

A Clinical Audit of Preterm Caesarean Sections and Associated Outcomes at a Tertiary Care Centre in Western Gujarat**Devi S. Bhanvadia****JR DGO (CPS), Department of Obstetrics and Gynecology, Dhoraji Civil Hospital, Gujarat, India****Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026****Corresponding author: Dr. Devi S. Bhanvadia****Conflict of interest: Nil****Abstract**

Introduction: The increasing rate of preterm caesarean sections has become a significant concern due to its impact on maternal and neonatal outcomes. Preterm births, defined as delivery before 37 completed weeks of gestation, are associated with increased neonatal morbidity and mortality. The present study aimed to audit preterm caesarean sections at a tertiary care centre in Western Gujarat to evaluate clinical indications, maternal and neonatal outcomes, and identify opportunities for improving obstetric management.

Materials and Methods: A retrospective observational audit was conducted in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital in Western Gujarat. A total of 120 women who underwent preterm caesarean section between 28 and 36+6 weeks of gestation were included. Data were collected retrospectively from hospital medical records, labour room registers, operation theatre records, and NICU registers. Maternal demographic characteristics, obstetric profile, indications for surgery, and maternal and neonatal outcomes were analyzed using descriptive statistics and Robson Ten Group Classification System wherever applicable.

Results: The majority of women belonged to the age group of 20–29 years (71.7%), were nulliparous (61.7%), and from rural areas (68.3%). Cephalic presentation was observed in 86.7% of cases, while singleton pregnancies accounted for 90.0%. Major indications for preterm caesarean section included antepartum hemorrhage (13.3%), fetal distress (12.5%), severe maternal conditions (11.7%), and previous caesarean section with refusal for trial of labor after caesarean (10.0%). Maternal outcomes were favorable, with 94.2% discharged successfully and only 13.3% requiring OBICU admission. Neonatal outcomes showed NICU admission in 85.0% of cases, respiratory support requirement in 11.7%, and live births in 95.0% of neonates.

Conclusion: Preterm caesarean sections were predominantly associated with fetal distress, antepartum hemorrhage, and previous caesarean section. Periodic auditing and evidence-based obstetric decision-making are essential to optimize maternal and neonatal outcomes while minimizing unnecessary preterm caesarean sections.

Keywords: Preterm Caesarean Section, Robson Classification, Maternal Outcome, Neonatal Outcome.

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Introduction

The increasing rate of caesarean section (CS) has become a major concern in obstetric practice worldwide. [1] Although the World Health Organization (WHO) recommends an ideal caesarean section rate of 10–15%, a substantial rise has been observed globally, including in India. [2] National Family Health Survey (NFHS-5) data reported an increase in caesarean deliveries in India, reflecting changing obstetric practices and growing maternal–fetal indications for operative delivery. [3] Among these, preterm caesarean sections constitute a particularly important subgroup due to their association with increased maternal and neonatal morbidity and mortality. Preterm birth, defined as delivery before 37

completed weeks of gestation, remains a significant contributor to adverse neonatal outcomes, including respiratory distress syndrome, neonatal sepsis, and long-term neurodevelopmental complications. [4] Preterm caesarean sections are frequently performed for maternal and fetal indications such as fetal distress, hypertensive disorders of pregnancy, placental abnormalities, malpresentation, fetal growth restriction, and premature rupture of membranes. [5] While timely surgical intervention can improve outcomes in selected cases, an increase in preterm caesarean deliveries raises concerns regarding the appropriateness of indications and their impact on maternal and neonatal health. [6] Evaluating the

patterns and indications of preterm caesarean sections is therefore essential to identify potentially avoidable procedures and optimize obstetric care. [6] Western Gujarat represents a unique healthcare setting with varied demographic, socioeconomic, and referral characteristics influencing obstetric practices at tertiary care centres. However, limited regional data are available regarding the indications, trends, and outcomes of preterm caesarean sections in this region.

