

DOI: <https://dx.doi.org/10.18203/2320-1770.ijrcog20262521>

Original Research Article

The indications, intraoperative complications, maternal and fetal outcomes in second-stage cesarean section at full dilation

Sreelakshmi K.*, Mohammad Siddhique, Smitha Sreenivas K.

Department of Obstetrics and Gynecology, GMC Kozhikode, Kerala, India

Received: 21 January 2026

Revised: 10 July 2026

Accepted: 14 July 2026

*Correspondence:

Dr. Sreelakshmi K.,

E-mail: sreelak648@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Second-stage caesarean section (SSCS), performed at full cervical dilatation, is associated with increased maternal and neonatal morbidity owing to technical difficulties during fetal extraction. This study aimed to evaluate the indications, intraoperative complications and maternal and neonatal outcomes of SSCS.

Methods: A prospective observational study was conducted among 73 term pregnant women who underwent second-stage caesarean section at a tertiary care teaching hospital over one year. Maternal demographic characteristics, indications for surgery, intraoperative and postoperative complications and neonatal outcomes were recorded and analysed. Associations were evaluated using the Chi-square test with $p < 0.05$ considered significant.

Results: The commonest indication for SSCS was arrest of descent/cephalopelvic disproportion (67.1%). Intraoperative complications occurred in 49.3% of women, with uterine angle extension being the most frequent (32.9%). Postoperative complications occurred in 50.7%, predominantly postoperative infection (38.4%). Neonatal complications were observed in 52.1%, with respiratory distress syndrome being the commonest (39.7%). The Patwardhan technique was significantly associated with increased intraoperative complications ($p = 0.013$), while operative duration exceeding one hour was significantly associated with postoperative complications and infections ($p = 0.001$).

Conclusions: Second-stage caesarean section is associated with substantial maternal and neonatal morbidity. Early recognition of labour abnormalities, timely intervention and appropriate surgical techniques may reduce adverse outcomes.

Keywords: Full dilatation caesarean section, Intraoperative complications, Maternal outcome, Neonatal outcome, Second-stage caesarean section

INTRODUCTION

In a woman's life cycle, pregnancy and childbirth are significant events. A caesarean section or a natural spontaneous vaginal delivery are the two options available to expectant mothers. In cases where pregnancy and labor difficulties arise, caesarean birth is an essential intervention for women.¹ Worldwide, the rate of caesarean deliveries (CDs) has dramatically grown. Caesarean section (CS) is one of the most commonly performed obstetric surgical procedures worldwide and plays a vital role in reducing maternal and neonatal morbidity and

mortality when appropriately indicated. Over the past three decades, the global rate of caesarean delivery has increased substantially, with many countries reporting rates well above the recommended levels. While caesarean section is often lifesaving, it is also associated with increased maternal morbidity, prolonged hospital stay and higher healthcare costs compared with vaginal delivery. Consequently, optimizing the indications and timing of caesarean delivery remains an important objective in modern obstetric practice.^{2,3,6} SSCS, defined as caesarean delivery performed after full cervical dilatation, represents one of the most technically demanding obstetric

procedures. It is usually performed for arrest of descent, cephalopelvic disproportion, failed operative vaginal delivery or non-reassuring fetal status. During this stage, the deeply impacted fetal head, thinned lower uterine segment and distorted pelvic anatomy increase the technical difficulty of surgery and predispose to intraoperative complications.^{5,7}

Compared with caesarean sections performed during the first stage of labour, SSCS is associated with significantly higher maternal morbidity, including uterine incision extensions, postpartum haemorrhage, injury to adjacent pelvic organs such as the bladder and ureters, increased blood transfusion requirements, postoperative infections, prolonged operative time and extended hospital stay.^{10,13,18,19} Neonates delivered by second-stage caesarean section are also at greater risk of respiratory distress, birth trauma, birth asphyxia, hypoxic-ischaemic encephalopathy, low Apgar scores and admission to the neonatal intensive care unit.^{20,38,44,45} These adverse outcomes are largely related to prolonged obstructed labour and the technical challenges encountered during fetal extraction.^{9,16}

