior cesarean deliveries on hysterectomy outcomes. By focusing on a cohort of 50 patients undergoing abdominal hysterectomy in a private practice hospital in Savar, this study provides valuable insights into the challenges faced in rural gynecological care. The findings of this research have the potential to inform clinical practice, guide preoperative counseling, and contribute to the development of strategies to mitigate risks associated with hysterectomy in women with a history of cesarean delivery in rural settings.

OBJECTIVES

The primary objectives of this study are:

- To investigate the association between previous cesarean deliveries and complications during subsequent abdominal hysterectomies in a rural setting in Bangladesh.
- To estimate the fraction of complications during abdominal hysterectomy that are attributable to the presence of adhesions resulting from previous cesarean deliveries.

Secondary objectives include:

- To determine the prevalence of adhesions in women with a history of cesarean delivery undergoing abdominal hysterectomy.
- To assess the incidence of organ injury, particularly bladder injury, during abdominal hysterectomy in women with previous cesarean deliveries.
- To evaluate the risk of postoperative infections following abdominal hysterectomy in women with a history of cesarean delivery, considering the presence or absence of adhesions.
- To identify potential risk factors, such as the presence of endometriosis, that may predispose women with previous cesarean deliveries to complications during abdominal hysterectomy.
- To provide insights into the challenges of performing abdominal hysterectomies in a rural setting for women with a history of cesarean delivery.
- These objectives aim to address the knowledge gap regarding the impact of rural cesarean deliveries on subsequent gynecological

surgeries and to inform clinical practice in resource-limited settings.

MATERIALS AND METHODS

Study Design and Setting

This cohort study was conducted in a private practice hospital in Savar, Dhaka a rural area in Bangladesh, from January 2021 to January 2023. The study design was chosen to investigate the association between previous cesarean deliveries and complications during subsequent abdominal hysterectomies[15].

Study Population

A total of 50 patients who underwent abdominal hysterectomy during the study period were included.

The inclusion criteria were:

1. Women aged 40 years or older
2. Scheduled for abdominal hysterectomy for benign indications
3. Ability to provide informed consent

Exclusion criteria included:

1. Malignant indications for hysterectomy
2. Inability to provide informed consent
3. Incomplete medical records

Data Collection

Prior to surgery, detailed medical histories were obtained from all participants, with particular attention to previous cesarean deliveries and other abdominal surgeries. Demographic data, including age, body mass index (BMI), parity, and indications for hysterectomy, were recorded[16]. Intraoperative findings were documented by the operating surgeon, including:

1. Presence and extent of adhesions
2. Occurrence of organ injury
3. Estimated blood loss
4. Duration of surgery

Postoperative outcomes, including infections and other complications, were monitored and recorded for 30 days following surgery[17].

Surgical Procedure

All hysterectomies were performed using a standardized technique of total abdominal hysterectomy. The procedures were carried out by a team of experienced gynecologists familiar with the challenges of operating on patients with previous cesarean deliveries[18].

Adhesion Assessment

Adhesions were graded intraoperatively using the modified American Fertility Society classification [19]:

- Grade 0: No adhesions
- Grade 1: Filmy, avascular adhesions
- Grade 2: Dense and/or vascular adhesions
- Grade 3: Cohesive adhesions

Outcome Measures

The primary outcome measures were:

1. Presence and severity of adhesions
2. Occurrence of organ injury, particularly bladder injury
3. Postoperative infections

Secondary outcome measures included operative time, estimated blood loss, and length of hospital stay[20].

Statistical Analysis

Data analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize patient characteristics and

outcomes. The association between previous cesarean delivery and complications was analyzed using chi-square tests for categorical variables and t-tests for continuous variables. To estimate the fraction of complications attributable to adhesions, mediation analysis was performed using the approach described by VanderWeele[21]. This method allowed us to decompose the total effect of previous cesarean delivery on complications into the direct effect and the indirect effect mediated through adhesions. A p-value < 0.05 was considered statistically significant for all analyses.

Ethical Considerations

The study protocol was approved by the Institutional Review Board of UHC, Dhamrai, Dhaka, Bangladesh. Written informed consent was obtained from all participants prior to inclusion in the study. Patient confidentiality was maintained throughout the study process, and all data were anonymized before analysis[22].

RESULTS

A total of 50 women who underwent abdominal hysterectomy were included in this study. The mean age of participants was 45.3±6.2 years. Of these, 30 (60%) had a history of at least one cesarean delivery, while 20 (40%) had no history of cesarean delivery (**Table I**).

