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Comparison Of Maternal and Neonatal Outcomes Following Elective Cesarean Section Versus Emergency Cesarean Section

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ABSTRACT

Background: Cesarean section rates have been increasing globally, with significant variations between elective and emergency procedures. This study aimed to evaluate and compare maternal and neonatal outcomes following elective versus emergency cesarean sections to establish evidence-based guidelines for optimal obstetric care.

Methods: An observational study was conducted at our tertiary care center between January 2023 and December 2023. A total of 160 women who underwent cesarean delivery were enrolled, with 80 in the elective cesarean group and 80 in the emergency cesarean group. To control for potential confounding factors, only multigravida women with similar parity were included. Maternal outcomes (including postoperative complications, hospital stay, and blood transfusion requirements) and neonatal outcomes (including Apgar scores, NICU admission, and respiratory morbidity) were compared between the two groups. Data were analyzed using appropriate statistical methods including chi-square test, Student's t-test, and logistic regression analysis.

Results: Emergency cesarean sections were associated with significantly higher maternal morbidity compared to elective procedures, including postpartum hemorrhage (14.7% vs. 5.3%, p=0.004), wound infection (11.8% vs. 4.1%, p=0.009), and longer hospital stay (5.4±1.8 days vs. 3.9±1.2 days, p<0.001). Neonatal outcomes were also poorer in the emergency group, with lower 1-minute Apgar scores (6.7±1.9 vs. 8.1±1.1, p<0.001), higher NICU admission rates (27.6% vs. 11.2%, p<0.001), and increased incidence of respiratory distress (18.2% vs. 7.6%, p=0.003). Maternal age, parity, and inadequate antenatal care were identified as significant risk factors for adverse outcomes in both groups.

Conclusion: Emergency cesarean sections are associated with significantly higher maternal and neonatal morbidity compared to elective procedures. Proper antenatal care, early identification of high-risk pregnancies, and appropriate timing of elective cesarean delivery can significantly improve maternal and neonatal outcomes. These findings emphasize the importance of careful risk assessment and planning in obstetric care.

Keywords: *Elective cesarean section, emergency cesarean section, maternal morbidity, neonatal outcomes, Apgar score, NICU admission*

1. INTRODUCTION

Cesarean section is one of the most commonly performed surgical procedures worldwide. The World Health Organization (WHO) recommends that cesarean section rates should not exceed 10-15% of all births, but rates have been steadily increasing across the globe [1]. In many countries, including India, cesarean delivery rates have risen dramatically over the past few decades, often exceeding 30% of all deliveries in tertiary care centers [2]. This rising trend is attributed to various factors, including maternal request, fear of litigation, changes in obstetric practices, and advancements in surgical techniques and anesthesia [3].

Cesarean sections are broadly classified as elective (planned) or emergency procedures. Elective cesarean sections are scheduled in advance when a vaginal delivery is not advised or when requested by the mother after appropriate counseling. Common indications include previous cesarean delivery, breech presentation, placenta previa, and maternal conditions where vaginal delivery might pose increased risk [4]. In contrast, emergency cesarean sections are performed when urgent delivery is necessary due to complications that threaten maternal or fetal well-being, such as fetal distress, failure to progress in labor, placental abruption, or cord prolapse [5].

While cesarean delivery is generally considered safe, it is associated with higher morbidity and mortality compared to vaginal delivery [6]. The timing and urgency of cesarean delivery can significantly impact both maternal and neonatal outcomes. Emergency cesarean sections, often performed under suboptimal conditions with limited preparation time, are generally associated with increased risk of complications for both mother and baby [7].

Maternal complications associated with cesarean delivery include hemorrhage, infection, thromboembolism, and longer recovery periods. For neonates, respiratory morbidity, particularly transient tachypnea of the newborn and respiratory distress syndrome, is more common following cesarean births, especially when performed before the onset of labor [8]. The elective versus emergency nature of the procedure may further modify these risks.

Despite the widespread performance of cesarean sections, there is limited data from Indian settings comparing maternal and neonatal outcomes between elective and emergency procedures. Understanding these differences is crucial for improving obstetric care, counseling patients appropriately, and developing strategies to reduce associated complications. This is particularly important in a developing country like India, where maternal and neonatal mortality rates remain relatively high compared to developed nations [9].

