International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Shandilya S et al. Int J Reprod Contracept Obstet Gynecol. 2026 Aug;15(8):3037-3043
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20262530

Original Research Article

Maternal and neonatal outcomes of elective cesarean section before and after 39 weeks

Saumya Shandilya*, Neerja Mistry, Darshana Chavhan

Department of Obstetrics and Gynecology, K. B. B. H Hospital, Bandra, Mumbai, Maharashtra, India

Received: 15 May 2026
Revised: 13 June 2026
Accepted: 07 July 2026

***Correspondence:**
Dr. Saumya Shandilya,
E-mail: saumyashandilya27@gmal.com

ABSTRACT

Background: Elective cesarean section rates are rising globally, including in India, due to medical and non-medical factors such as patient preference, fear of labor and scheduling convenience. Timing is crucial, as delivery before 39 weeks increases neonatal morbidity, while delaying beyond 39 weeks raises the risk of spontaneous labor and emergency cesarean section.
Methods: This retrospective observational study included 50 women with singleton pregnancies undergoing elective lower segment cesarean section (LSCS) at K. B. B. H Hospital, Mumbai. Participants were divided into <39 weeks (n=25) and ≥39 weeks (n=25), with 10 cases of spontaneous labor analyzed separately. Maternal outcomes included postpartum hemorrhage (PPH), wound complications, lower uterine segment formation and instrumental assistance. Neonatal outcomes included APGAR scores, respiratory complications, hypoglycemia and NICU admissions.
Results: Maternal complications, particularly PPH and need for instrumental assistance, were higher in the <39-week group. A well-formed lower uterine segment was more frequently observed in the ≥39-week group, resulting in improved surgical conditions. Neonatal outcomes were comparatively poorer in early-term deliveries, with increased respiratory morbidity and higher NICU admission rates. Women who experienced spontaneous labor before the scheduled date required emergency cesarean section and had increased perioperative risks.
Conclusions: Elective LSCS performed at or beyond 39 weeks is associated with improved maternal surgical outcomes and better neonatal health indicators. However, spontaneous labor before the planned date emphasizes the need for individualized, evidence-based scheduling to balance risks of early-term delivery against emergency interventions in accordance with established obstetric guidelines.

Keywords: Apgar score, Cesarean section, Elective surgical procedures, Gestational age, Premature birth, Term birth

INTRODUCTION

C-section delivery, specifically LSCS, is becoming an increasingly common practice worldwide, with a considerable rise in many countries over the last two decades.[1] India also has reported this trend with national C-section rates increasing from 8.5% in 2005–2006 to 21.5% in 2019–2021, according to the National Family Health Survey (NFHS-5).[2,3] Although when medically indicated, C-section delivery remains a life-saving intervention.[4] However, increasing dependency on technology and less emphasis on natural birthing practices for childbirth, as well as sociocultural influences, have contributed to the rise of C-sections, sometimes in the absence of clear clinical indications. Concerns about fear of labor pain, medico-legal pressures, convenience and provider-driven decision-making have further shaped these trends.[5] Parallel to this, with the rise in medical interventions during childbirth, there is a global push to make childbirth more respectful and woman-focused. This movement encourages doctors to think carefully about whether an elective C-section is truly needed and whether

it is being scheduled at the safest and most appropriate time.[6] Furthermore, literature presents ambiguous records for the timings of scheduling LSCS. It states that C-section at or beyond 39 weeks improves neonatal physiological conditions and results in more favorable surgical settings, whereas delaying LSCS till 39 weeks can induce spontaneous labor, leading to emergency C-sections, which are associated with more maternal and neonatal morbidities.[7-9] On the other hand, elective C-sections performed before 39 completed weeks of gestation have been consistently associated with higher risks of adverse neonatal events, including respiratory complications, need for NICU admission and composite morbidity when compared to those performed at or beyond 39 weeks.[7,8,10]

Major observational studies have shown that neonates delivered electively at 37 or 38 weeks have significantly higher rates of respiratory distress, mechanical ventilation, hypoglycemia and extended hospitalization when compared with infants delivered at 39 weeks of gestation.[11,12] Whereas, large meta-analyses and systematic reviews suggest that, although evidence on maternal outcomes is less robust, delaying elective LSCS until after 39 weeks tends to reduce the frequency of neonatal respiratory morbidity and NICU admissions without markedly increasing maternal adverse events.[8,13] Despite these data, elective C-sections before 39 weeks remain common in many regions due to scheduling preferences, concerns about spontaneous labor onset or institutional practices.[14,15]