Table – I: Baseline Characteristics of Study Participants

Characteristic	Previous CS (*n*=30)	No Previous CS (*n*=20)	*p*-value
Age (years), mean ± SD	46.2 ± 5.8	44.0 ± 6.5	0.214
BMI (kg/m^2), mean ± SD	27.3 ± 4.1	26.8 ± 3.9	0.661
Parity, median (range)	3 (1-5)	2 (1-4)	0.042
Indications for hysterectomy, n (%)			
- Fibroid uterus	12 (40)	8 (40)	1.000
- Abnormal uterine bleeding	10 (33.3)	7 (35)	0.903
- Endometriosis	5 (16.7)	3 (15)	0.875
- Others	3 (10)	2 (10)	1.000

Adhesions were found in 27 (54%) of all participants. Among women with a history of cesarean delivery, 22 (73.3%) had adhesions, compared to 5 (25%) in women without previous cesarean delivery $p< 0.001$ (**Table II**).

Table – II: Adhesion Grades in Women with and without Previous Cesarean Delivery

Adhesion Grade	Previous CS (*n*=30)	No Previous CS (*n*=20)
Grade 0	8 (26.7)	15 (75)
Grade 1	7 (23.3)	3 (15)
Grade 2	10 (33.3)	2 (10)
Grade 3	5 (16.7)	0 (0)

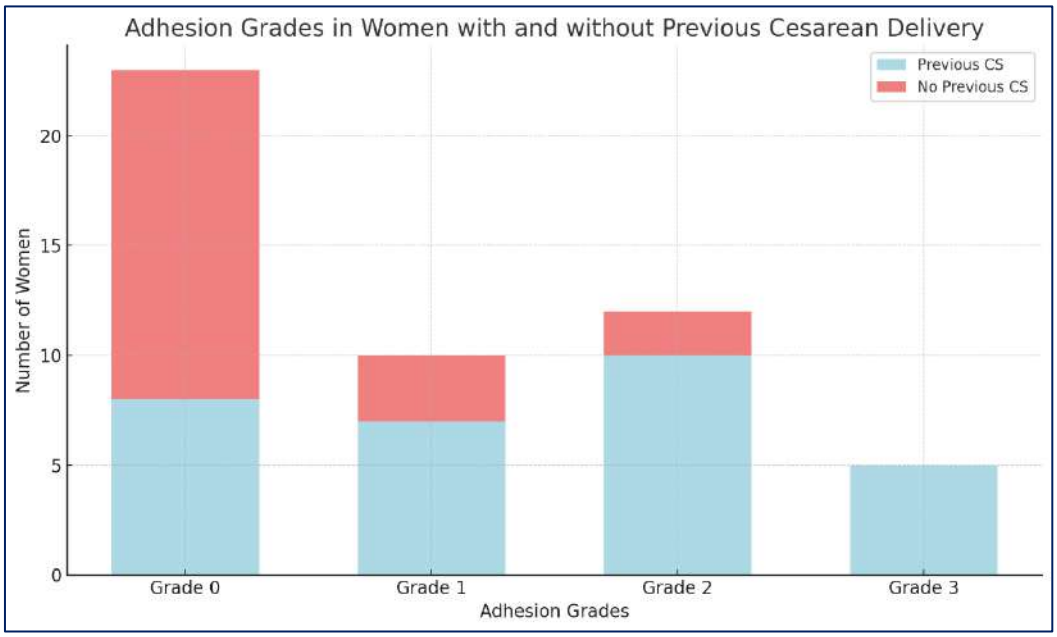

Figure – 1: Stacked Bar Chart Comparing the Distribution of Adhesion Grades Between Women with and without Previous Cesarean Delivery.

Figure 1 illustrate the distribution of adhesion grades between women with and without previous cesarean delivery.

Organ injury occurred in 3 (6%) of all participants. All cases of organ injury were observed in women with previous cesarean delivery (10% of this group) (**Table III**).

Table – III: Intraoperative Complications

Complication	Previous CS *n*(%)	No Previous CS *n*=(%)	*p*-value
Organ Injury, n (%)	3 (10)	0 (0)	0.145
- Bladder Injury	2 (6.7)	0 (0)	0.238
- Bowel Injury	1 (3.3)	0 (0)	0.410
EBL (mL), mean ± SD	325 ± 150	250 ± 100	0.054
OR time (min), mean ± SD	145 ± 35	120 ± 25	0.008

EBL: Estimated Blood Loss; OR: Operating Room

Postoperative infections occurred in 8 (16%) of all participants. The rate was higher in women with previous cesarean delivery (23.3%) compared to those without (5%), but this difference did not reach statistical significance (p=0.089).