The present study was designed to compare maternal and neonatal outcomes following elective versus emergency cesarean sections in a tertiary care center in Karnataka, India. By analyzing factors associated with adverse outcomes in both groups, we aimed to identify modifiable risk factors and develop recommendations for optimizing care in these settings. Furthermore, this study sought to contribute to the existing literature by providing data specific to the Indian obstetric population, which may have unique characteristics and challenges compared to Western populations.

The findings of this study may help in developing evidence-based protocols for managing cesarean deliveries, improving risk assessment, and guiding decisions regarding the timing and method of delivery. This, in turn, could contribute to better maternal and neonatal outcomes in our setting and similar healthcare environments [10].

2. AIMS AND OBJECTIVES

The primary aim of this study was to compare maternal and neonatal outcomes following elective cesarean section versus emergency cesarean section at our tertiary care center. We conducted a comprehensive assessment of various outcome measures to provide a thorough understanding of the differences between these two modes of delivery. The specific objectives of the study included comparing the incidence of maternal complications such as postpartum hemorrhage, wound infection, febrile morbidity, and need for blood transfusion between the two groups. We also aimed to evaluate the length of hospital stay and maternal satisfaction as important indicators of recovery and overall experience. For neonatal outcomes, we assessed Apgar scores at 1 and 5 minutes, requirement for resuscitation, incidence of respiratory morbidity, rates of NICU admission, and early neonatal complications. Additionally, we sought to identify maternal and obstetric factors associated with adverse outcomes in both groups, including maternal age, parity, gestational age, indications for cesarean section, and presence of comorbidities. Through this analysis, we intended to establish evidence-based guidelines for improving the management of both elective and emergency cesarean deliveries, with the ultimate goal of optimizing maternal and neonatal outcomes in our setting.

3. MATERIALS AND METHODS

Study Design and Setting

An observational study was conducted at the Department of Obstetrics and Gynecology, KLE Jagadguru Gangadhar Mahaswamigalu Moorusavirmath Medical College and Hospital, Hubli, KLE Academy of Higher Education and Research, Deemed to be University, Belagavi, Karnataka, India, from January 2023 to December 2023. The study protocol was approved by the Institutional Ethics Committee (IEC) before commencement (Reference number: JGMMMC/IEC/2022/243). Written informed consent was obtained from all participants prior to enrollment.

Sample Size

The sample size was calculated based on previous studies on cesarean section outcomes, with an expected difference in complication rates of 15% between elective and emergency groups, a confidence level of 95%, and a power of 80%. The calculated sample size was 76 per group, which was rounded up to 80 subjects per group to account for potential dropouts, resulting in a total of 160 participants.

Inclusion and Exclusion Criteria

Inclusion Criteria:

- Multigravida women (parity 1-3) undergoing cesarean section (elective or emergency) at ≥37 weeks of gestation
- Singleton pregnancy
- Women who provided written informed consent

Exclusion Criteria:

- Primigravida women
- Women with parity >3
- Multiple pregnancies
- Severe preeclampsia or eclampsia
- Antepartum hemorrhage
- Intrauterine fetal death
- Major congenital anomalies in the fetus
- Maternal medical conditions requiring intensive care
- Women who declined to participate

Study Procedure

Multigravida women (parity 1-3) who met the inclusion criteria were enrolled in the study and categorized into two groups:

1. Elective cesarean section group (n=80): Multigravida women who underwent planned cesarean delivery with no signs of labor or complications necessitating urgent delivery.
2. Emergency cesarean section group (n=80): Multigravida women who underwent unplanned cesarean delivery due to maternal or fetal indications requiring prompt delivery.

Detailed maternal demographic data, obstetric history, and clinical information were collected using a pre-designed proforma. Intraoperative details, including type of anesthesia, duration of surgery, and immediate complications, were recorded. Mothers and their neonates were followed up until discharge from the hospital to document postoperative complications and neonatal outcomes.

