ORIGINAL ARTICLE

Maternal and Neonatal Outcomes Following Elective Versus Emergency Repeat Cesarean Section in Women with One Previous Cesarean Delivery: A Comparative Cohort Study

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ABSTRACT

Objective: To compare maternal and neonatal outcomes between elective and emergency repeat cesarean section in women with previous cesarean delivery.

Study Design: Retrospective cohort study

Place and Duration of Study: The study was conducted in the obstetrics and gynecology unit of National Guards hospital Madinah Munawara, KSA from July 2025 to December 2025.

Materials and Methods: A total of 130 women with one previous cesarean section who underwent repeat cesarean delivery were included in the study. Among them, 65 underwent elective cesarean section and 65 chose trial of labour as their mode of delivery but later underwent emergency cesarean section due to complications arising during labour. Maternal outcomes assessed included uterine tears, postpartum hemorrhage, blood transfusion, bladder injury, puerperal wound infection, thrombosis, maternal death, and prolonged hospital stay. Neonatal outcomes included respiratory distress, aspiration of liquor, perinatal death, low Apgar score, and NICU admission. Demographic variables including maternal age, BMI, diabetes, parity, and fetal weight were also analyzed. To determine the odds of adverse outcomes between emergency versus elective caesarean groups, odds ratios with confidence interval were calculated for all variables. Chi square test was applied to assess the association of maternal and fetal outcomes with emergency cesarean.

Results: Odds ratio in Table II and III showed that patients in group I (emergency cesarean) had higher odds for adverse maternal and neonatal outcomes in the emergency caesarean group compared with the elective group except maternal death due to zero cases in the elective group. while Chi square test (Table IV) showed significant association of maternal outcomes like uterine tears p=.027, and puerperal wound infection p=.015 while border line association of PPH p=.049, blood transfusion p=.049 and low Apgar score p=.05 with emergency cesarean group I.

Conclusion: These findings indicate that although emergency cesarean section may have a greater odd of adverse maternal and neonatal outcomes, only uterine injury, postpartum hemorrhage, need for blood transfusion, puerperal wound infection and low Apgar score related morbidity showed statistically significant association with emergency cesarean compared to elective cesarean.

Key Words: *Emergency Cesarean, Maternal Morbidity, Neonatal Morbidity, Previous Cesarean Delivery.*

Introduction

Cesarean section (CS), once avoided because of its historically high mortality rate little more than a century ago, has evolved into one of the most frequently performed surgical procedures worldwide. It currently accounts for approximately one in three births in the United States[1] and as many as four out of five deliveries in certain regions globally.[2] Women with a history of a single prior cesarean section constitute a substantial proportion of this increasing rate.[3]

Determining the optimal mode of delivery for women with one previous cesarean birth presents a complex clinical dilemma for both patients and healthcare providers. Neither elective repeat cesarean delivery nor a trial of labor after cesarean (TOLAC) is entirely devoid of risk. Consequently, a pregnant woman with a prior cesarean section is

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invariably considered high risk—not only from an obstetric standpoint, but frequently from a psychological perspective as well.[4]

Although a trial of labor after cesarean (TOLAC) is advocated for appropriately selected women with a single prior cesarean delivery, repeat cesarean section remains a common practice in subsequent pregnancies. Multiple factors have been identified as increasing the probability of cesarean delivery, including advanced maternal age (particularly over 40 years)[5,6] obesity with its attendant obstetric complications such as fetal macrosomia[7,8] and both gestational and pregestational diabetes mellitus.[5]

Despite its general safety in modern obstetrics, cesarean delivery is associated with greater maternal morbidity and mortality when compared with vaginal birth.[9] Moreover, the timing and urgency of the procedure play a critical role in determining maternal and neonatal outcomes. Evidence from several studies indicates that emergency cesarean sections are linked to higher rates of intraoperative and postoperative complications, as well as prolonged recovery periods, relative to elective procedures[10,11,12.] Despite extensive research, limited evidence specifically compares maternal and neonatal outcomes among women with one previous cesarean delivery. The present study was designed to evaluate and compare maternal and neonatal outcomes between elective and emergency repeat cesarean sections in women with a history of one prior cesarean birth. Through systematic analysis of this specific population, the study aims to clarify the relative risks associated with each approach and to inform evidence-based clinical decision-making and patient counseling.

Materials and Methods

This cohort study was conducted on women with one previous caesarean section who underwent repeat caesarean delivery between July 2025 and December 2025. Ethical approval for the study was obtained from the hospital's Ethical Review Board. The Institutional Review Board (IRB) number was NRM26/003/2. All participants were informed about the study and provided written informed consent prior to enrollment.