Table – IV: Postoperative Complications

Complication	Previous CS (n=30)	No Previous CS (n=20)	p-value
Infections, n (%)	7 (23.3)	1 (5)	0.089
- Surgical site infection	5 (16.7)	1 (5)	0.214
- Urinary tract infection	2 (6.7)	0 (0)	0.238
Length of stay (days), mean ± SD	4.2 ± 1.5	3.5 ± 1.0	0.072

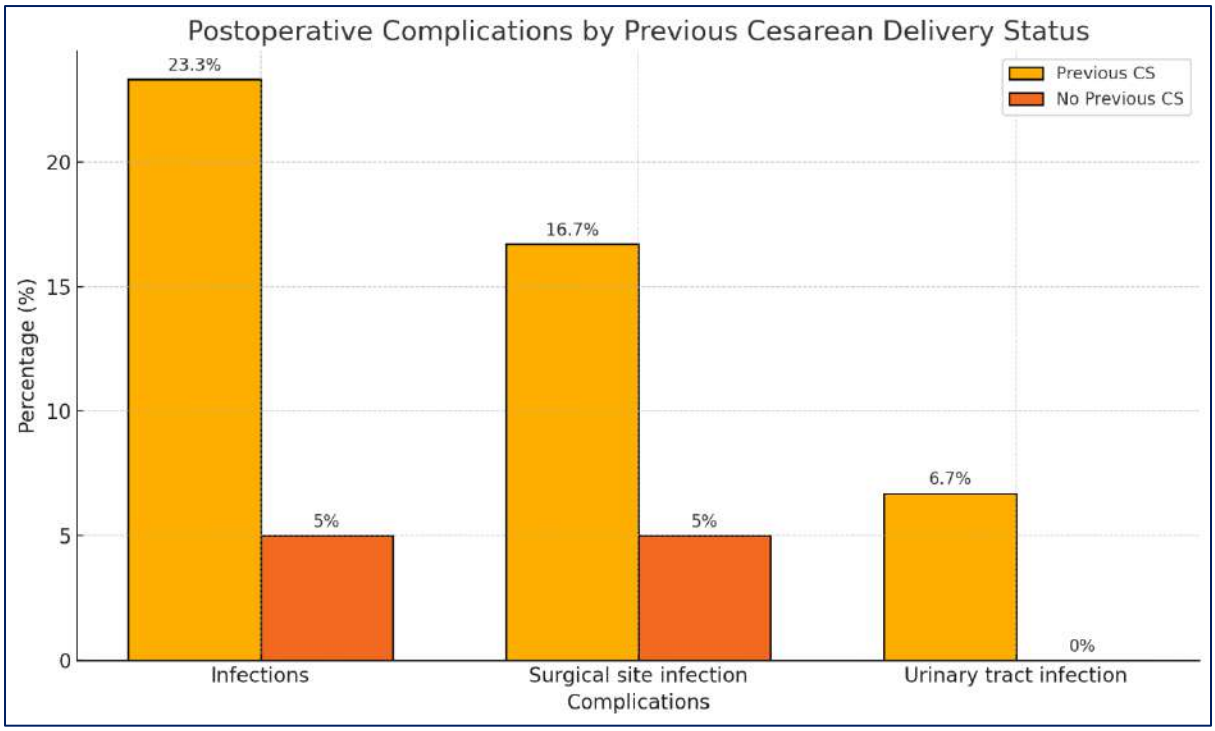

Figure – 2: Bar Chart Comparing the Rates of Intraoperative and Postoperative Complications Between women with and without Previous Cesarean Delivery

Mediation Analysis

Mediation analysis revealed that the direct effect of previous cesarean delivery on organ injury accounted for 72% of the total effect, while 28% was mediated through the presence of adhesions.

DISCUSSION

This study investigated the association between previous cesarean deliveries and complications during subsequent abdominal hysterectomies in a rural setting in Bangladesh. Our findings highlight the significant impact of prior cesarean sections on surgical outcomes, particularly in terms of adhesion