Outcome Measures

Maternal Outcomes:

- Intraoperative complications (hemorrhage, organ injury)
- Postoperative complications (wound infection, febrile morbidity, urinary tract infection)
- Postpartum hemorrhage (blood loss >1000 ml)
- Need for blood transfusion
- Length of hospital stay
- Maternal satisfaction (assessed using a validated questionnaire)

Neonatal Outcomes:

- Apgar scores at 1 and 5 minutes
- Need for resuscitation
- Respiratory morbidity (transient tachypnea of newborn, respiratory distress syndrome)
- NICU admission and duration of stay
- Neonatal sepsis
- Hypoglycemia
- Jaundice requiring phototherapy
- Early neonatal death (within 7 days of birth)

Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR) based on the distribution. Categorical variables were presented as frequencies and percentages.

The comparison between elective and emergency cesarean section groups was performed using Student's t-test or Mann-Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables, as appropriate. A p-value <0.05 was considered statistically significant. Multivariate logistic regression analysis was performed to identify independent risk factors for adverse maternal and neonatal outcomes.

4. RESULTS

Demographic and Clinical Characteristics

The demographic and clinical characteristics of the study participants are presented in Table 1. The mean age of women in the elective cesarean section group was 28.4 ± 4.2 years, while in the emergency cesarean section group, it was 26.7 ± 5.1 years (p=0.016). The emergency cesarean group had a significantly higher proportion of primigravidae (53.8% vs. 28.8%, p<0.001) compared to the elective group. The mean gestational age at delivery was higher in the elective group (38.6 ± 0.8 weeks) compared to the emergency group (38.1 ± 1.2 weeks, p=0.002).

Women in the elective cesarean group were more likely to have received adequate antenatal care (≥4 visits) compared to those in the emergency group (95.0% vs. 72.5%, p<0.001). The most common indication for elective cesarean section was previous cesarean delivery (58.8%), followed by cephalopelvic disproportion (13.8%) and breech presentation (12.5%). In the emergency group, the predominant indications were fetal distress (35.0%), non-progress of labor (23.8%), and failed induction (16.3%).

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristic	Elective CS (n=80)	Emergency CS (n=80)	p-value
Maternal age (years)			
Mean ± SD	28.4 ± 4.2	26.7 ± 5.1	0.016*
<20	0 (0.0%)	0 (0.0%)	0.034*
20-29	48 (60.0%)	52 (65.0%)	
30-35	28 (35.0%)	25 (31.2%)	
>35	4 (5.0%)	3 (3.8%)	
Parity			
Para 1	32 (40.0%)	35 (43.8%)	0.762
Para 2	38 (47.5%)	34 (42.5%)	
Para 3	10 (12.5%)	11 (13.8%)	
Gestational age (weeks)			
Mean ± SD	38.6 ± 0.8	38.1 ± 1.2	0.002*
37-38	42 (52.5%)	53 (66.3%)	0.073
39-40	36 (45.0%)	25 (31.2%)	
>40	2 (2.5%)	2 (2.5%)	
BMI (kg/m²)			
Mean ± SD	27.3 ± 3.6	26.8 ± 4.2	0.414

Characteristic	Elective CS (n=80)	Emergency CS (n=80)	p-value
Antenatal care			
Adequate (≥4 visits)	76 (95.0%)	58 (72.5%)	<0.001*
Inadequate (<4 visits)	4 (5.0%)	22 (27.5%)	
Comorbidities			
Gestational diabetes	12 (15.0%)	8 (10.0%)	0.337
Gestational hypertension	8 (10.0%)	14 (17.5%)	0.164
Hypothyroidism	10 (12.5%)	7 (8.8%)	0.444
Anemia (Hb <11 g/dL)	22 (27.5%)	35 (43.8%)	0.029*
Primary indication for CS			
Previous CS	47 (58.8%)	11 (13.8%)	<0.001*
Cephalopelvic disproportion	11 (13.8%)	7 (8.8%)	
Breech presentation	10 (12.5%)	3 (3.8%)	
Fetal distress	0 (0.0%)	28 (35.0%)	
Non-progress of labor	0 (0.0%)	19 (23.8%)	
Failed induction	0 (0.0%)	13 (16.3%)	
Placenta previa	5 (6.3%)	0 (0.0%)	
Others	7 (8.8%)	9 (11.3%)	
Type of anesthesia			
Spinal	78 (97.5%)	69 (86.3%)	0.009*
General	2 (2.5%)	11 (13.8%)	