Patients were divided into two groups: Emergency caesarean section (Group I) and elective caesarean section (Group II). Patients in both groups had a history of one previous cesarean. Group I consisted of women who opted for trial of labour after caesarean (TOLAC) but subsequently required emergency caesarean section due to fetal distress or failure to progress in labour. Patients who delivered normally were not included in the study. Group II comprised women who directly opted for elective repeat caesarean section following one previous caesarean delivery. They did not experience any labour.

The sample size was calculated using G*Power version 3.1 for comparison of two independent proportions.[13] Assuming a 95% confidence level, 80% study power, and an equal allocation ratio (1:1), with expected complication rates of 35% in the emergency caesarean section group and 15% in the elective caesarean section group, the minimum required sample size was calculated to be 63 participants per group. After accounting for incomplete data, 65 patients were included in each group, resulting in a total sample size of 130. Initially 500 patients were enrolled with history of one previous cesarean were examined out of which 260 did not meet the inclusion criteria while 40 patients showed incomplete data so 300 patients were excluded from the study. The remaining 200 patients were divided in 2 groups.125 patients opted for trial of labour so included in group I. Remaining 75 patients were added in group II. In group I all patients waited for the labour to start naturally. Out of 125 patients 60 were delivered normally so excluded from the study and remaining 65 underwent emergency cesarean due to poor progress of labour or fetal distress. The final sample in group I was 65. In group II 75 patients opted for elective cesarean, out of which follow up of 10 patients could not be maintained so we were left with 65 patients in group II. Strobe diagram is shown in Figure 1. Participants in both groups were recruited using consecutive sampling until the required sample size for each group was achieved. Equal allocation (1:1 ratio) was selected to maximize statistical efficiency and facilitate comparison between groups. The inclusion criteria were: history of one previous caesarean section with a low transverse uterine incision, gestational age ≥37 weeks, singleton pregnancy, and a clinically adequate pelvis. Exclusion criteria included lack of antenatal care, fetal malformations,

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cephalopelvic disproportion, multiple gestations, previous uterine surgery for non-obstetric indications, fetal malpresentation, placenta previa, estimated fetal weight >4,000 g, and interpregnancy interval of less than 12 months from the previous caesarean delivery. Patients with a history of previous vaginal delivery or those with more than one prior caesarean section were also excluded. All patients were followed regularly during antenatal care and received detailed counseling regarding the risks and complications associated with TOLAC, along with the likelihood of successful vaginal birth. All patients in Group I provided informed consent for TOLAC. A Pfannenstiel incision was used in all caesarean sections across both emergency and elective groups.

Statistical analysis was performed using IBM SPSS Statistics version 16. Various intraoperative and postoperative maternal and neonatal outcomes were assessed. Maternal outcome variables included uterine tears, postpartum hemorrhage (PPH), blood transfusion, bladder injury, wound infection, prolonged hospital stay, and thrombosis. Neonatal outcomes included respiratory distress, aspiration of liquor, perinatal death, low Apgar score, and neonatal intensive care unit (NICU) admission. Hospital stay was classified as prolonged if it exceeded two days. Apgar score was considered low if it was less than 7 at 5 minutes after birth. Both variables were converted into categorical variables and coded as yes/no.

The Shapiro–Wilk test was performed to assess the normality of data distribution. To determine the odds of adverse outcomes between emergency versus elective caesarean groups, odds ratios with confidence interval were calculated. A p-value <0.05 indicated that the data was not normally distributed. A p-value ≤0.05 was considered statistically significant. Chi Square test was performed to study the association of maternal and fetal outcomes with emergency cesarean. A p-value ≤0.05 was considered statistically significant.

Results

Out of 130 patients, 65 (50%) underwent emergency caesarean section (Group I) and 65 (50%) underwent elective caesarean section (Group II). Regarding anesthesia, 27 patients (20.7%) received general anesthesia, of whom 20 (74%) belonged to the emergency group I and 7 (25.9%) to the elective group II. Spinal anesthesia was used in 103 patients (79.2%), including 25 (24.3%) emergency cases and 78 (75.7%) elective cases. Demographic characteristics are presented in Table I. Advanced maternal age (≥35 years) was more common in the emergency group (93.8%) than in the elective group (61%). Similarly, BMI >30 was more frequent in the emergency group (40%) compared with the elective group (27.6%).

