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Original Research Article

Effect of Maternal and Fetal Outcomes in Women with a History of Cesarean Section

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Abstract

Aim: This study focuses on investigating the maternal and fetal outcomes of women with previous lower segment cesarean section histories in comparison to those women who have had previous deliveries via the vaginal route while underscoring the risks and complications accompanying them.

Methodology: A prospective, comparative, observational study involving 70 pregnant women, with 35 having had previous LSCS and 35 having had previous vaginal deliveries. Pregnant women were selected to participate in the study if they had been admitted after 28 weeks of gestation. Still, those who had classical cesarean sections, uterine surgery of any kind, or multifetal pregnancies were excluded from the study. Maternal and fetal outcomes were calculated through SPSS v.20.0.

Results: The results showed that in the LSCS group, complication rates were higher compared to others, such as postpartum hemorrhage at 5.7% and wound sepsis at 8.6%. Of the cases, 11.43% needed neonatal resuscitation. However, no increased rate was found for newborns with low birth weight or poor Apgar scores. Instead, the mean birth weight of newborns for the LSCS group was lower, which was 2.81 kg, differing significantly from the control mean birth weight of 2.87 kg at p-value of 0.04.

Conclusion: Women with a history of LSCS have worse maternal outcomes, and therefore careful monitoring and management are required to prevent the risk of complications associated with repeated cesarean deliveries.

Keywords: Lower Segment Cesarean Section (LSCS), Maternal and Fetal Outcomes, Neonatal Resuscitation, Postpartum Complications, Vaginal Delivery,

Introduction

The cesarean section (CS) is now one of the most essential lifesaving interventions for both the mother and fetus, integral to contemporary obstetric treatment. It ranks as one of the most common surgical interventions, now performed in many parts of the world [1]. These developments in medical science gained over the years, have greatly improved safety and efficacy in the cesarean section. The introduction of the lower uterine segment technique enhanced anesthetic capabilities, readily available blood products, effective antibiotics, improved surgical techniques, and advancements in neonatal intensive care have collectively transformed cesarean sections into routine procedures in the 21st century [2]. However, the rising numbers of cesarean sections performed around the world are worrisome. Meanwhile, within just ten years, the cesarean rates have skyrocketed to nearly 30 percent, and the rates of vaginal births after cesarean sections have plummeted to below 10%, leaving healthcare systems in an impossible puzzle [3]. The uptick in cesarean delivery has also been associated with increased maternal morbidity in those cases that have had multiple cesareans [4].

According to the 1985 WHO recommendation, the recommended ideal rate for cesarean section was no more than 10–15%. If the rate surpasses 15%, it likely indicates overuse. A less than 5% rate, on the other hand, means that many women would not have access to necessary surgical care in obstetrics. India is not an exception, wherein the prevalence of cesarean section has increased from as low as 8.48% to as high as 41.9% in different parts of the country [5]. Naturally, this increase in the primary cesarean section will lead to an increase in the number of repeat cesareans associated with a higher degree of complications in pregnancy, particularly those related to abnormal placentation. Studies, such as

rise in maternal complications like bladder injuries, excessive intraoperative blood loss, uterine artery ligation, and obstetric hysterectomies as the number of repeat cesarean sections increases. Women who have had one or more previous cesarean sections undergo nearly half of the cesarean hysterectomies [6]. Beyond immediate surgical risks, repeated cesarean sections pose longer-term health threats.

Late complications, including bowel obstructions and chronic pelvic pain from peritoneal adhesions, are difficult to quantify but tend to increase with each subsequent cesarean. Numerous studies have documented a rise in postoperative infections—such as urinary tract infections, wound infections, and endometritis—in women undergoing multiple cesarean deliveries [7]. The volume of blood loss during surgery, which tends to increase in repeat cesareans, is a critical factor contributing to postoperative infections and other complications due to tissue damage and prolonged operative time [8]. The major obstetrical risk for multiple cesarean deliveries is the increased likelihood of uterine scar rupture, antepartum, and postpartum, which consequently increases both maternal and fetal morbidity and mortality rates. The pre-operative risks, such as placenta previa, especially with abnormal placental adherence like accreta and increta, likewise multiply in women who have had three or more cesareans [9]. These risks form the gist of why it is imperative to closely monitor and manage a cesarean section. Therefore, this study evaluated the maternal and fetal outcomes in women who had previously undergone cesarean deliveries to better understand the associated risks and complications.

1. Materials and methods

1.1 Research Design

An observational cross-sectional study designed to assess maternal and fetal outcomes in women having prior lower segment cesarean sections (LSCS) in comparison to those with previous vaginal births. The study followed an observational approach to track and compare outcomes based on predefined variables in a clinical setting, ensuring a comprehensive evaluation of both groups over one year.