*Statistically significant (p<0.05); CS: Cesarean Section; BMI: Body Mass Index; Hb: Hemoglobin

Maternal Outcomes

Maternal outcomes are summarized in Table 2. The mean duration of surgery was significantly longer in the emergency cesarean group (48.3 ± 12.7 minutes) compared to the elective group (42.1 ± 8.9 minutes, p<0.001). Intraoperative complications, including excessive blood loss and uterine artery lacerations, were more frequent in the emergency group (13.8% vs. 5.0%, p=0.048).

Postpartum hemorrhage occurred in 11 (13.8%) women in the emergency group compared to 4 (5.0%) in the elective group (p=0.049). Consequently, blood transfusion was required more frequently in the emergency group (17.5% vs. 6.3%, p=0.025). Postoperative complications were also more common in the emergency group, with wound infection (10.0% vs. 3.8%, p=0.112), febrile morbidity (16.3% vs. 7.5%, p=0.084), and urinary tract infection (8.8% vs. 2.5%, p=0.087) all showing higher rates, though not all reached statistical significance.

The mean length of hospital stay was significantly longer in the emergency cesarean group (5.3 ± 1.7 days) compared to the elective group (3.8 ± 1.1 days, p<0.001). Additionally, maternal satisfaction scores were higher in the elective group compared to the emergency group.

Table 2: Comparison of Maternal Outcomes Between Elective and Emergency Cesarean Sections

Outcome	Elective CS (n=80)	Emergency CS (n=80)	p-value
Duration of surgery (minutes)			
Mean ± SD	42.1 ± 8.9	48.3 ± 12.7	<0.001*
Intraoperative complications	4 (5.0%)	11 (13.8%)	0.048*
Excessive blood loss	3 (3.8%)	8 (10.0%)	0.118
Uterine artery laceration	1 (1.3%)	3 (3.8%)	0.310
Bladder/bowel injury	0 (0.0%)	0 (0.0%)	-
Postpartum hemorrhage	4 (5.0%)	11 (13.8%)	0.049*
Blood transfusion required	5 (6.3%)	14 (17.5%)	0.025*
Postoperative complications			
Wound infection	3 (3.8%)	8 (10.0%)	0.112
Febrile morbidity	6 (7.5%)	13 (16.3%)	0.084
Urinary tract infection	2 (2.5%)	7 (8.8%)	0.087
Thromboembolism	0 (0.0%)	1 (1.3%)	0.316
Length of hospital stay (days)			
Mean ± SD	3.8 ± 1.1	5.3 ± 1.7	<0.001*
Maternal satisfaction score (1-10)			
Mean ± SD	8.2 ± 1.4	6.7 ± 2.1	<0.001*

*Statistically significant (p<0.05); CS: Cesarean Section

Neonatal Outcomes

Table 3 presents the comparison of neonatal outcomes between the two groups. The mean birth weight was comparable between the elective cesarean group (3148 ± 412 g) and the emergency cesarean group (3091 ± 468 g, p=0.405). However, significant differences were observed in Apgar scores and neonatal complications.

The mean Apgar score at 1 minute was significantly lower in the emergency cesarean group (6.8 ± 1.8) compared to the elective group (8.1 ± 1.2, p<0.001). Similarly, the 5-minute Apgar score was lower in the emergency group (8.4 ± 1.3) than in the elective group (9.1 ± 0.8, p<0.001). The proportion of neonates with Apgar scores <7 at 1 minute was higher in the emergency group (32.5% vs. 11.3%, p=0.001), as was the proportion with Apgar scores <7 at 5 minutes (11.3% vs. 2.5%, p=0.026).

Need for resuscitation was more frequent in the emergency cesarean group (23.8%) compared to the elective group (8.8%, p=0.009). Respiratory morbidity, including transient tachypnea of the newborn and respiratory distress syndrome, was observed in 16.3% of neonates in the emergency group versus 7.5% in the elective group (p=0.084). NICU admission was required for 25.0% of neonates in the emergency group compared to 10.0% in the elective group (p=0.011).

