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Original Research Article

A prospective study of maternal complications as predictors of C-sections and their impact on neonatal outcomes

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ABSTRACT

Background: Rising cesarean section (C-section) rates globally have emphasized the need to identify maternal complications that necessitate surgical intervention and their consequences for neonatal health.
Methods: This prospective observational study was conducted over six months at a government hospital in Dharashiv, involving 100 pregnant women undergoing C-sections due to complications such as oligohydramnios, hypertension and fetal distress. Data were collected using structured tools and analyzed using descriptive statistics and Fisher's exact test to explore maternal and neonatal outcomes.
Results: Oligohydramnios (53%) emerged as the leading indication for C-sections, followed by previous cesarean delivery and breech presentation (14% each). Primigravida women accounted for the majority of cases (66%). Most deliveries occurred at term (81%) and while 58 neonates had normal birth weight, 41 were low birth weight. Postoperative maternal complications were primarily severe pain, back pain and headache. Neonatal complications included respiratory distress, jaundice and meconium aspiration, with APGAR scores significantly improving from 1 to 5 minutes.
Conclusions: The study underscores the critical role of early detection and management of maternal complications in reducing adverse neonatal outcomes and highlights the importance of individualized, evidence-based care to optimize C-section indications and improve maternal-neonatal health.

Keywords: Cesarean section, Fetal distress, Low birth weight, Maternal complications, Neonatal outcomes, Oligohydramnios, Pediatrics

INTRODUCTION

Introduction to cesarean section

A cesarean section is a surgical procedure to deliver a baby via incisions in the abdomen and uterus, used when vaginal birth poses risks.[1] Since Munro Kerr's 1926 introduction of the low transverse uterine incision, advancements in asepsis, anesthesia, blood transfusions and antibiotics have improved safety.[2]

Indications for c-section

Obstetric

Labor dystocia, previous C-sections.[3]

Fetal

Distress, malpresentation.[4]

Maternal

Hypertensive disorders, elective reques.[4]

Epidemiology of Cesarean Section

Global C-section rates rose from ~7% (1990) to 21.1% (2010-18), with regional disparities: 5% in Sub-Saharan Africa vs. 42.8% in Latin America. WHO advises that rates above 10% may not further reduce mortality.[5,6] In India, rates climbed to 21.5% by 2021, highest in Telangana (60%) and Andhra Pradesh (42%).[7,8] Private hospitals report far higher rates (37.9%) than public ones (13.7%), with Andhra Pradesh's private facilities responsible for ~68.5% of CS births.[9,10] By 2030, global CS rates may reach 28.5%, with sharp increases in Asia and North Africa.[5]

Maternal complications leading to C-section

Maternal complications leading to C-sections include hypertensive disorders-chronic hypertension, gestational hypertension and preeclampsia-that increase maternal and fetal risks.[11] Diabetes, both pre-existing and gestational, raises the likelihood of macrosomia, stillbirth and the need for surgical delivery.[12] Placental abnormalities such as placenta previa, placental abruption and placenta accreta spectrum frequently necessitate C-sections due to hemorrhage risk.[13]

Disorders of amniotic fluid volume, including oligohydramnios and polyhydramnios, signal fetal or placental problems requiring intervention.[14] Umbilical cord abnormalities can impair fetal circulation and worsen outcomes.[15] Premature rupture of membranes (PROM/PPROM) increases the risk of infection and preterm labor and is managed based on gestational age.[16] Breech presentation, present in 3–4% of term pregnancies, often requires cesarean delivery or attempts at external cephalic version.[16]

Maternal complications like placental insufficiency, hypertension and amniotic fluid issues can reduce oxygen supply to the fetus, often leading to cesarean delivery.[17] Low fetal heart rate variability may signal distress, requiring urgent C-section.[18]

These complications increase risks of birth asphyxia, respiratory distress, meconium aspiration, prematurity, low birth weight and jaundice, resulting in higher NICU admissions.[19]

Careful management of maternal conditions and delivery mode is essential to improve outcomes. Advanced maternal age, teenage pregnancy and parity affect neonatal risks like preterm birth and low birth weight.[20]

METHODS

This 6-month prospective observational study was conducted from August 2024 to January 2025 at Government District Women's Hospital, Dharashiv, included 100 women undergoing C-sections due to maternal complications.