Given these clinical, ethical and practical complexities, studying real-world maternal and neonatal outcomes associated with different timings of elective LSCS is essential for improving decision-making. This retrospective observational study was therefore designed to compare elective LSCS outcomes before 39 weeks with those at or beyond 39 weeks in a tertiary care hospital. Additionally, outcomes of women who entered spontaneous labor before their scheduled LSCS were evaluated to understand the implications of delaying surgery. The findings aim to align institutional practice with international recommendations while supporting individualized, evidence-based and patient-centred childbirth planning.

METHODS

This retrospective observational study was carried out at K. B. B. H Hospital, Mumbai, from December 2024 to April 2025 with the aim of understanding the maternal and neonatal outcomes associated with elective LSCS.

A total of 50 women with singleton pregnancies and clear indications for C-section delivery who underwent elective LSCS were included in the study. Women with fetal congenital anomalies, multiple gestations or incomplete medical records were excluded. Those who required emergency LSCS were also not considered for analysis. Only elective procedures performed between 37 and 40 weeks of gestation were included. The selected cases were then divided into two equal groups based on gestational age at the time of surgery, group A consisted of 25 women who underwent LSCS before 39 weeks, while group B included 25 women who were operated at or beyond 39 weeks. Patient information, including operative notes and neonatal charts, was retrieved from hospital records. Maternal variables such as previous LSCS, bad obstetric history, cephalopelvic disproportion, malpresentation, medical disorders and placenta previa were documented as indications for surgery. Intraoperative findings including the formation of the lower uterine segment, scar integrity and any evidence of scar dehiscence were also recorded. Maternal complications such as postpartum hemorrhage (PPH), infections, the need for instrumental assistance due to a non-engaged fetal head and any additional interventions were carefully noted.

For neonatal outcomes, data on APGAR scores, respiratory complications (including respiratory distress syndrome and transient tachypnoea of the newborn) and NICU admissions with their respective indications were collected. Immediate postnatal adaptation whether the newborn was shifted to the mother's side or required NICU care was also documented. In addition, a separate retrospective review was carried out for 10 women who were scheduled for elective LSCS at 39 weeks but experienced spontaneous onset of labor before the planned date, leading to emergency LSCS. Maternal and neonatal outcomes for these cases were analyzed independently.

The primary outcomes measured included maternal morbidity specifically PPH, wound complications and surgical difficulties and neonatal morbidity in the form of respiratory problems, hypoglycemia and NICU stay. Secondary outcomes assessed were the rate of spontaneous labor before the scheduled LSCS, the incidence of scar dehiscence and the need for instrumental assistance due to a non-engaged fetal head.

Descriptive statistics were used to compare outcomes between the <39-week and ≥39-week groups. Proportions of complications in each group were evaluated and presented in percentages.

RESULTS

A total 50 women were included in the study. Authors observed considerable differences between group A (<39 weeks) and group B (≥39 weeks). Baseline demographic characteristics, including maternal age, parity, body mass index and pre-existing comorbidities, were similar between the two groups, with no statistically significant differences observed (all $p>0.05$). The detailed demographic details of the patients are described in Table 1.

Among the indications for LSCS, previous LSCS was the most common reason for surgery in women delivered before 39 weeks. In contrast, in the ≥39-week group, both

previous LSCS and a bad obstetric history contributed equally to the decision for a repeat LSCS (Figure 1).

This bar chart illustrates the distribution of various indications leading to elective LSCS. The data is categorized based on the gestational age at which the elective LSCS was performed: less than 39 weeks (<39 weeks) and 39 weeks or greater (>39 weeks).

In terms of maternal outcomes, women who delivered after 39 weeks experienced fewer complications compared with those who underwent LSCS before 39 weeks. This difference was particularly evident in the incidence of PPH, which occurred in only 8% of women in the ≥39 weeks group, compared with 22% in the <39 weeks group. The higher rate of PPH in early-term deliveries is likely linked to a less well-formed and poorly contractile uterus (Figure 2).