Several techniques have been described for the delivery of the deeply impacted fetal head during second-stage caesarean section, including the vertex extraction, push method, reverse breech extraction and Patwardhan technique. However, there is no universal consensus regarding the optimal technique and maternal and neonatal outcomes may vary depending on the chosen method, surgeon's experience and intraoperative circumstances. Early recognition of labour abnormalities and timely decision-making are therefore essential to reduce procedure-related complications. Although numerous international studies have evaluated maternal and neonatal outcomes following second-stage caesarean section, prospective data from Indian tertiary care centres remain limited.^{31,40,45} Evaluating the indications, operative challenges and fetomaternal outcomes in our population is important for improving obstetric practice, guiding clinical decision-making and developing strategies to minimise maternal and neonatal morbidity.

Therefore, the present study was undertaken to evaluate the indications, intraoperative complications, maternal outcomes and neonatal outcomes associated with second-stage caesarean section in a tertiary care teaching hospital.

METHODS

Study design and setting

A prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College, Kozhikode, Kerala, over a period of one year September 2023 to August 2024. The study was approved by the Institutional Research Committee and Institutional Ethics Committee before commencement.

Study population

The study included 73 term pregnant women who underwent second-stage caesarean section, defined as caesarean delivery performed at full cervical dilatation, during the study period.

Inclusion criteria

The study included women with singleton term pregnancies (≥ 37 weeks) in cephalic presentation who underwent second-stage caesarean section at full cervical dilatation and provided written informed consent.

Exclusion criteria

Women with preterm pregnancies (< 37 weeks), multiple pregnancies, non-cephalic presentations, elective caesarean sections and those with incomplete clinical records were excluded from the study.

Sample size

The sample size was calculated based on an expected maternal complication rate of 24% reported in previous studies, with a 95% confidence level and 10% absolute precision, yielding a minimum required sample size of 73 participants.

Data collection procedure

After obtaining informed consent, maternal demographic characteristics, obstetric history, antenatal complications, indication for caesarean section, duration of second stage of labour, fetal head station, presence of caput and moulding, method of delivery of the fetal head, duration of surgery, intraoperative complications, postoperative maternal complications and neonatal outcomes were recorded using a structured proforma.

Maternal intraoperative complications assessed included uterine angle extension, postpartum haemorrhage, bladder injury, bowel injury and requirement for blood transfusion. Postoperative maternal outcomes included postoperative infection, prolonged catheterisation, prolonged hospital stay, HDU admission, hysterectomy and lower urinary tract symptoms.

Neonatal outcomes included Apgar score, need for resuscitation, birth injury, respiratory distress syndrome, hypoxic-ischaemic encephalopathy, neonatal seizures, NICU admission and neonatal mortality. As an additional analysis, maternal and neonatal outcomes of women undergoing second-stage caesarean section were compared with an equal number (73) of women who underwent caesarean section during the first stage of labour.

Outcome measures

The primary outcome was the occurrence of intraoperative maternal complications. Secondary outcomes included postoperative maternal morbidity and neonatal morbidity.

Statistical analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26.0. Categorical variables were expressed as frequencies and percentages. Associations between categorical variables were analysed using the Chi-square test or Fisher's exact test, wherever applicable. A p value <0.05 was considered statistically significant.

RESULTS

The study included women undergoing second-stage caesarean section at full cervical dilatation. Most women belonged to the reproductive age group and were predominantly primigravidae. Arrest of descent was the most common indication for second-stage caesarean section. Prolonged duration of the second stage of labour and the presence of caput and moulding was frequently observed at the time of surgery. Intra-operative complications were commonly encountered. Uterine extensions and tears constituted the most frequent complication, followed by postpartum haemorrhage.

Postoperative maternal morbidity was significant, with postoperative fever, wound infection and prolonged

hospital stay being common. Prolonged duration of surgery was associated with increased maternal morbidity. Neonatal morbidity was also observed. The majority of women were aged 26–30 years (53.4%) and were primigravidae (63.0%).