Inclusion criteria

Pregnant women with complications needing C-section.

Exclusion criteria

Vaginal deliveries and babies not admitted to SNCU.

Data were collected twice weekly using a structured form covering maternal and neonatal health.

Ethical approval

Ethical approval (Ref. No./KTPCOP/IEC/2024-2025/016) and informed consent were obtained, but some data gaps from hospital records are acknowledged.

Statistical analysis

Data analysis used descriptive statistics and Fisher's exact test (Graph Pad Prism), with $p<0.05$ as significant.

RESULTS

Descriptive statistics

Association between maternal age and C-section rates and association between maternal weight and C-section rates

Most C-sections occurred in younger age groups

18–21 years

42 patients (mean age 20.02±3.52). 22–25 years: 39 patients (mean 23.38±3.45). Fewer cases were seen in older age groups (26–33 years). Younger mothers had a higher frequency of C-sections.

At 1 min

Most neonates (59) had moderate distress (mean score 5.47±1.27), followed by 34 with normal scores. At 5 min: 66 neonates achieved normal scores (mean 7.74±1.36), showing improvement post-delivery.

Distribution of C-section deliveries by gravida status

G1 (first pregnancy) had the highest C-section rate at 66%, followed by G2 (18%) and G3 (12%). Rates dropped significantly in higher gravida groups, suggesting primigravida women are more prone to C-sections.

Indications for C-section distribution of cases by causes

Oligohydramnios was the leading cause of C-sections (53%), followed by previous LSCS and breech (14% each) and fetal distress (13%). Other less frequent causes included PIH, PROM, cord issues and placental problems.

Correlation between lab values and the C-section

Hypotension (35%) and hypertension (11%) showed strong links with C-section need. Most patients with C-sections had moderate to severe oligohydramnios, suggesting that abnormal BP and low AFI are key risk factors for fetal distress and surgical delivery.

Post-C-section complications and gestational age distribution of patients

Severe pain (37%), back pain (35%) and headache (22%) were the most common maternal complications. Fever, depression and wound infection were rare, indicating the need for better pain and post-op care.

Most C-section deliveries (81%) occurred at term (38–42 weeks), while 19% were preterm (30–37 weeks). This indicates that most surgeries were timely, though some preterm cases required early intervention due to complications.

Neonatal birth weight distribution and APGAR score in neonates

Among the neonates, 58 had normal birth weight (NBW), 41 had low birth weight (LBW) and only 1 had very low birth weight (VLBW). The average birth weight was highest in the NBW group (2.78 kg), indicating favorable outcomes in most cases.

At 1 minute, 48 neonates had normal APGAR scores and 45 had moderate distress. By 5 minutes, 82 had normal scores, showing improvement. Only a few remained in moderate or severe distress, reflecting good neonatal recovery post-delivery.

Neonatal outcomes

Common neonatal complications included respiratory distress (44), low birth weight (33) and jaundice (22). Other issues like meconium aspiration (18), preterm birth (19) and fewer instances of birth asphyxia or feeding issues were also noted, highlighting the impact of maternal risk factors on neonatal health.

Correlation between lab value and neonatal abnormalities

Elevated total serum bilirubin (TSB) was linked with jaundice, with 14 neonates showing severe levels (mean TSB 17.52±6.41). Oxygen saturation data showed that 25 neonates had severe hypoxia (mean SpO_2 73.28±5.97), correlating with respiratory distress and birth asphyxia. Heart rate analysis revealed 20 neonates had bradycardia and 18 had tachycardia, often associated with stress or neonatal complications. These lab findings highlight strong associations between physiological parameters and neonatal morbidities in C-section births.

Pre-operative medications, post-operative medication and neonatal treatment

All patients received inj. genta, bupivacaine (spinal anesthesia) and diclo, confirming their essential role in infection prevention, anesthesia and pain management. Most also received metro (98%), pan (93%) and emset (88%), indicating standard yet slightly individualized protocols based on patient needs.

Universal use of Inj. Pan and Diclo reflects priority on gastric and pain care post-surgery. Inj. Xone (91), Genta (89) and Taxim (80) were commonly used antibiotics. Emset (76), Metro (55) and XST (44) were given based on clinical necessity, showing a personalized post-op regimen.

Neonatal care primarily included vit K (80) and Dextrose 10% (75) to manage clotting and blood sugar. Other treatments like calcium gluconate, simyl MCT oil and Capnea were given selectively to address individual.