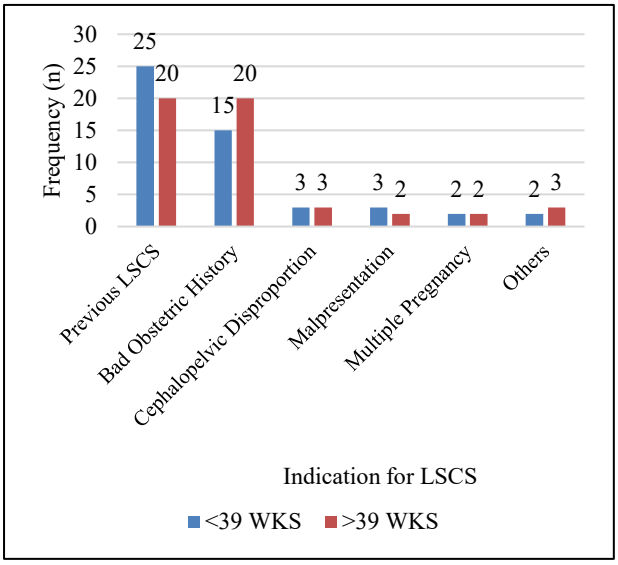

Figure 1: Indications for elective lower segment cesarean section.

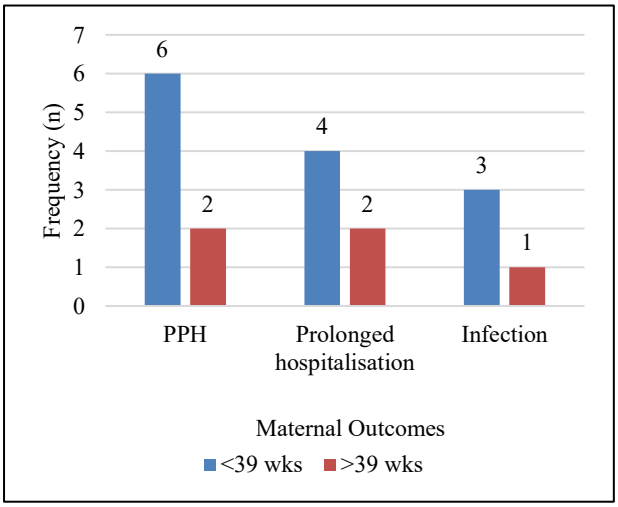

Figure 2: Maternal outcomes following elective lower segment cesarean section.

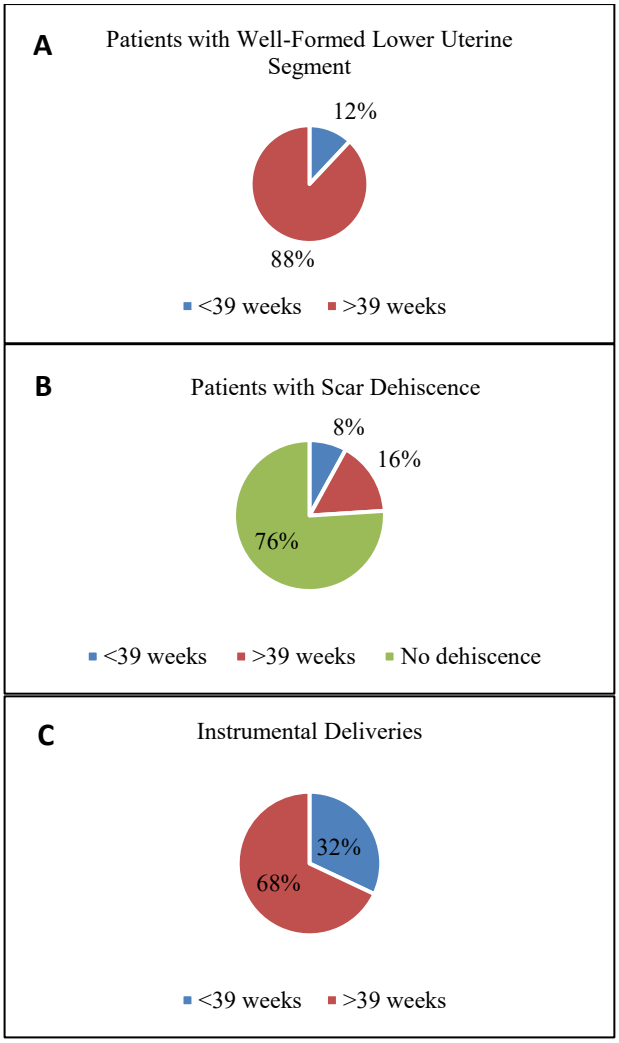

Figure 3 (A-C): Intraoperative and delivery findings in elective LSCS cases.