Most participants had regular antenatal care (71.2%) and nearly half were overweight (46.6%) (Table 1). Arrest of descent/cephalopelvic disproportion was the most common indication for second-stage caesarean section (67.1%). Caput and moulding were present in more than half of the cases (54.8%) and the fetal head was most commonly at station +3 (31.5%) (Table 2).

Vertex extraction was the most commonly employed technique (68.5%). Surgery lasted less than one hour in 60.3% of cases, while 26.0% of women required blood transfusion. Nearly half of the women (49.3%) experienced intraoperative complications, with uterine angle extension being the most frequent complication (32.9%), followed by atonic postpartum haemorrhage (13.7%).

Postoperative complications occurred in 50.7% of women, predominantly postoperative infections (38.4%) and HDU admissions (16.4%) (Table 3). (More than one complication may have occurred in the same patient). Neonatal complications were observed in 52.1% of newborns. Respiratory distress syndrome was the commonest complication (39.7%) and 35.6% of neonates required NICU admission (Table 4).

Table 1: Demographic profile of study population (n=73).

Variable	Category	Frequency (%)
Age (in years)	18-25	5 (6.8)
	26-30	39 (53.4)
	31-35	26 (35.6)
	More than 35	3 (4.1)
Parity	Primi	46 (63.0)
	Multi	23 (31.5)
	Grand multi	4 (5.5)
ANC visits	Regular ANC	52 (71.2)
	Irregular ANC	18 (24.7)
	No ANC	3 (4.1)
BMI	Less than 18.5	11 (15.1)
	18.5 to 24.9	18 (24.7)
	25 to 29.9	34 (46.6)
	30 to 34.9	8 (11)
	More than 35	2 (2.7)
Height	Less than 145 cm	7 (9.6)
	145 to 150 cm	24 (32.9)
	150 to 160 cm	32 (43.8)
	More than 160 cm	10 (13.7)

Table 2: Clinical profile and obstetrics characters of study population.

Variable	Category	Frequency (%)
Comorbidities in mother	Absent	6 (8.2)
	Present	67 (91.8)
Indication for C-section	Arrest of descent and CPD	49 (67.1)
	Fetal distress	12 (16.4)
	Failed instrumental	8 (11.0)
	Maternal collapse	4 (5.5)
Duration of second stage of labor	1 hour	40 (54.8)
	2 hours	33 (45.2)
Presence of caput/moulding of fetal head	No	33 (45.2)
	Yes	40 (54.8)
Station of fetal head at time of C-section	2	18 (24.7)
	3	23 (31.5)
	4	19 (26)
	5	12 (16.4)
	6	1 (1.4)

Table 3: Operative characteristics of study population.

Variable	Category	Frequency	%
Method of delivery of head	Vertex	50	68.5
	Patwardhan	21	28.8
Duration of surgery	Less than 1 hour	44	60.3
	More than 1 hour	29	39.7
Need for blood transfusion to mother	No	54	74.0
	Yes	19	26.0
Prolonged catheterization in mother	No	60	82.2
	Yes	13	17.8
Prolonged hospital stay in mother	No	55	75.3
	Yes	18	24.7
Intraoperative complication	No complications	37	50.7
	Atonic PPH	10	13.7
	Traumatic PPH	8	11.0
	Extension of uterine angle/tear	24	32.9
	Bladder injury	3	4.1
	Bowel serosal injury	1	1.4
Post-operative complication	HDU admission	12	16.4
	DIC	4	5.5
	Post-operative infection	28	38.4
	Leading to hysterectomy	3	4.1
	Lower urinary tract symptoms(LUTS)	10	13.7
	Scar dehiscence	1	1.4

Table 4: Neonatal outcomes in study population.

Neonatal outcomes	Frequency	%
NICU admission	26	35.6
Neonatal resuscitation via bag and mask	25	34.2
Neonatal resuscitation via ventilatory support	9	12.3
Birth injury	4	5.5
Low APGAR at birth	15	20.5
RDS	29	39.7
HIE	4	5.5
Neonatal death	1	1.4

Continued.

Neonatal outcomes	Frequency	%
Neonatal seizure	2	2.7

Table 5: Association between method of delivery and intra-operative complication and association between method of delivery and birth injury to baby.