1.2 Study Area

This observational cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Patna Medical College and Hospital, Patna, Bihar, India for one year

1.3 Sample Size

The total sample size for the study consisted of 70 women, selected based on specific inclusion and exclusion criteria.

1.4 Sample Selection Criteria

❖ **Inclusion Criteria**

- Pregnant women are admitted after 28 weeks of gestation.
- Women with a history of previous LSCS (cases) or vaginal delivery (controls).

❖ **Exclusion Criteria**

- Previous history of classical cesarean section.
- Prior uterine surgery (e.g., Myomectomy).
- History of abortions or medical termination of pregnancy (MTP).
- Multifetal pregnancies.
- History of placenta previa in a previous pregnancy.
- Patients with other underlying medical disorders.

1.5 Procedure

Upon admission to the hospital, pregnant women who met the inclusion criteria were enrolled after giving informed consent. The patients were randomly selected using a random sampling technique to ensure unbiased participant selection. A detailed medical and obstetric history was obtained, including information on maternal age, gravidity, parity, gestational age, and previous delivery history. This comprehensive assessment helped in understanding the patient's background and any potential risks during the current pregnancy.

Maternal outcomes were closely monitored for complications such as intraoperative injuries, including bladder or uterine rupture, postpartum hemorrhage, and infections. Other surgical outcomes were also tracked to ensure maternal safety and recovery during and after delivery. Fetal outcomes were evaluated by recording Apgar scores, NICU admissions, neonatal resuscitation, and perinatal complications. Continuous clinical monitoring of maternal vital signs and fetal heart rate through cardiotocography (CTG) was maintained to ensure the well-being of both mother and baby throughout delivery and postoperatively. The mode of delivery, whether vaginal, elective cesarean or emergency cesarean, was also recorded.

1.6 Statistical Analysis

The study was conducted using the SPSS v.20.0 program, which is a statistical tool designed for social sciences. A significant criterion of P=0.05 was used. Numerical and percentage values were used to describe quantitative data. The quantitative data was characterized using statistical measures such as range, mean, standard deviation (SD), and median. The $\chi 2$-test was used to evaluate the comparability of several groups based on categorical data.

Results

Table 1 presents the operative details and complications among a study group of 35 patients. Most cesarean sections (CS) were performed as

emergency procedures (62.9%), while 37.1% were elective. Anesthesia was predominantly spinal (94.3%), with only 5.7% receiving general anesthesia. In terms of skin incision techniques, Pfannenstiel was the most common method used (74.3%), compared to 25.7% for midline incisions. Regarding complications, uterine dehiscence occurred in 22.9% of cases, indicating a notable risk during the operative procedure. Intraperitoneal adhesions were reported in 14.3%, while bladder injury was documented in 8.6% of the patients. Importantly, there were no instances of bowel injury or uterine rupture. Most patients had a lower segment scar (97.1%), with only a small percentage (2.9%) exhibiting a classical scar. Additionally, uterine artery ligation was performed in 2.9% of cases. Overall, the data highlight a predominance of emergency surgeries and spinal anesthesia, with several significant complications, particularly related to uterine integrity.

Table 1: Analysis of Complications Associated with Cesarean Section Procedures

Complications	Cases (n=35)	Percentage (%)
Type of CS		
Elective	13	37.1
Emergency	22	62.9
Anesthesia		
Spinal	33	94.3
General	2	5.7
Skin Incision		
Pfannenstiel	26	74.3
Midline	9	25.7
Complications		
Uterine Dehiscence	8	22.9
Intraperitoneal Adhesions	5	14.3
Bladder Injury	3	8.6
Bowel Injury	0	0
Uterine Rupture	0	0
Lower Segment Scar	34	97.1
Classical Scar	1	2.9
Uterine Artery Ligation	1	2.9

The comparison of adverse maternal outcomes between the study and control groups, each with 35 participants, reveals a generally higher incidence of complications in the study group. Postpartum hemorrhage (5.7%) and blood transfusions (5.7%) occurred at a slightly higher rate in the study group compared to the control group (2.9% for both). ICU admissions, hysterectomy, wound sepsis, and maternal death were reported exclusively or more frequently in the study group. Notably, wound sepsis was more common in the study group (8.6%) compared to the control group (2.9%), and there was one case of maternal death in the study group, with none in the control group. Overall, the study group experienced worse outcomes across all categories.