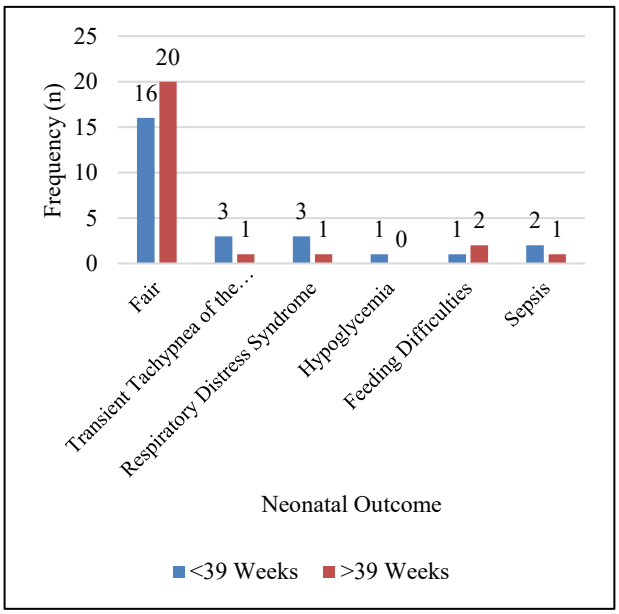

Figure 4: Neonatal outcomes following elective lower segment cesarean section.

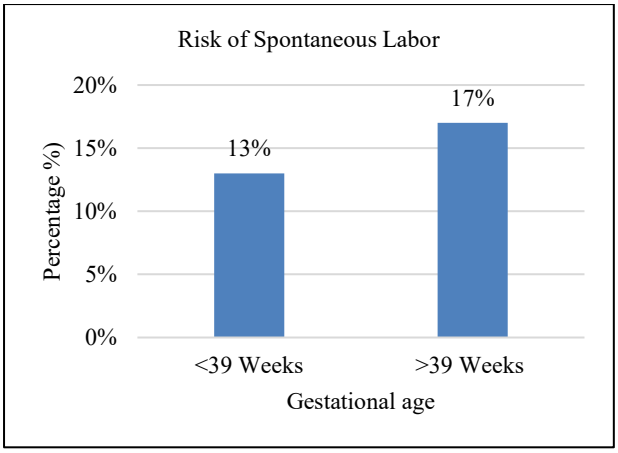

Figure 5: Risk of spontaneous labor before scheduled elective LSCS.

This bar chart illustrates the incidence of key maternal complications following an elective LSCS. The outcomes are grouped based on the gestational age at which the procedure was performed: less than 39 weeks (<39 weeks) (represented by the blue colour bars) and 39 weeks or greater (>39 weeks) (represented by the red colour bars).

A well-formed lower uterine segment was seen in 88% of women in the ≥39 weeks group, suggesting more favorable surgical conditions than in the early-term group. In contrast, instrumental assistance due to a non-engaged fetal head was needed far more often in the <39 weeks group, with 32% of women requiring assistance. Among the observed complications, PPH remained the most frequent issue in women delivering before 39 weeks, followed by prolonged hospitalization and an increased risk of postoperative infection. Scar integrity also showed variation between the two groups. Scar dehiscence was identified in 2 out of 25 women (8%) in the <39 weeks group and in 4 out of 25 women (16%) in the ≥39 weeks group (Figure 3).

This figure presents three pie charts illustrating crucial surgical and delivery observations based on the gestational age at which the elective LSCS was performed: less than 39 weeks (<39 weeks) and 39 weeks or greater (>39 weeks).

Panel A formation of lower uterine segment

This chart compares the formation of the lower uterine segment between the two gestational age groups.

Key finding

The lower uterine segment was well formed in 88% of patients whose delivery was terminated at or after 39 weeks (>39 weeks).

Panel B scar dehiscence

This chart details the incidence of scar dehiscence (a separation of the uterine scar from a previous surgery) in the two groups.