Status	Frequency/percent	Method of delivery			Total
		Vertex	Patwardhan	Push method	
Absent	Frequency	31	5	1	37
	Percent	62.00	23.80	50.00	50.70
Present	Frequency	19	16	1	36
	Percent	38.00	76.20	50.00	49.30
Total	Frequency	50	21	2	73
	Percent	100.00	100.00	100.00	100.00
P value=0.013					
Association between method of delivery and birth injury to baby					
Absent	Frequency	47	20	2	69
	Percent	94.00	95.20	100.00	94.50
Present	Frequency	3	1	0	4
	Percent	6.00	4.80	0.00	5.50
Total	Frequency	50	21	2	73
	Percent	100.00	100.00	100.00	100.00
P value=0.92					

Table 6: Association between method of delivery and neonatal complications.

Status	Frequency/percent	Method of delivery			Total
		Vertex	Patwardhan	Push method	
Absent	Frequency	26	8	1	35
	Percent	52.00	38.10	50.00	47.90
Present	Frequency	24	13	1	38
	Percent	48.00	61.90	50.00	52.10
Total	Frequency	50	21	2	73
	Percent	100.00	100.00	100.00	100.00
P value=0.56					

Table 7: Association between duration of surgery and post-operative complications & post op infections.

Status of post op complications	Frequency/percent	Duration of surgery		Total
		Less than 1 hour	More than 1 hour	
Absent	Frequency	34	2	36
	Percent	77.30%	6.90%	49.30%
Present	Frequency	10	27	37
	Percent	22.70%	93.10%	50.70%
Total	Frequency	44	29	73
	Percent	100.00%	100.00%	100.00%
P value=0.001				
Status of post op infections	Frequency/percent	Duration of surgery		Total
		Less than 1 hour	More than 1 hour	
Absent	Frequency	37	8	45
	Percent	84.10	27.60	61.60
Present	Frequency	7	21	28
	Percent	15.90	72.40	38.40
Total	Frequency	44	29	73
	Percent	100.00	100.00	100.00
P value=0.001				

Table 8: Presence of any Intraoperative complication post operative complications compared to control group.

S. no	Intra op complications	Incidence	%	Incidence in control group	% In control group
1	Atonic PPH	10	13.70	6	8.20
2	Traumatic PPH	8	11.00	5	6.80
3	Extension of uterine angle/ tear	24	32.90	5	6.80
4	Bladder injury	3	4.10	0	0
5	Bowel injury	1	1.40	0	0
6	No complications	37	50.70	57	78.08
Postoperative complication					
		Incidence	%	Incidence in control group	% in control group
1	HDU admission	12	16.4	7	9.50
2	DIC	4	5.5	5	6.80
3	Post-operative infection	28	38.4	10	13.60
4	Leading to hysterectomy	3	4.1	10	0
5	Lower urinary tract symptoms (LUTS)	10	13.7	4	0
6	Scar dehiscence	1	1.4	0	5.40
7	No complications	36	49.30	42	57.50

Table 9: Presence of any neonatal complication compared to control group.

S. no.	Neonatal complications	Incidence	%	Incidence in control group	% In control group
1	Low APGAR at birth	15	20.50	6	8.20
2	RDS	29	39.70	15	20.50
3	HIE	4	5.40	1	1.30
4	Neonatal death	1	1.30	0	0
5	Neonatal seizures	2	2.70	0	0
6	No complications	35	47.90	52	71.20

DISCUSSION

The present prospective observational study evaluated the indications, intraoperative complications, maternal morbidity and neonatal outcomes associated with second-stage caesarean section in a tertiary care teaching hospital. The findings demonstrated that second-stage caesarean section is associated with a substantial burden of maternal and neonatal morbidity, with nearly half of the women experiencing intraoperative (49.3%) and postoperative (50.7%) complications, while neonatal complications occurred in 52.1% of cases. These findings highlight the technical challenges of caesarean delivery at full cervical dilatation and emphasize the importance of timely obstetric intervention and meticulous surgical technique.