Materials and Methods

The present study was designed as a retrospective observational audit conducted in the Department of Obstetrics and Gynecology at a tertiary care teaching hospital in Western Gujarat. The study was carried out to evaluate the clinical profile, indications, and outcomes of preterm caesarean sections performed at the institution over a defined study period. Ethical approval was obtained from the Institutional Ethics Committee prior to commencement of the study, and confidentiality of patient information was maintained throughout the study process. The study population included all women who underwent preterm caesarean section, defined as delivery before completion of 37 weeks of gestation, during the study period. Women with singleton or multiple pregnancies who underwent caesarean section between 28 and 36+6 weeks of gestation were included in the study. Cases with incomplete medical records, uncertain gestational age, vaginal preterm deliveries, or patients referred after delivery from outside institutions were excluded from the analysis to maintain data accuracy and consistency.

Data were collected retrospectively from hospital medical records, labour room registers, operation theatre records, and neonatal intensive care unit (NICU) registers. Information regarding maternal demographic characteristics, obstetric history, and gestational age at delivery, parity, antenatal complications, indication for preterm caesarean

section, fetal presentation, and associated maternal risk factors were extracted using a predesigned data collection proforma. Maternal outcomes such as postpartum hemorrhage, blood transfusion requirement, postoperative complications, duration of hospital stay, and maternal morbidity were recorded. Neonatal outcomes including birth weight, Apgar score, NICU admission, respiratory distress syndrome, neonatal sepsis, and neonatal mortality were also assessed.

All cases of preterm caesarean section were categorized according to the Robson Ten Group Classification System wherever applicable to identify the major contributors to preterm caesarean delivery and assess trends in obstetric practice. The indications for surgery were analyzed and grouped into maternal, fetal, and obstetric causes. Descriptive analysis was performed to determine the frequency distribution of indications and associated outcomes, thereby facilitating an audit of current clinical practices in managing preterm pregnancies at the tertiary care center. The collected data were entered into Microsoft Excel and analyzed using appropriate statistical software. Quantitative variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Statistical significance was assessed using suitable tests such as the Chi-square test and Student's t-test wherever applicable, with a p-value of <0.05 considered statistically significant. The findings were interpreted to identify potential areas for improving maternal and neonatal outcomes and reducing unnecessary preterm caesarean sections in the tertiary care setting of Western Gujarat.

Results

Most women undergoing preterm Caesarean section belonged to the 20–29 years age group (71.7%). Nulliparous women formed the largest proportion (61.7%), while most participants were from rural areas (68.3%).

Table 1: Socio-demographic and Obstetric Characteristics of Study Participants (N = 120)

Variable	Frequency (n)	Percentage (%)
Age (years)		
<20	6	5.0
20–29	86	71.7
30–39	24	20.0
≥ 40	4	3.3
Parity		
Nulliparous	74	61.7
Primiparous	34	28.3
Multiparous	12	10.0
BMI (kg/m²)		
<20	14	11.7
20–22	64	53.3
22–25	20	16.7
25–29	16	13.3
≥ 30	6	5.0

Most women had no previous Caesarean scar (81.7%), and cephalic presentation was predominant (86.7%). The majority of deliveries occurred between 32–36 weeks of gestation (65.0%), with singleton pregnancies accounting for 90% of cases. Most participants had normal hemoglobin and platelet values. Ultrasonographic assessment revealed normal AFI in two-thirds of cases and anterior placental placement in the majority.

Table 2: Clinical, Laboratory and Ultrasonographic Profile (N = 120)

Variable	Category	n (%)	Variable	Category	n (%)
Previous Caesarean Scar	Absent	98 (81.7)	Hemoglobin Level (g/dL)	9–12	95 (79.2)
	Present	22 (18.3)		7–9	21 (17.5)
Fetal Presentation	Cephalic	104 (86.7)	Platelet Count	<7	4 (3.3)
	Breech	8 (6.7)		Normal (1.5–4 lakh)	112 (93.3)
	Others	8 (6.7)		Reduced (<1.5 lakh)	8 (6.7)
Gestational Age at Delivery	28–32 weeks	42 (35.0)	Amniotic Fluid Index (AFI)	5–25 cm	80 (66.7)
	32–36 weeks	78 (65.0)		<5 cm	40 (33.3)
Number of Fetuses	Singleton	108 (90.0)	Placental Position	Anterior	84 (70.0)
	Twins	12 (10.0)		Posterior	18 (15.0)
	—	—		Others	18 (15.0)