Key findings

Scar dehiscence was noted in 2/25 (8%) of patients whose delivery was terminated at <39 weeks. Scar dehiscence was noted in 4/25 (16%) of patients whose delivery was terminated at >39 weeks.

Panel C instrumental deliveries

This chart highlights the necessity for instrumental assistance during delivery.

Key finding

32% of deliveries in the <39 weeks group required instrumental assistance (such as forceps or vacuum) due to a non-engaged fetal head. Neonatal complications were more frequently observed in babies delivered before 39 weeks. Respiratory morbidities including respiratory distress syndrome (RDS) and transient tachypnoea of the newborn (TTN) were notably higher in the <39-week group. A greater proportion of babies born at ≥39 weeks were shifted to the mother's side immediately after birth, suggesting better immediate postnatal adaptation. Conversely, early-term neonates required more frequent NICU admissions, primarily due to respiratory concerns (Figure 4).

The bar chart illustrates the frequency of neonatal outcomes and complications among newborns delivered via elective LSCS. The data is segmented based on the gestational age at delivery: less than 39 weeks (<39 weeks) (represented by the blue bars) and 39 weeks or greater (>39 weeks) (represented by the red bars). Additionally, a separate retrospective study of 10 women who went into spontaneous labor before their planned elective LSCS further revealed that the incidence of emergency LSCS was higher in the women of the ≥39 weeks group (Figure 5).

Table 1: Demographic characteristics of the study participants.

Demographic variables	Group A (<39 weeks) (n=25)	Group B (≥39 weeks) (n=25)	P value
Maternal age (in years)	27.75±5.29	28.27±5.74	0.741
Mean parity	1.70±0.70	1.92±0.73	0.282
Body mass index (kg/m²)	29.3±4.8	29.1±5.0	0.886
Comorbidities			

Continued.

Demographic variables	Group A (<39 weeks) (n=25)	Group B (≥39 weeks) (n=25)	P value
gestational diabetes mellitus	8%	12%	1.000
Hypertensive disorders of pregnancy	8%	6%	1.000
Hypothyroidism	4%	7%	1.000
Anemia	12%	16%	1.000
Bronchial asthma	4%	5%	1.000
No significant comorbidities	64%	54%	0.773

DISCUSSION

The practice of C-section operation for child birth is becoming a common practice today.[1,16] However, the international guidelines recommend utmost precaution while prescribing C-section for childbirth since it can impose serious concerns when it comes to the health of the mother and child.[17,18] American College of Obstetricians and Gynecologists (ACOG) emphasizes that, in the absence of medical indications, vaginal delivery remains a safe and appropriate option and elective C-section delivery should not be performed before 39 weeks because of increased neonatal respiratory morbidity.[1] Similar recommendations from the Royal College of Obstetricians and Gynaecologists (RCOG) and the Federation of Obstetric and Gynaecological Societies of India (FOGSI) also support the 39 weeks threshold, highlighting that early-term elective LSCS is associated with higher risks of postpartum hemorrhage and neonatal complications.[2] In this study, we have compared the maternal and neonatal outcomes in both scenarios where the child was born before and after 39 weeks of gestation.

Baseline demographic characteristics, including maternal age, parity, BMI and maternal comorbidities, were comparable between the two groups, with no statistically significant differences observed (all $p>0.05$). These findings indicate that the study groups were clinically homogeneous at baseline, allowing the observed differences in maternal and neonatal outcomes to be primarily attributed to the timing of elective LSCS. In this retrospective study of 50 women, undergoing elective LSCS between 37 to 40 weeks of gestation, clear differences were observed in maternal and neonatal outcomes between early-term (<39 weeks) and late-term (≥39 weeks) patients. These findings highlight the importance of timing for the elective LSCS. This aligns with the international recommendations led by ACOG, RCOG and FOGSI, which advocate for scheduling late (≥39 weeks) elective LSCS to minimize preventable complications.[19,20]