Categorical variables analysis

gestational age and neonatal birth weight

Low birth weight is more common in preterm deliveries (13 out of 19) than term deliveries (20 out of 81). Most term babies had normal weight, showing that preterm birth increases the risk of low birth weight and related complications.

Table 1: Association between maternal age and C-section rates and association between maternal weight and C-section rates.

Maternal age group (in years)	No. of patients	Mean±SD
18-21	42	20.02±3.52
22-25	39	23.38±3.45
26-29	10	27.7±3.36
30-33	9	30.55±3.64
Association between maternal weight and C-section rates		

Continued.

Maternal age group (in years)	No. of patients	Mean±SD
APGAR score in 1 min		
Normal	34	7.29±1.22
Moderate distress	59	5.47±1.27
Severe distress	7	3±1.37
APGAR score in 5 min		
Normal	66	7.74±1.36
Moderate distress	31	5.61±1.39
Severe distress	3	3±1.29

Table 2: Distribution of C-section deliveries by gravida status.

Group	Proportion (%)
G1	66.00
G2	18.00
G3	12.00
G4	3.00
G5	1.00

Table 3: Distribution of C-Section Deliveries by Gravida Status.

Causes for C-section	No. of patients
Fetal distress	13
Oligohydramnios	53
Umbilical cord issue	6
Pregnancy-induced hypertension	10
Breech	14
PROM	9
PV leakage	5
Bleeding	1
Absent liquor	1
Fetoplacental insufficiency	3
Intramural fibroid	1
Latent labor	1
Meconium stain liquor	1
Previous LSCS	14

Table 4: Blood pressure range and distribution of AFI.

Blood pressure	No. of patients
Hypotension	35
Normal	54
Hypertension	11
Distribution of AFI	
AFI	
Mild oligohydramnios	3
Moderate oligohydramnios	24
Severe oligohydramnios	25

Table 3.5: Post-C-section complications and gestational age distribution of patients.

Complication type	(%)
Severe headache	22.30
Severe back pain	34.94
Severe pain	37.17
Wound infection	0.37

Continued.

Complication type	(%)
Postpartum fever	3.35
Postpartum depression	1.86%
Gestational age distribution of patients	
Gestational weeks	
30-37 (Preterm)	19
38-42 (Term)	81

Table 6: Neonatal birth weight distribution and APGAR score in neonates.

Neonatal Weight	No. of patients	Mean±SD
VLBW	1	1.4±0.54
LBW	41	2.08±0.41
NBW	58	2.78±0.40
APGAR score in neonates		
APGAR score in 1 min		
Normal 7 to 10	48	12±10.86
Moderate distress 4 to 6	45	15±6.97
Severe distress 1 to 3	7	2.33±0.57
APGAR score in 5 min		
Normal 7 to 10	82	20.5±19.22
Moderate distress 4 to 6	13	4.33±0.57
Severe distress 1 to 3	5	1.66±1.15

Table 7: Neonatal outcomes.

Neonatal abnormalities	No. of patients
Respiratory distress	44
Meconium aspiration	18
Neonatal jaundice	22
Low birth weight	33
Preterm birth	19
Vomiting	2
Hypoglycemia	1
Birth asphyxia	5
Refuse to feed	1
Anuria	1
MCH	1

Table 8: Total serum bilirubin levels in neonates, oxygen saturation levels in hypoxic neonates and heart rate distribution among neonates.

TSB Level	No. of patients	Mean±SD
Mild: TSB	5	12.00±4.98
Moderate: TSB	3	13.77±5.59
Severe: TSB	14	17.52±6.41
Oxygen saturation levels in hypoxic neonates		
Oxygen Saturation		
Mild hypoxia	9	91.77±1.31
Moderate hypoxia	10	86.4±1.01
Severe hypoxia	25	73.28±5.97
Heart rate distribution among neonates		
Heart Rate		
Bradycardia	20	88.6±26.97
Normal	62	145.20±11.00
Achycardia	18	168.05±31.15

Table 9: Distribution of pre-operative treatments among patients, post-operative treatments administered to patients and neonatal treatments administered to patients.