Emergency caesarean section was associated with higher percentage of maternal morbidity compared with elective cesarean. Uterine tears occurred in 13.8% of emergency cases versus 3.1% of elective cases. Postpartum hemorrhage was observed in 16.9% versus 6.1%, blood transfusion in 18.5% versus 4.6%, and wound infection in 15.4% versus 1.5% in group I and II, respectively. Bladder injury occurred in 3.1% of emergency cases and 1.5% of elective cases. Thrombotic events were reported 3 (4.6%) and (1.5%) in group I and II respectively. One maternal death occurred in the emergency group (1.5%), while none occurred in the elective group. Neonatal complications were also more frequent in the emergency group. Respiratory distress occurred in 6.1% versus 3.1%, liquor aspiration in 6.1% versus 1.5%, and perinatal mortality in 3.1% versus 1.5% in emergency and elective groups, respectively. Low Apgar score was (12.3% & 1.5%). and NICU admission rates were (9% & 3%) in group I and II respectively.

All odds ratios (Table II&III) were greater than 1, indicating higher odds of adverse maternal and neonatal outcomes in the emergency caesarean group compared with the elective group except maternal death due to zero cases in the elective group. Similarly, the chi-square test (Table V) demonstrated significant association of uterine tears ($p = 0.027$) as well as puerperal wound infection ($p = 0.015$). Borderline significance was observed for postpartum hemorrhage ($p = 0.049$), blood transfusion ($p = 0.049$) and low Apgar score ($p = 0.057$).

Discussion

Caesarean section is a well-established obstetric surgical procedure performed to reduce maternal and fetal morbidity and mortality. Despite being classified as a major abdominal surgery, its global prevalence has increased considerably over recent

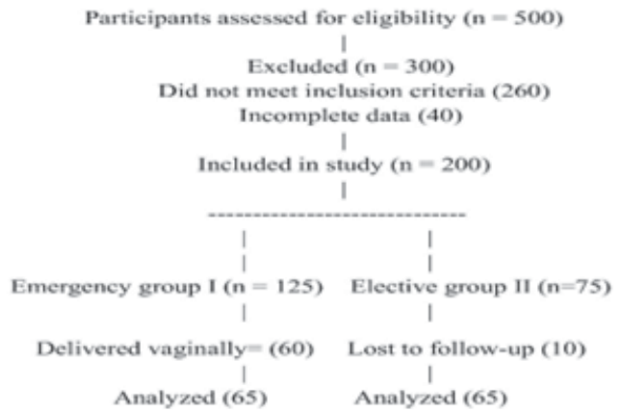

Figure 1: Strobe Diagram

Table I: Frequency Of Demographic Characteristics of Emergency and Elective Cesarean Groups

Demographic characteristics	Em CS N=65	Percentage	El CS N=65	Percentage
Maternal age < 25	4	6.15%	8	12.3%
Maternal age ≥ 35	61	93.8%	39	60%
Maternal BMI ≥ 30	26	40%	18	27.6%
Gestational diabetes	6	9.2%	7	10.7%
Fetal weight more than 3.5 kg	12	18.4%	6	9.2%

Table II: Odds Ratio of Maternal Complications

Complication	Odds ratio	Confidence interval
Uterine tears	1.83	1.354-2.483
PPH	1.613	1.143-2.27
Blood transfusion	2.071	1.615-2.656
Bladder injury	1.344	.592-3.308
Puerperal wound infection	1.788	1.300-2.458
Thrombotic event	1.524	.842-2.758
Prolonged hospital stay	1.72	.721-2.239
Maternal death	.000	.000

Table III: Odds Ratio of Fetal Complications

Complication	Odds ratio	CI
Respiratory distress	1.355	.749-2.453
Liquor aspiration	1.693	1.021-2.632
Perinatal death	1.344	.592-3.049
Low APGAR score	1.887	1.40-2.543
NICU admission	1.367	.832-2.247

Table IV: Chi Square Test in Emergency Cesarean Group

MATERNAL COMPLICATIONS	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Uterine tear	4.866[a]	1	.025	.054	.027
PPH	3.693[a]	1	.055	.097	.049
Blood transfusion	3.69[a]	1	.055	.097	.049
Bladder injury	.341[a]	1	.559	1.00	.500
Puerperal wound infection	5.876[a]	1	.015	.030	.015
Thrombotic event	1.032[a]	1	.310	.619	.310
Hospital long stay	.533[a]	1	.465	.718	.359
Maternal death	.000[a]	1	1.00	1.00	.752
FETAL COMPLICATIONS					
Respiratory distress	.699[a]	1	.403	.680	.340
Liquor aspiration	1.872[a]	1	.171	.365	.183
Perinatal death	.341[a]	1	.559	1.000	.500
Low APGAR score	3.775[a]	1	.052	.115	.057
NICU admission	1.07[a]	1	.300	.492	.246

decades.[14] A recent study by Gavial and Thomas reported a notable rise in caesarean section delivery rates in India over the past decade, increasing from 17% during National Family Health Survey-4 (NFHS-4, 2015–2016) to 21.5% during National Family Health Survey-5 (NFHS-5, 2019–2021.[15]