Maternal outcomes showed a marked increase in PPH with rate of 22% and poor formation of lower uterine segment in the women delivered before 39 weeks of gestation along with higher frequency of instrumental assistance during childbirth. It can be attributed to a less mature and poorly contractile uterus.[21] In this line, Göksu et al also reported that the lower uterine segment reflects in rupture of the uterine wall, which can ultimately lead to PPH.[22] The higher frequency of instrumental assistance in the <39 weeks group further reflects the challenges posed by a non-engaged fetal head in early-term pregnancies. Neonatal outcomes were also significantly influenced by gestational age. Babies delivered before 39 weeks exhibited more respiratory complications, including and RDS. This goes in line with the observations reported by Yeganegi et al who showed that the babies born before 39 weeks, such as 35, 36 and 37 weeks, faced a 10-fold, 2-fold and 1-fold increased risk of severe adverse conditions, including RDS.[23] These findings are also consistent with established evidence that early-term neonates have an increased risk of respiratory morbidity due to incomplete lung fluid clearance and delayed physiological maturation.[24] Correspondingly, more neonates in the ≥39 weeks group demonstrated appropriate postnatal adaptation and were transferred directly to their mothers rather than to the NICU.

The study also highlighted the unpredictability faced when scheduling elective LSCS at 39 weeks. A spontaneous labor onset rate of 17% was observed before the scheduled surgery, resulting in emergency LSCS. Emergency procedures inherently carry higher risks than planned surgeries, both for the mother and the baby. The separate analysis of 10 women who went into early labor underscores the importance of individualized decision-making, particularly in women with previous LSCS, suboptimal obstetric history or other risk factors.

Overall, the results of this study emphasize the delicate balance required when choosing the optimal time for elective LSCS. While delivering after 39 weeks clearly reduces the likelihood of early-term neonatal respiratory complications and improves maternal outcomes, delaying too long in high-risk patients may increase the chances of spontaneous labor, emergency interventions and associated morbidities. Hence, the decision should reflect both evidence-based guidelines and patient-specific clinical considerations.

Limitations

This study was limited by its retrospective design, small sample size and single-center setting, which may restrict the generalizability of the findings. In addition, only short-term maternal and neonatal outcomes were assessed and the observational nature of the study precludes

establishing a causal relationship between the timing of elective LSCS and the observed outcomes. Larger prospective multicentre studies are required to validate these findings.

CONCLUSION

In conclusion, this study demonstrated that performing elective LSCS before 39 weeks is associated with increased maternal and neonatal morbidities, including higher rates of postpartum hemorrhage, respiratory distress in newborns and the need for instrumental assistance. Elective LSCS at or beyond 39 weeks resulted in better intraoperative conditions, lower neonatal respiratory complications and improved immediate postnatal adaptation.