Table 2: Comparison of Adverse Outcomes Between Study and Control Groups

Adverse Outcome	Study Group (n=35)	Control Group (n=35)
Postpartum Hemorrhage (PPH)	2 (5.7%)	1 (2.9%)
Blood Transfusion	2 (5.7%)	1 (2.9%)
ICU Admission	1 (2.9%)	Nil
Hysterectomy	1 (2.9%)	Nil
Wound Sepsis	3 (8.6%)	1 (2.9%)
Maternal Death	1 (2.9%)	Nil

In Table 3, the comparison of Apgar scores at 5 minutes between the study and control groups (each with 35 participants) shows no significant difference. Both groups had 1 participant (2.9%) with an Apgar score of less than 7, while the majority in both groups (97.1%) had scores greater than 7. The chi-square test ($\chi^2 = 0.00$, $p = 1.00$) indicates no statistical significance between the groups, meaning the Apgar scores at 5 minutes were comparable in both the study and control groups.

Table 3: Comparison of Apgar Scores at 5 Minutes Between Study and Control Groups			
Apgar Score at 5 Minutes	**Study Group (n=35) No. (%)**	**Control Group (n=35) No. (%)**	**Statistical Inference (Chi-square test)**
<7	1 (2.9%)	1 (2.9%)	$\chi^2 = 0.00$; p = 1.00; Not significant
>7	34 (97.1%)	34 (97.1%)	
Total	**35**	**35**	

Table 4 presents a comparison of neonate birth weights between cases and controls, each with 35 participants. The incidence of low birth weight (LBW) was similar, with 5 cases (14.3%) and 4 controls (11.4%), and the chi-square test showed no significant difference ($\chi^2 = 0.11$, p = 0.74). However, most neonates in both groups had normal birth weights (greater than 2.5 kg), with 30 cases (85.7%) and 31 controls (88.6%). Significantly, the average birth weight for the cases was 2.81 kg (±0.45) whereas the average birth weight for the controls was 2.87 kg (±0.51); an unpaired t-test revealed a statistically significant difference (t = 1.97, p = 0.04). This suggests that while LBW rates were comparable, the control group had a higher average birth weight.

Table 4: Comparison of the Birth Weight of Neonates in the Cases and Controls.

Neonate Birth Weight	**Cases (n=35)**	**Controls (n=35)**	**Statistical Inference**
<2.5	5 (14.3%)	4 (11.4%)	$\chi^2 = 0.11$; p = 0.74; Not significant
>2.5	30 (85.7%)	31 (88.6%)	
Total	**35**	**35**	
Mean birth weight ± SD	**2.81 ± 0.45**	**2.87 ± 0.51**	**Statistical Inference**
			t = 1.97; p = 0.04; Significant

Table 5 compares adverse fetal outcomes between cases and controls, each group consisting of 35 participants. The data show that neonatal resuscitation was required for 4 cases (11.43%) compared to 1 control (2.86%), with a chi-square value of $\chi^2 = 3.27$ and a p-value of 0.07, indicating no significant difference (NS). For NICU admissions, 6 cases (17.14%) required admission, while 2 controls (5.71%) did, yielding a chi-square value of $\chi^2 = 2.14$ and a p-value of 0.14, also not significant (NS). Additionally, neonatal death occurred in 1 case (2.86%) and 1 control (2.86%), resulting in a chi-square value of $\chi^2 = 0.00$ and a p-value of 1.00, again indicating no significant difference (NS). Overall, the findings suggest that while there are differences in the frequencies of adverse fetal outcomes, none reached statistical significance.

Table 5: Comparison of Adverse Fetal Outcomes Between Cases and Controls

Adverse Fetal Outcome	**Cases (n=35)**	**Controls (n=35)**	**Statistical Inference**
Neonatal Resuscitation	4 (11.43%)	1 (2.86%)	$\chi^2 = 3.27$; p = 0.07; Not significant (NS)
NICU Admission	6 (17.14%)	2 (5.71%)	$\chi^2 = 2.14$; p = 0.14; Not significant (NS)
Neonatal Death	1 (2.86%)	1 (2.86%)	$\chi^2 = 0.00$; p = 1.00; Not significant (NS)

Discussion

The present investigation presents essential data on the operated and complicated cesarean sections (CS) carried out in a series of 35 patients. It is interesting that 62.9% of performed CS were emergent, and the most frequently used technique for anesthesia was spinal in 94.3%. The complication rate was also remarkably high: uterine dehiscence occurred in 22.9%, intraperitoneal adhesions in 14.3%, and bladder injury was involved in 8.6%. These findings highlight the surgical risks, mainly on uterine integrity. Such a high rate of lower segment scars (97.1%) also supports the frequent surgeries seen. Overall, there is an obvious trend regarding urgent interventions and major complications that require much more attention. In contrast to this, Wen et al.