The majority of women in the present study were aged 26–30 years (53.4%) and were primigravidae (63.0%). This observation is comparable to previous studies by Seal et al, Goswami et al and Khaniya et al, which also reported that second-stage caesarean section was more common among young primigravid women.^{31,40,45} Primigravidae are at increased risk of prolonged second-stage labour because of cephalopelvic disproportion, inefficient maternal expulsive efforts and malposition of the fetal head, thereby increasing the likelihood of operative intervention.

In the present study, arrest of descent with cephalopelvic disproportion was the most common indication for second-stage caesarean section (67.1%), followed by fetal distress (16.4%). Similar findings have been reported by Murphy et al, Seal et al and Asıcıoğlu et al in whom arrest disorders constituted the predominant indication for caesarean section at full dilatation.^{8,11,40} The high proportion of arrest disorders observed in our study may be attributed to the tertiary referral nature of our institution, where women with prolonged labour and obstructed labour are frequently referred for definitive management.

In the present study, 91.8% of women had at least one maternal comorbidity, with hypothyroidism (32.9%), gestational diabetes mellitus (30.1%) and gestational hypertension (28.8%) being the most frequently encountered conditions. The high prevalence of medical disorders may be explained by the tertiary referral nature of our institution, where high-risk pregnancies are commonly managed. Maternal comorbidities are known to increase the risk of labour abnormalities and operative delivery, thereby predisposing women to second-stage caesarean section. Similar observations have been reported in previous Indian studies evaluating second-stage caesarean deliveries.

Nearly half of the women (49.3%) experienced intraoperative complications, with uterine angle extension (32.9%) being the most common complication, followed by atonic postpartum haemorrhage (13.7%). Similar findings have been reported by Murphy et al, Seal et al and Govender et al who identified uterine incision extensions as the commonest complication during second-stage caesarean section.^{11,40,43,45} These complications are primarily attributed to the deeply impacted fetal head, oedematous lower uterine segment and distorted pelvic anatomy encountered during surgery. Prompt surgical intervention and familiarity with appropriate fetal head extraction techniques are essential to minimise these complications.

Postoperative complications occurred in 50.7% of women, with postoperative infection (38.4%) being the most frequent complication. Women whose surgeries lasted more than one hour had a significantly higher incidence of postoperative complications and infections. This finding is consistent with previous reports demonstrating that prolonged operative duration is associated with increased tissue trauma, blood loss, contamination and postoperative morbidity. These findings highlight the importance of early decision-making, meticulous surgical technique and involvement of experienced obstetricians in technically difficult second-stage caesarean sections.^{20,38,40} Neonatal complications were observed in 52.1% of newborns, with respiratory distress syndrome (39.7%) and low Apgar scores (20.5%) being the predominant adverse outcomes. Similar findings have been reported by Sinha et al, Zewdu et al and Omwodo et al who observed significantly higher neonatal morbidity following second-stage caesarean section compared with caesarean delivery during the first stage of labour. Prolonged labour, fetal hypoxia and technical difficulty during delivery of the impacted fetal head may contribute to these adverse neonatal outcomes.^{20,38,44,45}

In the present study, the Patwardhan technique was significantly associated with a higher incidence of intraoperative complications. Although the Patwardhan technique has been advocated as an effective method for delivering the deeply impacted fetal head, its success is highly dependent on surgeon experience and careful patient selection. The higher complication rate observed in our study may reflect the greater technical complexity of cases in which this technique was employed rather than the technique itself. This finding should therefore be interpreted with caution and warrants further evaluation in larger prospective studies.^{9,16,35}

Comparison with women undergoing caesarean section during the first stage of labour demonstrated significantly higher intraoperative, postoperative and neonatal complications in the second-stage caesarean group. Uterine angle extension, postoperative fever, low Apgar scores and respiratory distress syndrome were all significantly more frequent among women undergoing second-stage caesarean section. These findings are

consistent with previous cohort studies and reinforce that caesarean delivery at full cervical dilatation remains a high-risk obstetric procedure requiring experienced surgical management and timely intervention.^{17,19,38,44}

While this study offers valuable insights into the maternal and neonatal outcomes of second-stage caesarean sections, it does come with a few limitations.