The most common indications for preterm LSCS were antepartum hemorrhage (13.3%), fetal distress (12.5%), severe maternal conditions including sickle cell crisis (11.7%), and previous Caesarean section with refusal for TOLAC (10.0%).

Table 3: Major Indications for Preterm Caesarean Section (N = 120)

Indication	Frequency (n)	Percentage (%)
Antepartum hemorrhage (APH)	16	13.3
Fetal distress	15	12.5
Sickle cell crisis / Severe maternal condition	14	11.7
Previous CS with refusal for TOLAC	12	10.0
Cephalopelvic disproportion	10	8.3
Failure of induction	9	7.5
Twin pregnancy with abnormal lie	8	6.7
Scar tenderness	7	5.8
Anhydramnios / Oligohydramnios	7	5.8
Breech with PROM	5	4.2
Others	17	14.2

Only 10% of women required magnesium sulfate, and most did not need OBICU care (86.7%). Spinal anesthesia was the preferred modality (95.0%). The majority of mothers had favorable outcomes, with 94.2% discharged successfully, while maternal mortality remained low (1.7%).

Table 4: Maternal Outcomes Following Preterm LSCS (N = 120)

Variable	Frequency (n)	Percentage (%)
MgSO₄ Requirement		
Yes	12	10.0
No	108	90.0
OBICU Admission		
Required	16	13.3
Not Required	104	86.7
Type of Anaesthesia		
Spinal	114	95.0
General Anaesthesia	6	5.0
Hospital Stay		
<4 days	42	35.0
5–7 days	28	23.3
≥8 days	50	41.7
Maternal Outcome		
Discharged	113	94.2
DAMA	5	4.2
Mortality	2	1.7

NICU admission was required for 85% of neonates, although respiratory support was needed in only 11.7% of cases. Most neonates demonstrated satisfactory Apgar scores at both 1 and 5 minutes. A majority of babies weighed between 1.5–2.5 kg, and favorable fetal outcomes were observed, with 95% live births.

Table 5: Neonatal Outcomes Following Preterm LSCS (N = 120)

Variable	Category	n (%)	Variable	Category	n (%)
NICU Admission	Yes	102 (85.0)	Apgar Score at 5 min	9–10	91 (75.8)
	No	18 (15.0)		<9	29 (24.2)
Need for Respiratory Support	Yes	14 (11.7)	Birth Weight	>2.5 kg	5 (4.2)
	No	106 (88.3)		1.5–2.5 kg	87 (72.5)
Apgar Score at 1 min	9–10	74 (61.7)	Fetal Outcome	1.0–1.5 kg	28 (23.3)
	<9	46 (38.3)		Live birth	114 (95.0)
	—	—		Stillbirth	6 (5.0)

Discussion

The present study evaluated the clinical profile, indications, and maternal–neonatal outcomes of preterm Caesarean sections in a tertiary care centre in Western Gujarat. In the present study, the majority of women undergoing preterm Caesarean section belonged to the age group of 20–29 years (71.7%), and nulliparous women constituted the largest proportion (61.7%). Similar findings were reported by Gurung et al. [7] and Wahane et al. [8], where Robson Group 1 and Group 2 women, predominantly nulliparous patients, represented major contributors to Caesarean sections. Likewise, Gupta et al. [9] observed increased Caesarean section rates among primigravida women in Robson Groups 1 and 2. The predominance of women from rural areas in the present study (68.3%) may reflect referral patterns and healthcare accessibility in tertiary care settings, which is in line with the findings of Tripathy et al. [10], who emphasized regional variations in Caesarean section practices across India and highlighted rising CS rates in both rural and urban populations.