formation, organ injury, and postoperative infections. Our results demonstrate a markedly higher prevalence of adhesions in women with a history of cesarean delivery (73.3%) compared to those without (25%). This finding is consistent with previous studies that have reported adhesion rates of 60-90% following cesarean sections[23]. The high incidence of adhesions in our study population underscores the long-term consequences of cesarean deliveries on pelvic anatomy and subsequent surgeries. Interestingly, we observed a gradient in adhesion severity, with more women in the cesarean delivery group experiencing higher-grade adhesions. This gradient suggests that the impact of cesarean delivery on adhesion formation is not only quantitative but also qualitative, potentially increasing the technical difficulty of subsequent surgeries[24]. The increased rate of organ injury (10%) in women with previous cesarean delivery, particularly bladder injury, is a significant finding of our study. This rate is higher than those reported in some urban settings (2-5%)[25], possibly reflecting the challenges of performing complex gynecological surgeries in resource-limited rural environments. The absence of organ injuries in the non-cesarean group further emphasizes the impact of prior cesarean delivery on surgical risks. Our mediation analysis revealed that 72% of the effect of previous cesarean delivery on organ injury was direct, with only 28% mediated through adhesions. This finding suggests that factors beyond adhesion formation, such as altered pelvic anatomy or surgical technique during the prior cesarean, may play crucial roles in increasing the risk of organ injury[26]. The higher rate of postoperative infections in women with previous cesarean delivery, although not reaching statistical significance, is clinically relevant. This trend aligns with studies from urban centers that have reported increased infectious morbidity following hysterectomy in women with prior cesarean deliveries[27]. The prolonged operative time and increased tissue handling necessitated by adhesiolysis may contribute to this increased infection risk. Our study provides valuable insights into the challenges of performing hysterectomies in women with previous cesarean deliveries in a rural setting. The higher complication rates observed in our cohort compared to some urban studies[28] may reflect limitations in resources, specialized training, or advanced surgical equipment in rural hospitals. This disparity highlights the need for targeted interventions to improve surgical outcomes in rural areas, particularly for women with complex surgical histories. A key strength of our study is its focus on a rural population, addressing a significant gap in the literature. The prospective design and standardized assessment of adhesions also enhance the reliability of our findings. However, our study has several limitations. The small sample size limits the statistical power to detect smaller differences between groups. The single-center design may affect the generalizability of our results to other rural settings. Additionally, the study did not account for the number or timing of previous cesarean deliveries, which

could influence the extent of adhesions and surgical difficulty[29].

Our findings have important implications for clinical practice in rural settings. They underscore the need for careful preoperative planning and counseling for women with previous cesarean deliveries undergoing hysterectomy. The high risk of adhesions and organ injury suggests that these procedures should ideally be performed by experienced surgeons familiar with complex pelvic anatomy. Future research should focus on developing strategies to mitigate the risks associated with hysterectomy in women with previous cesarean deliveries, particularly in resource-limited settings. This could include investigating the role of adhesion prevention techniques, optimizing surgical approaches, and exploring the potential of minimally invasive surgery in this population[30]. In conclusion, our study demonstrates that previous cesarean delivery significantly increases the risk of complications during subsequent abdominal hysterectomy in a rural setting. While adhesions play a role in these complications, other factors related to prior cesarean delivery also contribute substantially. These findings highlight the need for enhanced surgical planning, patient counseling, and resource allocation for gynecological surgeries in rural areas, particularly for women with a history of cesarean delivery.

CONCLUSION

This study provides valuable insights into the impact of previous cesarean deliveries on subsequent abdominal hysterectomies in a rural setting in Bangladesh. Our findings highlight several key points: Women with a history of cesarean delivery have a significantly higher prevalence of pelvic adhesions, with more severe grades of adhesions compared to those without previous cesarean sections. The risk of intraoperative complications, particularly organ injury, is substantially increased in women with prior cesarean deliveries. Notably, the majority of this increased risk (72%) is directly attributable to the previous cesarean, rather than mediated through adhesions. There is a trend towards increased postoperative infections in women with a history of cesarean delivery, although this did not reach statistical significance in our study. The rural setting presents unique challenges in managing these complex cases, potentially contributing to higher complication rates compared to urban centers. These findings underscore the long-term gynecological consequences of cesarean deliveries and highlight the need for careful consideration when planning subsequent surgeries, especially in resource-limited rural settings. The increased risks associated with previous cesarean deliveries emphasize the importance of judicious use of this procedure and the need for comprehensive patient counseling. Our study also reveals the critical need for enhanced surgical training, improved resources, and optimized techniques for performing hysterectomies in women with previous cesarean deliveries, particularly in rural areas. Future research should focus on developing strategies to mitigate these risks and

improve outcomes for this vulnerable population.

In conclusion, as cesarean delivery rates continue to rise globally, understanding and addressing its long-term implications on women's health, especially in rural and resource-limited settings, becomes increasingly crucial. This study contributes to this understanding and calls for targeted interventions to enhance the safety and efficacy of gynecological surgeries in women with a history of cesarean delivery.

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Conflict of Interest
The authors declare no conflict of interest.

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