Pre-operative treatment	No. of patients
Inj. Pan (40 mg)	93
Inj. Emset (4 mg)	88
Inj. Metro (0.5 gm)	98
Inj. Genta (80 gm)	100
Anesthesia (spinal) Bupivacaine	100
Inj. Diclo	100
Distribution of post-operative treatments administered to patients	
Post-operative treatment	
Inj. Pan (40 mg)	100
Inj. Diclo	100
Inj. Emset (4 mg)	76
Inj. Metro	55
Inj. Genta	89
Inj. XST (0.1cc)	44
Inj. Xone (1 gm)	91
Inj. Taxim (1 gm)	80
Distribution of neonatal treatments administered to patients	
Neonatal treatment	
Inj. Capnea (10 mg)	20
Inj. Dextrose 10% (7.5 cc)	75
Inj. Calcium gluconate	30
Inj. Sodium bicarbonate	17
Ciprox eye drop	10
Inj. Vit K	80
Inj C-tax	24
Inj. Pipzo	12
Simyl mct oil	33

Table 10: Distribution of gestational age and birth weight categories among neonates.

Gestational age	Low birth weight (<2.5 kg)	Normal birth weight (≥2.5 kg)	Total
Preterm (<37 w)	13	6	19
Term (37–42 w)	20	61	81
Total	33	67	100

DISCUSSION

The study found maternal age affects C-section rates, with higher prevalence in older age groups (30–33 years) possibly due to conditions like gestational diabetes and preeclampsia.[21,22] Most C-section patients were younger (18–25 years), though older age still carried higher surgical risk. APGAR score analysis showed neonates of mothers with abnormal weight had poorer scores at 1 and 5 minutes. Normal weight mothers had the best neonatal outcomes. Maternal BMI, including both underweight and obesity, is known to influence the risk of C-section and neonatal distress.[23,24] C-sections were most common among primigravida women (66%), suggesting higher risk due to labor complications like CPD and fetal distress. Previous studies confirm higher C-section rates in first pregnancies.[25,26] Oligohydramnios was the leading indication for C-section (53%), followed by previous LSCS and breech presentation (14 each), fetal distress (13) and PIH (10). These findings align with earlier reports highlighting oligohydramnios and fetal distress as key contributors.[27-30] Early identification of these risks is critical for outcome improvement. Blood pressure and AFI correlations revealed that both hypotension and hypertension (notably PIH) were linked with altered amniotic fluid levels and adverse pregnancy outcomes.

Severe oligohydramnios frequently resulted in fetal distress requiring C-section. Literature supports PIH's role in placental insufficiency and amniotic fluid disorders, increasing C-section rates and maternal-fetal risks.[27,31] The study found that severe pain, back pain and headaches

were the most common post-C-section maternal complications, emphasizing the need for effective pain management and mental health support.[32] Most C-sections (81%) occurred at term, reducing neonatal risks, but preterm deliveries (19%) showed higher complications like respiratory distress and low birth weight.[33] Neonates mostly had normal birth weight, but many were low birth weight, increasing risks of respiratory and developmental issues.[34] APGAR scores improved by 5 minutes, yet moderate to severe distress cases needed ongoing care.[35,36]

Respiratory distress, low birth weight and jaundice were frequent neonatal issues linked to maternal complications.[37,38] Lab values correlated with clinical outcomes: high bilirubin with jaundice, low oxygen saturation with respiratory distress and abnormal heart rates with asphyxia and infections, underscoring early intervention needs.[39-41] Standard pre- and post-operative medications included spinal anesthesia, antibiotics, analgesics and selective antiemetics to prevent infection, control pain and improve recovery.[42-44] Neonatal care focused on Vitamin K, glucose stabilization and infection management.[45]

Preterm birth strongly correlated with low birth weight and neonatal complications, highlighting the importance of maternal care to improve outcomes.[45]

Although the prospective design minimized recall bias, reliance on hospital records may have led to missing data. However, efforts were made to ensure completeness and accuracy through multiple data sources.

CONCLUSION

The study found that higher maternal age, weight and first-time pregnancies increase C-section rates. Oligohydramnios and fetal complications were common reasons for surgery. Most C-sections were full term, leading to mostly healthy new-borns with good APGAR scores. Postoperative complications were generally mild, showing effective care. Early lab monitoring and standard medications helped manage risks. Tailored neonatal treatments supported recovery. Overall, timely diagnosis and individualized, evidence-based care improved outcomes for mothers and babies.

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