Single-centre study

Conducted at a single tertiary care centre, the findings may not be easily applicable to other healthcare environments, particularly in rural or lower-resource hospitals where surgical expertise and obstetric practices can differ significantly.

Potential observer bias

Since the data was gathered from medical records in a prospective manner, there's a chance of observer bias or inconsistencies in documentation, especially regarding intraoperative complications and neonatal assessments.

Limited neonatal outcome assessment

Although NICU admissions and neonatal complications were noted, the study didn't delve into long-term neonatal issues, such as developmental delays or cognitive outcomes.

CONCLUSION

This study highlights the significant maternal and neonatal outcomes associated with caesarean delivery performed in the second stage of labor. A high prevalence of maternal comorbidities, including gestational diabetes mellitus, hypertension and hypothyroidism, was observed, emphasizing the need for vigilant antenatal monitoring. Arrest of descent and cephalopelvic disproportion were the leading indications for caesarean section and prolonged second-stage labor was frequently noted.

Intraoperative complications were common, occurring in nearly half (49.3%) of the cases, with uterine angle extension/tear being the most frequent. Postoperative complications were observed in 50.7% of women, with infections and ICU admissions being the most notable concerns. Prolonged duration of surgery was strongly associated with an increased risk of postoperative complications, including infections. Neonatal morbidity was substantial, with 52.1% experiencing complications. Respiratory distress syndrome was the most common neonatal issue, followed by low APGAR scores at birth. Although neonatal mortality was low (1.4%), the need for NICU admission was significant, highlighting the impact of second-stage caesarean deliveries on neonatal health.

The study findings suggest that caesarean delivery in the second stage of labor is associated with considerable

maternal and neonatal risks. The method of delivery of the fetal head plays a crucial role, with the Patwardhan technique showing a higher risk of intraoperative complications. Additionally, prolonged surgery significantly increases the likelihood of adverse postoperative outcomes. These results emphasize the importance of timely decision-making, skilled surgical techniques and postoperative surveillance to minimize complications in both mothers and neonates. Further research and protocol optimization may help improve outcomes in such high-risk deliveries.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