However, a measurable proportion of women 17% in this study experienced spontaneous labor before their scheduled 39 weeks procedure, highlighting the potential risks of delaying surgery in selected patients. Therefore, while 39 weeks remains the recommended timing for elective LSCS in uncomplicated pregnancies, individualized planning is crucial, especially for women with previous cesarean deliveries or high-risk clinical profiles. The findings of this study support existing international guidelines and underscore the need for thoughtful, patient-centered decision-making to ensure optimal maternal and neonatal outcomes.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sizear MI, Rashid M. Urgent need to address increasing caesarean section rates in lower-middle-income countries like Bangladesh. Front Glob Womens Health. 2024;5:1365504.
2. Neethi Mohan V, Shirisha P, Vaidyanathan G, Muraleedharan VR. Variations in the prevalence of caesarean section deliveries in India between 2016 and 2021–an analysis of Tamil Nadu and Chhattisgarh. BMC Pregn Childbirth. 2023;23(1):622.
3. Roy N, Mishra PK, Mishra VK, Chattu VK, Varandani S, Batham SK. Changing scenario of C-section delivery in India: Understanding the maternal health concern and its associated predictors. J Family Med Prim Care. 2021;10(11):4182-8.
4. Cahill AG, Raghuraman N, Gandhi M, Kaimal AJ. First and second stage labor management: ACOG Clinical Practice Guideline No. 8. Obstetrics and gynecology. 2024;143(1):144-62.
5. Nayak AK, Nath A. There is an urgent need to humanise childbirth in India. Econ Polit Wkly. 2018;53(2):655.
6. World Health Organisation. WHO and partners launch global guide to advance respectful maternal and newborn care. 2025. Available at https://www.who.int/news/item/who-and-partners-launch-global-guide-to-advance-respectful-maternal-and-newborn-care. Accessed on 11 November 2025.
7. Tita AT, Landon MB, Spong CY, Lai Y, Leveno KJ, Varner MW, et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes. N Engl J Med. 2009;360(2):111-20.
8. Prediger B, Mathes T, Polus S, Glatt A, Bühn S, Schiermeier S, et al. A systematic review and time-response meta-analysis of the optimal timing of elective caesarean sections for best maternal and neonatal health outcomes. BMC Pregn Childbirth. 2020;20(1):395.
9. Wilmink FA, Pham CT, Edge N, Hukkelhoven CW, Steegers EA, Mol BW. Timing of elective pre-labour caesarean section: A decision analysis. Aust N Z J Obstet Gynaecol. 2019;59(2):221-7.
10. Shetty SK, Shetty AK. Association of neonatal respiratory morbidity with timing of elective cesarean delivery. Int J Reprod Contracept Obstet Gynecol. 2015;4(2):461.
11. Vidic Z, Blickstein I, Štucin Gantar I, Verdenik I, Tul N. Timing of elective cesarean section and neonatal morbidity: a population-based study. J Matern Fetal Med. 2016;29(15):2461-3.
12. Al Bizri A, Boghossian NS, Nassar A, Nakad P, Jaber D, Chahine R, et al. Timing of term elective cesarean section and adverse neonatal outcomes: A multi-center retrospective cohort study. Plos One. 2021;16(4):249557.
13. Prediger B, Heu-Parvaresch A, Polus S, Bühn S, Neugebauer EA, Dawid P. A systematic review on the effectiveness of implementation strategies to postpone elective caesarean sections to≥ 39+(0–6) weeks of gestation. Syst Rev. 2021;10(1):176.
14. Pirjani R, Afrakhteh M, Sepidarkish M, Nariman S, Shirazi M, Moini A, et al. Elective caesarean section at 38–39 weeks gestation compared to> 39 weeks on neonatal outcomes: a prospective cohort study. BMC pregnancy childbirth. 2018;18(1):140.
15. Vigdis Rikhardsdottir J, Hardardottir H, Thorkelsson T. The majority of early term elective cesarean sections can be postponed. J Matern Fetal Med. 2021;34(20):3344-9.
16. 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):762.
17. Bettes BA, Coleman VH, Zinberg S, Spong CY, Portnoy B, DeVoto E, et al. Cesarean delivery on maternal request: obstetrician–gynecologists' knowledge, perception and practice patterns. Obstet Gynecol. 2007;109(1):57-66.
18. World Health Organization. WHO recommendations non-clinical interventions to reduce unnecessary caesarean sections. WHO 2018. Available at

https://www.who.int/publications. Accessed on 11 November 2025.
19. Muhandule CJ, Benetti CM, Fogulin LB, Bento SF, Amaral E. Caesarean delivery on maternal request: the perspective of the postpartum women. BMC Pregn Childbirth. 2024;24(1):257.
20. Habak PJ, Khaparde G, Vadakekut ES. Vaginal birth after cesarean delivery. StatPearls Publishing. 2025.
21. Wormer KC, Jamil RT, Bryant SB. Postpartum hemorrhage. InStatPearls. 2024. StatPearls Publishing. Accessed from: https://www.ncbi.nlm.nih.gov/books/NBK499988/. Accessed on 11 December 2025.
22. Göksu M, Kadiroğulları P, Seçkin KD, Şahin B, Başkıran Y. Evaluation of lower uterine segment thickness in pregnant women with previous cesarean section and pain at term. Zeynep Kamil Med J. 2024;55(4):187-91.
23. Yeganegi M, Bahrami R, Azizi S, Marzbanrad Z, Hajizadeh N, Mirjalili SR, et al. Caesarean section and respiratory system disorders in newborns. Eur J Obstet Gynecol Reprod Biol X. 2024;23:100336.
24. Gromann J, Mancino I, Manegold-Brauer G, Adams M, Wellmann S, Burkhardt T. Incidence of neonatal respiratory morbidity after vaginal and caesarean delivery in the late-preterm and term period–a retrospective cohort study. Swiss Med Wkly. 2024;154(7):3798.

Cite this article as: Shandilya S, Mistry N, Chavhan D. Maternal and neonatal outcomes of elective cesarean section before and after 39 weeks. Int J Reprod Contracept Obstet Gynecol 2026;15:3037-43.