[10] and Leung et al. [11] place the risk factors surrounding caesarean deliveries into a wider context. Although, on average, the uterine rupture rate was 0.65%, other complications were higher in a cohort of 308,755 women who attempted a trial of labor after previous cesarean deliveries reported by Wen et al. Their study highlighted an alarming link between elective cesarean sections and a higher maternal mortality rate, indicating that the mode of delivery is closely intertwined with the morbidity of the mother. Similarly, Leung et al. investigated catastrophic uterine rupture; here, these authors concluded that characteristics of mothers could not predict severity in the case of rupture but clearly pointed out the intervention being made was quite prompt and significantly reduced complications for the neonate. Collectively, these studies suggest that though the present study shows a variety of complications at both elective and emergency CS, the unifying theme remains one of uterine integrity and maternal safety, consistent with the broader findings in the literature, requiring and emphasizing rigorous surgical practice and post-operative monitoring.

The current study is part of an unfortunate trend with adverse maternal outcomes, where the group under investigation of 35 patients had higher rates of complications than a control group of equal size. Specifically, postpartum hemorrhage and blood transfusions occurred in 5.7% and 2.9%, respectively, among the study group compared with the control group. Besides this, other important findings were that compared to the control group, there was a higher incidence of ICU admissions, hysterectomy, and one case of maternal death; wound sepsis was significantly more common at 8.6% in the case group compared with the control group at 2.9%. Overall, these data convey that woman in the case group had much worse outcomes compared across several categories of maternal-related disorders, which have major implications for clinical management and intervention strategies. The study in contrast performed by Khalil et al. [12] investigated the impact of maternal age on adverse pregnancy outcomes among a large cohort of 76,158 singleton pregnancies and established that advanced maternal age at ≥40 years was a risk factor for several complications, including pre-eclampsia, GDM, miscarriage, and the likelihood of cesarean delivery. Although this current study did not target an investigation of maternal age, the enhanced risks noted here parallel those noted in Altieri et al. [13], where adverse outcomes of maternal PCOS were explored. The authors noted a greater rate of GDM and preterm birth in women with PCOS than controls; such targeted aspects of maternal health most certainly contribute to the overall experience. Both conclude that awareness of and control over factors that predispose to maternal health risks would help reduce complications in pregnancy and delivery.

The present study reveals that the incidences of low scores in 5 minutes are the same between the study and control groups, with a 2.9% score within both groups but with a hugely predominant percentage scoring above 7 at 97.1%. The chi-square test values ($\chi^2 = 0.00$, $p = 1.00$) settle the comparability of results too. However, in their Ethiopia's study, Ajibo et al. [14] found that low fifth-minute Apgar scores were relatively more common and at a prevalence of birth asphyxia at 22.52%, resulting in increased neonatal mortality and morbidity. These authors reported an association of a few risk factors with low Apgar scores, these being low birth weight of the fetus and an emergency cesarean section. Similarly, Junior et al. [15] undertook a case-control study that reported various maternal and fetal variables to be associated with low Apgar scores and that pre-labor cesarean sections are protective. The other two reports showed critical correlations between various risk factors and poor neonatal outcomes. This is once again in stark contrast to the findings of this study, as no group differences in Apgar scores were identified.

Both cases and controls demonstrated equivalent proportions of LBW infants, where 14.3% of the latter actually fell under cases and 11.4% were of control groups; no statistical difference appeared ($\chi^2 = 0.11$, $p = 0.74$). However, the mean birth weight of controls is greater than that of cases (2.87 vs. 2.81 kg, $t = 1.97$; $p = 0.04$). Conversely, Gascoin et al. [16] reported a significantly high incidence of small-for-gestational-age neonates at 23% in the group born to mothers who received Rouxen-Y gastric bypass, compared with that in the control group, which was 3.6%, thereby indicating complications in maternal health conditions and a relation with birth weight. In a similar way, critical maternal factors associated with term neonates and LBW were identified by Mahecha-Reyes et al. [17] Such factors included inadequate weight gain during pregnancy and lack of prenatal care, as the odds of LBW significantly increased them, that is, aOR 0.77 and OR 8.20, respectively. Thus, though the rates of LBW in the current study are similar, differences in the aspects of maternal health and prenatal care influence birth weight outcomes in other populations.

Conclusion

The increasing number of cesarean sections worldwide, particularly in India, has led to increased maternal morbidity, particularly those related to abnormal placentation. The recommended ideal rate is 10-15%, but many women lack access to necessary surgical care. This has resulted in an alarming rise in maternal complications like bladder injuries, excessive intraoperative blood loss, uterine

artery ligation, and obstetric hysterectomies. Repeated cesarean sections pose longer-term health threats, including late complications, postoperative infections, and pre-operative risks. A study evaluating maternal and fetal outcomes in women who had previously undergone cesarean deliveries found a higher incidence of complications, including postpartum hemorrhage, blood transfusions, ICU admissions, hysterectomy, wound sepsis, and maternal death. The study found no significant difference in Apgar scores at 5 minutes between the study and control groups, but the incidence of low birth weight was similar.

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