In our study, emergency deliveries accounted for 50% of cases, while elective procedures also comprised 50%. This was because we took elective cesarean group as control to calculate the odds ratio, so maintained the sample size equal in both groups. As odds ratio in our study was greater than 1, this shows that group 1 has higher odds for maternal and neonatal complications. These observations are in agreement with the results reported by Khawaja et al.[16] who found that cesarean delivery is associated with excessive bleeding, postoperative infection, thromboembolic events, and prolonged convalescence. However, from a neonatal perspective, cesarean birth is linked to an increased likelihood of respiratory complications, including respiratory distress syndrome which is contradictory to our results.[17]

In our sample, emergency cesarean sections were marked by a higher percentage of adverse maternal and fetal outcomes in group I. These findings align with RCOG guidelines which recognize emergency cesarean section as a higher-risk procedure due to urgent clinical circumstances, increased operative complexity, and greater maternal and fetal compromise at the time of delivery.[18] Similarly according to recommendations by the World Health

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Organization, caesarean section is a critical life-saving intervention when clinically indicated. However, unnecessary or emergency caesarean deliveries may increase the risk of both short-term and long-term maternal and neonatal complications, including hemorrhage, infection, surgical trauma, and neonatal respiratory morbidity.[19]

Emergency cesarean sections are associated with significantly higher number of postpartum hemorrhage in our study which is consistent with the findings of Sajjad et al.[14] who documented an elevation in the risk of hemorrhage in emergency cesarean deliveries compared with elective operations. Similarly, a meta-analysis conducted by Lee and Park[20]identified a significantly greater overall risk of maternal morbidity in emergency cesarean sections relative to planned procedures.

However, when chi square test was applied to our data adverse maternal outcomes such as uterine tears, and puerperal wound infection were observed statistically significantly associated with emergency cesarean group I, while post-partum hemorrhage and blood transfusion requirement showed a borderline association. No association was found between fetal outcomes and emergency cesarean. In contrast to these findings, earlier research indicates that the overall incidence of bladder injury during cesarean delivery ranges from 0.22% to 0.44%. Reported rates vary between 0.11% and 0.42% for primary cesarean sections and 0.27% to 0.81% for repeat procedures.[21] Similar to our study the pooled prevalence of surgical infection in post-cesarean section was 3 % (95 % CI: 2 %–4 %) in Saudi sample.[22] Hansen et al.[23] documented increased respiratory morbidity in infants delivered before 39 weeks of gestation by emergency cesarean. Edipoglu and Celik[24] also reported less favorable neonatal outcomes when emergency cesarean delivery was performed under general anesthesia compared to regional anesthesia techniques. This investigation is distinctive in that it exclusively evaluated maternal and neonatal outcomes among women with a history of a single prior cesarean delivery, comparing emergency and elective repeat procedures in a local Saudi hospital. The findings consistently demonstrated that patients undergoing emergency cesarean section were significantly associated only with uterine tears, post-partum hemorrhage, blood transfusion and puerperal wound infection indicating significant differences between the group I and II for these outcomes.

Despite its contributions, the study has several limitations. Confounding variables such as maternal age, BMI, parity, diabetes status, and fetal weight were adjusted but still all confounding variables were not adjusted which may have introduced bias in the estimated associations. As the study was conducted in a single healthcare center, the findings may reflect local clinical practices and patient characteristics, limiting external validity to other settings or populations. The relatively small sample size may have reduced statistical power, increased the likelihood of Type II error and limited the precision of odds ratio estimates, particularly for rare outcomes. Differences in patient selection between emergency and elective cesarean section groups may have influenced outcome comparisons, potentially affecting the validity of the results.

Conclusion

These findings indicate that although emergency cesarean section may have a greater frequency of adverse maternal and neonatal outcomes, only uterine tears, post-partum hemorrhage, need for blood transfusion, and puerperal wound infection related adverse maternal outcomes while in fetal outcomes low Apgar score is statistically significantly associated with emergency cesarean. These findings underscore the critical role of meticulous antenatal surveillance in the early detection of high-risk pregnancies and in facilitating timely, well-structured delivery planning. When cesarean section is clinically warranted, scheduling the procedure electively under controlled and optimal conditions may markedly enhance outcomes for both mother and neonate.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.