In the present study, cephalic presentation was observed in 86.7% of cases, and singleton pregnancies accounted for 90% of preterm Caesarean deliveries. The majority of women had no previous Caesarean scar (81.7%), although previous Caesarean section remained an important contributor to operative delivery. Comparable observations were reported by Zimmo et al. [11], Pravina et al. [12], and Abidi et al. [13], who identified Robson Group 5 (women with previous Caesarean section) as a major contributor to overall Caesarean section rates. Similarly, Tura et al. [14] reported that multiparous women with previous Caesarean section and nulliparous women significantly contributed to CS rates. These findings suggest that previous Caesarean section remains an important determinant of repeat operative delivery and highlights the need for strengthening evidence-based protocols for vaginal birth after Caesarean (VBAC) where feasible.

The present study found antepartum hemorrhage (13.3%), fetal distress (12.5%), severe maternal

conditions including sickle cell crisis (11.7%), and previous Caesarean section with refusal for trial of labor after Caesarean (10.0%) as the major indications for preterm LSCS. Similar findings were reported by Tura et al. [14], where fetal compromise, mainly fetal distress, and obstructed labor were among the leading indications for Caesarean section. Gupta et al. [9] and Pravina et al. [12] also identified fetal distress, failed induction, previous Caesarean section, breech presentation, and antepartum hemorrhage as major indications for operative delivery. Additionally, Gurung et al. [7] emphasized fetal distress and previous Caesarean section as common indications contributing to increasing Caesarean section rates. These findings collectively indicate that fetal compromise and prior uterine scar continue to be important determinants of Caesarean section in preterm pregnancies.

Maternal outcomes in the present study were generally favorable, with 94.2% of women discharged successfully and only a small proportion requiring OBICU admission (13.3%). Spinal anesthesia was the preferred mode in 95% of patients, reflecting safe perioperative management in most cases. Similarly, Ansari et al. [15] highlighted the importance of clinical auditing using Robson classification to identify contributing factors and optimize obstetric practices, leading to reduction in Caesarean section rates upon re-audit. Wahane et al. [8] also stressed that Caesarean sections should be performed only when clinically justified rather than focusing solely on achieving lower rates. These observations support the importance of periodic institutional audits and evidence-based decision-making to improve maternal outcomes while minimizing unnecessary interventions. Regarding neonatal outcomes, the present study reported NICU admission in 85% of neonates, although respiratory support was required in only 11.7% of cases, and live birth was achieved in 95% of deliveries.

Most neonates had satisfactory Apgar scores and birth weights between 1.5–2.5 kg. Comparable concerns regarding preterm births and neonatal

outcomes were emphasized by Zimmo et al. [11] and Zeitlin et al. [16], who noted heterogeneity in Caesarean section practices, especially among singleton cephalic preterm births (Robson Group 10), highlighting the need for standardized approaches to optimize neonatal outcomes. Furthermore, Abidi et al. [13] and Tripathy et al. [10] emphasized the need for developing effective strategies and institutional protocols to reduce unnecessary Caesarean sections while maintaining favorable maternal and neonatal outcomes. Thus, continuous monitoring through Robson classification-based audits may help optimize preterm Caesarean section practices in tertiary care settings.

Conclusion

The present study highlights that preterm Caesarean sections were predominantly performed among women aged 20–29 years, with fetal distress, antepartum hemorrhage, severe maternal conditions, and previous Caesarean section being the major indications.

Most maternal and neonatal outcomes were favorable, with high rates of maternal discharge and live births despite substantial NICU admissions among neonates. The findings emphasize the importance of careful case selection, evidence-based decision-making, and periodic audit using Robson classification to optimize Caesarean section practices and improve maternal–neonatal outcomes in tertiary care settings of Western Gujarat.