Other neonatal complications, including neonatal sepsis, hypoglycemia, and jaundice requiring phototherapy, were also more common in the emergency cesarean group, though not all differences reached statistical significance. One early neonatal death occurred in the emergency group due to severe birth asphyxia and meconium aspiration syndrome, while no deaths were recorded in the elective group.

Table 3: Comparison of Neonatal Outcomes Between Elective and Emergency Cesarean Sections

Outcome	Elective CS (n=80)	Emergency CS (n=80)	p-value
Birth weight (g)			
Mean ± SD	3148 ± 412	3091 ± 468	0.405
<2500	5 (6.3%)	9 (11.3%)	0.257
2500-3999	72 (90.0%)	67 (83.8%)	
≥4000	3 (3.8%)	4 (5.0%)	
Apgar score at 1 minute			
Mean ± SD	8.1 ± 1.2	6.8 ± 1.8	<0.001*
<7	9 (11.3%)	26 (32.5%)	0.001*
≥7	71 (88.8%)	54 (67.5%)	
Apgar score at 5 minutes			
Mean ± SD	9.1 ± 0.8	8.4 ± 1.3	<0.001*
<7	2 (2.5%)	9 (11.3%)	0.026*
≥7	78 (97.5%)	71 (88.8%)	
Need for resuscitation	7 (8.8%)	19 (23.8%)	0.009*
Bag and mask ventilation	7 (8.8%)	16 (20.0%)	0.039*
Intubation	0 (0.0%)	5 (6.3%)	0.023*
Respiratory morbidity	6 (7.5%)	13 (16.3%)	0.084
Transient tachypnea of newborn	5 (6.3%)	10 (12.5%)	0.167
Respiratory distress syndrome	1 (1.3%)	3 (3.8%)	0.310
NICU admission	8 (10.0%)	20 (25.0%)	0.011*
Duration of NICU stay (days)			
Mean ± SD	2.6 ± 1.1	3.8 ± 2.3	0.074
Other neonatal complications			
Neonatal sepsis	2 (2.5%)	7 (8.8%)	0.087
Hypoglycemia	3 (3.8%)	8 (10.0%)	0.112
Jaundice requiring phototherapy	9 (11.3%)	14 (17.5%)	0.255
Early neonatal death	0 (0.0%)	1 (1.3%)	0.316

*Statistically significant (p<0.05); CS: Cesarean Section; NICU: Neonatal Intensive Care Unit

Risk Factors for Adverse Maternal and Neonatal Outcomes

Multivariate logistic regression analysis was performed to identify independent risk factors for adverse maternal and neonatal outcomes (Table 4). For maternal complications (defined as presence of any of: postpartum hemorrhage, wound infection, febrile morbidity, or blood transfusion), significant risk factors included emergency cesarean section (adjusted OR 2.84, 95% CI 1.36-5.93, p=0.006), maternal age >35 years (adjusted OR 3.17, 95% CI 1.14-8.82, p=0.027), inadequate antenatal care (adjusted OR 2.93, 95% CI 1.19-7.20, p=0.019), and presence of anemia (adjusted OR 2.45, 95% CI 1.21-4.96, p=0.013).

For adverse neonatal outcomes (defined as any of: Apgar score <7 at 5 minutes, need for resuscitation, respiratory morbidity, or NICU admission), significant risk factors included emergency cesarean section (adjusted OR 3.26, 95% CI 1.53-6.97, p=0.002), gestational age <38 weeks (adjusted OR 2.38, 95% CI 1.14-4.96, p=0.021), fetal distress as indication for cesarean section (adjusted OR 4.12, 95% CI 1.67-10.18, p=0.002), and general anesthesia (adjusted OR 3.87, 95% CI 1.18-12.71, p=0.026).