- Betrán AP, Ye J, Moller AB, Zhang J, Gülmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: global, regional and national estimates: 1990-2014. *PloS One*. 2016;11(2):148343.
- Elias S, Wolde Z, Tantu T, Gunta M, Zewudu D. Determinants of early neonatal outcomes after emergency cesarean delivery at Hawassa University comprehensive specialised hospital, Hawassa, Ethiopia. *PLoS One*. 2022;17(3):263837.
- Unterscheider J, McMenamin M, Cullinane F. Rising rates of caesarean deliveries at full cervical dilatation: a concerning trend. *European J Obst Gynecol Reprod Biol*. 2011;157(2):141-4.
- Sobhy S, Arroyo- Manzano D, Murugesu N. Maternal and perinatal mortality and complications associated with caesarean section in low- income and middle-income countries: a systematic review and meta-analysis. *Lancet*. 2019;393:1973-82.
- Vousden N, Cargill Z, Briley A, Tydeman G, Shennan AH. Caesarean section at full dilatation: incidence, impact and current management. *Obstet Gynaecol*. 2014;16(3):199-205.
- Baloch S, Khaskheli M, Khushk IA, Sheeba A. Frequency of second stage intervention and its outcome in relation with instrumental vaginal delivery versus caesarean section. *J Ayub Med Coll Abbottabad*. 2008;20(1):87-90.
- Manning JB, Tolcher MC, Chandrachan E, Rose CH. Delivery of an impacted fetal head during cesarean: a literature review and proposed management algorithm. *Obst Gynecol Surv*. 2015;70(11):719-24.
- Asıcıoglu O, Güngördük K, Yildirim G, Asıcıoglu BB, Güngördük ÖÇ, Ark C, et al. Second-stage vs first-stage caesarean delivery: comparison of maternal and perinatal outcomes. *J Obst Gynaecol*. 2014;34(7):598-604.
- Thirukumar M. Feto-maternal outcome in caesarean sections performed in second stage of labour. *Jaffna Med J*. 2020;14;32(1):986.
- Sinha S, Malik S, Dixit M. First versus second stage caesarean section: a comparison of maternal and neonatal outcomes. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(8):3477-80.
- Murphy DJ, Liebling RE, Verity L, Swingler R, Patel R. Early maternal and neonatal morbidity associated with operative delivery in second stage of labour: a cohort study. *Lancet*. 2001;358(9289):1203-7.
- Irani M, Deering S. Challenges affecting access to cesarean delivery and strategies to overcome them in low-income countries. *Int J Gynecol Obst*. 2015;131(1):30-4.
- Shah A, Fawole B, M'imunya JM, Amokrane F, Nafiou I, Wolomby JJ, et al. Cesarean delivery outcomes from the WHO global survey on maternal and perinatal health in Africa. *Int J Gynecol Obst*. 2009;107(3):191-7.
- Dalvi SA. Difficult deliveries in cesarean section. *J Obst Gynecol of India*. 2018;68(5):344-8.
- Lurie S, Raz N, Boaz M, Sadan O, Golan A. Comparison of maternal outcomes from primary cesarean section during the second compared with first stage of labor by indication for the operation. *European J Obstet Gynecol Reprod Biol*. 2014;182:43-7.
- Lipschuetz M, Guedalia J, Cohen SM, Lewkowicz AA, Amsalem H, Karavani G, et al. Unplanned cesarean delivery in the second stage of labor holds higher odds of complications than in the first stage, while similar in primiparas and multiparas. *Fetal Diagn Ther*. 2020;47(7):565-71.
- Sinha S, Malik S, Dixit M. First versus second stage caesarean section: a comparison of maternal and neonatal outcomes. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(8):3477-80.
- Sung JF, Daniels KI, Brodzinsky L, El-Sayed YY, Caughey AB, Lyell DJ. Cesarean delivery outcomes after a prolonged second stage of labor. *American J Obst Gynecol*. 2007;197(3):306.
- Thuillier C, Roy S, Peyronnet V, Quibel T, Nlandu A, Rozenberg P. Impact of recommended changes in labor management for prevention of the primary cesarean delivery. *American J Obst Gynecol*. 2018;218(3):341.
- Hernández S, Basteiro E, Meler E, Cobo T, Figueras F, Parra J. Protocolo de Cesárea. Hospital Clínic, Hospital Sant Joan de Déu, Universitat de Barcelona. 2020:1-26.
- Hu HT, Xu JJ, Lin J, Li C, Wu YT, Sheng JZ, et al. Association between first caesarean delivery and adverse outcomes in subsequent pregnancy: a retrospective cohort study. *BMC Pregn Childbirth*. 2018;18:1-2.
- Kamath BD, Todd JK, Glazner JE, Lezotte D, Lynch AM. Neonatal outcomes after elective cesarean delivery. *Obstet Gynecol*. 2009;113(6):1231-8.
- Caughey AB, Stotland NE, Washington AE, Escobar GJ. Maternal and obstetric complications of pregnancy are associated with increasing gestational age at term. *American J Obst Gynecol*. 2007;196(2):155.