Limitations of the Study

The present study had certain limitations. Being a retrospective, single-center study, the findings may not be generalizable to all healthcare settings. The relatively limited sample size and dependence on hospital medical records may have introduced information bias due to incomplete documentation in some cases. Additionally, long-term maternal and neonatal outcomes could not be assessed, limiting the ability to evaluate the prolonged impact of preterm Caesarean sections.

Bibliography

- Verma V, Vishwakarma RK, Nath DC, Khan HT, Prakash R, Abid O. Prevalence and determinants of caesarean section in South and South-East Asian women. *PloS One*. 2020;15(3):e0229906.
- Betran AP, Ye J, Moller AB, Souza JP, Zhang J. Trends and projections of caesarean section rates: global and regional estimates. *BMJ Glob Health*. 2021;6(6).
- Dutta R, Nathani P, Patil P, Ghoshal R, Tuli S, Bakker JM, et al. State-wise variation and inequalities in caesarean delivery rates in India: analysis of the National Family Health Survey-5 (2019–2021) data. *Lancet Reg Health-Southeast Asia*. 2025;32.
- Ward RM, Beachy JC. Neonatal complications following preterm birth. *BJOG Int J Obstet Gynaecol*. 2003;110:8–16.
- Venturella R, Quaresima P, Micieli M, Rania E, Palumbo A, Visconti F, et al. Non-obstetrical indications for cesarean section: a state-of-the-art review. *Arch Gynecol Obstet*. 2018;298(1):9–16.
- Wilson RD, Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, et al. Guidelines for antenatal and preoperative care in cesarean delivery: enhanced recovery after surgery society recommendations (part 1). *Am J Obstet Gynecol*. 2018;219(6):523–e1.
- Gurung P, Malla S, Lama S, Malla AP, Laxmi R. Analysis of cesarean section using Robson's criteria in tertiary care center. *J Patan Acad Health Sci*. 2022;9(3):29–36.
- Wahane A, Ghaisas AS. Analysis of caesarean sections according to Robson's criteria at a tertiary care teaching hospital in central India. *Int J Reprod Contracept Obstet Gynecol*. 2020;9(10):4221–7.
- Gupta R. Caesarean section audit in a tertiary hospital of North India using Robson's classification. *Int J Reprod Contracept Obstet Gynecol*. 2019;8(4):1426–31.
- Tripathy B, Pandey AK, Mishra SS, Mishra C. Caesarean section delivery in India: A comparative assessment of geographical variability using nationally representative survey factsheet data. *Natl J Community Med*. 2023;14(04):260–6.
- Zimmo MW, Laine K, Hassan S, Bottcher B, Fosse E, Ali-Masri H, et al. Caesarean section in Palestine using the Robson Ten Group Classification System: a population-based birth cohort study. *BMJ Open*. 2018;8(10):e022875.
- Pravina P, Ranjana R, Goel N, RANJANA R. Cesarean audit using Robson classification at a tertiary care center in Bihar: a retrospective study. *Cureus*. 2022;14(3).
- Abidi SMA, Hussain SNF, Abbas S, Abidi STF, Haresh S. Application of the Robson classification in assessing cesarean section rates: an audit of a tertiary care hospital's gynecology department in Karachi, Pakistan. *Ther Adv Reprod Health*. 2025;19:26334 941251339710.
- Tura AK, Pijpers O, De Man M, Cleveringa M, Koopmans I, Gure T, et al. Analysis of caesarean sections using Robson 10-group classification system in a university hospital in eastern Ethiopia: a cross-sectional study. *BMJ Open*. 2018;8(4):e020520.
- Ansari A, Baqai S, Imran R. An audit of caesarean section rate using modified Robson

- criteria at a tertiary care hospital. J Coll Physicians Surg Pak. 2019;29(8):768–70.
16. Zeitlin J, Durox M, Macfarlane A, Alexander S, Heller G, Loghi M, et al. Using Robson's Ten-Group Classification System for comparing caesarean section rates in Europe: an analysis of routine data from the Euro-Peristat study. BJOG Int J Obstet Gynaecol. 2021;128(9):1444–53.