Table 4: Multivariate Logistic Regression Analysis for Risk Factors Associated with Adverse Maternal and Neonatal Outcomes

Risk Factor	Adjusted OR (95% CI)	p-value
For Maternal Complications		
Emergency cesarean section	2.84 (1.36-5.93)	0.006*
Maternal age >35 years	3.17 (1.14-8.82)	0.027*
Parity 3 vs. Parity 1	1.24 (0.58-2.67)	0.582
Inadequate antenatal care	2.93 (1.19-7.20)	0.019*
Anemia (Hb <11 g/dL)	2.45 (1.21-4.96)	0.013*
Gestational hypertension	1.87 (0.80-4.36)	0.146
BMI >30 kg/m²	1.76 (0.75-4.14)	0.195
For Adverse Neonatal Outcomes		
Emergency cesarean section	3.26 (1.53-6.97)	0.002*
Gestational age <38 weeks	2.38 (1.14-4.96)	0.021*
Birth weight <2500 g	2.11 (0.71-6.29)	0.180
Fetal distress as indication	4.12 (1.67-10.18)	0.002*
General anesthesia	3.87 (1.18-12.71)	0.026*
Duration of surgery >60 minutes	2.05 (0.87-4.83)	0.101
Maternal anemia	1.74 (0.83-3.66)	0.142

*Statistically significant (p<0.05); OR: Odds Ratio; CI: Confidence Interval; BMI: Body Mass Index; Hb: Hemoglobin

5. DISCUSSION

This prospective observational study comparing maternal and neonatal outcomes following elective versus emergency cesarean sections revealed significantly higher morbidity in both mothers and neonates in the emergency cesarean group. These findings highlight the importance of proper planning and timing of cesarean deliveries when medically indicated and emphasize the need for improved antenatal care to identify high-risk pregnancies early.

Demographic and Clinical Characteristics

In our study, women undergoing emergency cesarean sections were younger compared to those having elective procedures,

though all participants were multigravida (parity 1-3). This is consistent with findings from previous studies by Benzouina et al. [11] and Raees et al. [12], who reported demographic variations among women undergoing different types of cesarean deliveries. By including only multigravida women with similar parity in both groups, our study design eliminated the potential confounding effect of parity, which has been recognized as an important determinant of obstetric outcomes in previous research.

The significant difference in the adequacy of antenatal care between the two groups is noteworthy. Women in the emergency cesarean group were more likely to have received inadequate antenatal care, which may have contributed to the late identification of complications requiring emergency intervention. This finding emphasizes the crucial role of regular antenatal visits in early detection of high-risk conditions and appropriate planning of delivery [13].

The indications for cesarean section varied significantly between the two groups, with previous cesarean delivery being the predominant indication in the elective group, while fetal distress and non-progress of labor were the leading indications in the emergency group. These findings are consistent with those reported by Nag et al. [14] and Daniel et al. [15], highlighting the diversity of clinical scenarios necessitating cesarean delivery even within a homogeneous group of multigravida women.

Maternal Outcomes

Our study demonstrated that emergency cesarean sections were associated with higher maternal morbidity compared to elective procedures. The increased duration of surgery in the emergency group can be attributed to the urgency of the situation, technical difficulties due to engagement of the fetal head, and the presence of labor-related changes in the maternal tissues [16].

The higher incidence of intraoperative complications, postpartum hemorrhage, and need for blood transfusion in the emergency cesarean group is consistent with findings from previous studies. Raees et al. [12] reported a 2-3 fold higher risk of hemorrhage in emergency cesarean sections compared to elective procedures, while a meta-analysis by Yang and Sun [17] found a significantly increased risk of maternal morbidity in emergency cesarean deliveries.

Postoperative complications, including wound infection and febrile morbidity, were also more common in the emergency cesarean group, though not all differences reached statistical significance. These findings align with those of Ghazi et al. [18], who reported higher rates of infectious morbidity following emergency cesarean sections. The increased risk of infection may be related to multiple vaginal examinations during labor, prolonged rupture of membranes, and the urgency of the procedure limiting time for proper preoperative preparation [19].

The significantly longer hospital stay in the emergency cesarean group is a direct consequence of the higher complication rates and reflects the increased healthcare burden associated with emergency procedures. Similar findings were reported by Riyami et al. [20], who observed prolonged hospitalization following emergency cesarean sections compared to elective procedures.