24. Roos N, Sahlin L, Ekman-Ordeberg G, Kieler H, Stephansson O. Maternal risk factors for postterm pregnancy and cesarean delivery following labor induction. *Acta Obstetrica Et Gynecologica Scandinavica*. 2010;89(8):1003-10.
25. Zhang J, Troendle JF, Yancey MK. Reassessing the labor curve in nulliparous women. *American J Obst Gynecol*. 2002;187(4):824-8.
26. Rosenbloom JI, Woolfolk CL, Wan L, Stout MJ, Tuuli MG, Macones GA, et al. The transition from latent to active labor and adverse obstetrical outcomes. *American J Obst Gynecol*. 2019;221(5):487.
27. Robson M, Murphy M, Byrne F. Quality assurance: The 10-Group Classification System (Robson classification), induction of labor and cesarean delivery. *Int J Gynecol Obstet*. 2015;131:23-7.
28. Betran AP, Temmerman M, Kingdon C, Mohiddin A, Opiyo N, Torloni MR, et al. Interventions to reduce unnecessary caesarean sections in healthy women and babies. *Lancet*. 2018;392(10155):1358-68.
29. Opiyo N, Torloni MR, Robson M, Ladfors L, Gholbzouri K, Kacerauskiene J, et al. WHO's Robson platform for data-sharing on caesarean section rates. *Bulletin of the World Health Organization*. 2022;100(5):352.
30. Boatin AA, Schlottheuber A, Betran AP, Moller AB, Barros AJ, Boerma T, et al. Within country inequalities in caesarean section rates: observational study of 72 low and middle income countries. *BMJ*. 2018;24:360.
31. Khaniya B. Fetomaternal outcome in second stage caesarean section. *Nepalese Medical J*. 2020;3(1):279-81.
32. Moodley J, Devjee J, Khedun SM, Esterhuizen T. Second-stage primary Caesarean deliveries: Are maternal complications increased. *South Afr Fam Pract*. 2009;51(4):67.
33. Myles TD, Santolaya J. Maternal and neonatal outcomes in patients with a prolonged second stage of labor. *Obst Gynecol*. 2003;102(1):52-8.
34. American College of Obstetricians and Gynecologists. Committee on Quality Assessment. Quality Improvement in Women's Health Care. American College of Obstetricians and Gynecologists Women's Health Care Physicians. 2000.
35. Saha PK, Gulati R, Goel P, Tandon R, Huria A. Second stage caesarean section: evaluation of patwardhan technique. *JCDR*. 2014;8(1):93.
36. Belay T, Yusuf L, Negash S. A comparative study on first stage versus second stage caesarean section on maternal and perinatal outcome. *Ethiopian Med J*. 2014;52(1):1-8.
37. Sucak A, Çelen Ş, Akbaba E, Soysal S, Moraloglu O, Danışman N. Comparison of nulliparas undergoing cesarean section in first and second stages of labour: a prospective study in a tertiary teaching hospital. *Obst Gynecol Int*. 2011;20(1):986506.
38. Zewdu D, Tantu T, Degemu F, Abdlwehab M. Association between the stage of labour during caesarean delivery with adverse maternal and neonatal outcomes among referred mothers to tertiary centres in resource-limited settings. *BMJ Open*. 2023;13(11):77265.
39. Ewington LJ, Quenby S. Full dilatation caesarean section and the risk of preterm delivery in a subsequent pregnancy: a historical cohort study. *J Clin Med*. 2020;9(12):3998.
40. Seal SL, Kamilya G, Mukherji J, Bhattacharyya SK, De A, Hazra A. Outcome in second-versus first-stage caesarean delivery in a teaching institution in eastern India. *American J Perinatol*. 2010;27(6):507-12.
41. Sethuram R, Jamjute P, Kevelighan E. Delivery of the deeply engaged head: a lacuna in training. *J Obstetr Gynaecol*. 2010;30(6):545-9.
42. McKelvey A, Ashe R, McKenna D, Roberts R. Caesarean section in the second stage of labour: a retrospective review of obstetric setting and morbidity. *J Obstet Gynaecol*. 2010;30(3):264-7.
43. Govender V, Panday M, Moodley J. Second stage caesarean section at a tertiary hospital in South Africa. *J Maternal-Fet Neonat Med*. 2010;23(10):1151.
44. Omwodo KA, Were E. Comparing adverse maternal and perinatal outcomes in primary caesarean delivery during first versus second-stage of labour in Kenya: An institution-based cohort study. *Plos One*. 2023;18(11):294266.
45. Chandrashekhar AB, Ramakrishnappa HC, Nagaraj R, Iyengar S. Maternal and fetal outcome in second stage caesarean section: a retrospective study. *Int J Reprod, Contracep, Obstet Gynecol*. 2024;13(4):993–6.

Cite this article as: Sreelakshmi K, Siddhique M, Smitha Sreenivas K. The indications, intraoperative complications, maternal and fetal outcomes in second-stage cesarean section at full dilation. *Int J Reprod Contracept Obstet Gynecol* 2026;15:2979-87.