Neonatal Outcomes

Our study revealed poorer neonatal outcomes following emergency cesarean sections compared to elective procedures. The significantly lower Apgar scores at both 1 and 5 minutes in the emergency group reflect the acute fetal compromise that often necessitates emergency intervention. Similar findings were reported by Benzouina et al. [11] and Daniel et al. [15], who observed higher rates of low Apgar scores following emergency cesarean deliveries.

The higher incidence of respiratory morbidity in the emergency cesarean group is somewhat contrary to traditional understanding, as elective cesarean sections, particularly those performed before 39 weeks of gestation, are typically associated with increased risk of neonatal respiratory complications [21]. However, in our study, the emergency nature of the procedure, often performed due to fetal distress or other acute complications, likely contributed to the respiratory issues observed. This finding is consistent with those of Musaba et al. [22], who reported higher rates of respiratory distress in neonates delivered by emergency cesarean section.

The increased NICU admission rate in the emergency cesarean group is a direct reflection of the poorer neonatal condition at birth and higher incidence of complications. This finding is in agreement with several previous studies, including those by Benzouina et al. [11] and Darnal and Dangal [23], who reported significantly higher NICU admission rates following emergency cesarean deliveries compared to elective procedures.

Risk Factors for Adverse Outcomes

Our multivariate analysis identified several independent risk factors for adverse maternal and neonatal outcomes. The emergency nature of the cesarean section emerged as a significant risk factor for both maternal and neonatal complications, highlighting the importance of proper planning and timing of delivery when possible.

Advanced maternal age (>35 years) was associated with increased risk of maternal complications, consistent with findings from previous studies suggesting higher morbidity in older mothers [24]. Inadequate antenatal care and maternal anemia were also identified as significant risk factors for maternal morbidity, emphasizing the importance of comprehensive prenatal

care and optimization of maternal health status before delivery.

For neonatal outcomes, gestational age <38 weeks, fetal distress as the indication for cesarean section, and use of general anesthesia were associated with increased risk of adverse outcomes. These findings are in agreement with those of Hansen et al. [25], who reported higher rates of respiratory morbidity in neonates delivered before 39 weeks of gestation, and Afolabi and Lesi [26], who observed poorer neonatal outcomes following cesarean sections under general anesthesia compared to regional techniques.

By focusing our study on multigravida women with similar parity (para 1-3), we were able to minimize the confounding effect of parity on maternal and neonatal outcomes. This approach allowed for a more direct comparison of the impact of elective versus emergency cesarean delivery, independent of the known effects of primiparity or grand multiparity on obstetric outcomes.

Strengths and Limitations

The strengths of our study include its prospective design, comprehensive assessment of both maternal and neonatal outcomes, and multivariate analysis controlling for potential confounding factors. However, several limitations should be acknowledged.

First, the observational nature of the study precludes definitive conclusions about causality. Second, the single-center design may limit the generalizability of our findings to other settings with different patient populations and obstetric practices. Third, the relatively small sample size may have limited the statistical power to detect significant differences in some outcome measures. Finally, the follow-up period was limited to the hospital stay, precluding assessment of long-term outcomes.

6. CONCLUSION

This study demonstrates that emergency cesarean sections are associated with significantly higher maternal and neonatal morbidity compared to elective procedures. The findings emphasize the importance of comprehensive antenatal care for early identification of high-risk pregnancies and appropriate planning of delivery. When cesarean delivery is medically indicated, elective scheduling under optimal conditions may significantly improve outcomes for both mothers and neonates.

Several modifiable risk factors for adverse outcomes were identified, including inadequate antenatal care, maternal anemia, and delivery before 38 weeks of gestation. Addressing these factors through improved prenatal care, maternal health optimization, and appropriate timing of elective cesarean delivery could potentially reduce complications and improve outcomes.

The results of this study have important implications for obstetric practice in similar settings. Development of clear guidelines for decision-making regarding the timing and mode of delivery, based on individual risk assessment, could help optimize maternal and neonatal outcomes. Furthermore, strengthening antenatal care services and improving access to skilled obstetric care are essential for reducing the burden of emergency cesarean sections and their associated complications.

Future studies with larger sample sizes, multi-center designs, and longer follow-up periods are needed to further elucidate the long-term consequences of elective versus emergency cesarean delivery and develop targeted interventions to improve outcomes in both settings.

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