

Maternal and Fetal Outcomes Following Caesarean Section in Second Stage of Labour

Sadaf Moin, Ayesha Akram, Shazia Iffet, Farwah Arif, Maryam Nisar, Nayab Gull

ABSTRACT

Objectives: The primary objectives of this study were to establish the frequency of caesarean sections conducted during the second stage of labour, identify the reasons leading to this intervention, and evaluate the maternal and fetal outcomes associated with second-stage caesarean deliveries.

Study Design and Setting: Cross sectional study in Combined Military Hospital Abbottabad.

Methodology: After approval from ethical committee, this study was conducted from 1st January 2024 to 30th June 2024. Via non-probability consecutive sampling, pregnant women between ages 20-45 years, with a singleton pregnancy, and gestation age greater than 37 weeks were included. The study evaluated indications for caesarean section, preoperative instrumentation, intraoperative complications (uterine incision extension, haemorrhage, atonic post-partum haemorrhage), and postoperative complications (wound infection, febrile illness, and neonatal morbidity and mortality).

Results: There were a total of 1195 deliveries over the research period. 642 (54%) babies born via cesarean section. Amongst these, 25 (3.8%) cesarean sections were performed in the second stage. The most common indication for second-stage CS in the present study was non-progress of labour (36%). Among women undergoing second-stage CS, the most common maternal complication was atonic PPH (32%), followed by blood transfusion (28%). In our study, there was no case of maternal and neonatal deaths. For neonates, the most common causes of NICU admission were RDS (36%) and HIE (32%)

Conclusion: Several intra-operative maternal problems and neonatal morbidity are linked to cesarean sections that are performed during the second stage of labour.

Key words: Caesarean Section, Fetal Health, "Labor Stage, Second", Pregnancy Outcome, Fetomaternal Outcome, Maternal Health, Obstetric procedures.

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INTRODUCTION

The global rate of caesarean section has risen significantly over the past decades. The rise is largely attributed to advances in surgical safety, anaesthesia, improved postoperative care, and a reduction in instrumental vaginal deliveries¹. Despite these improvements, CS continues to carry greater risks of maternal complications compared to vaginal birth, particularly when performed in the later stages of labour². The timing of a CS is critical: when performed during the second stage of labour, both maternal and neonatal risks increase due to technical and clinical challenges unique to this period³.

A second-stage caesarean section is defined as a CS performed after the cervix has become fully dilated, usually following a failed vaginal delivery attempt or the emergence of complications that rule out a safe vaginal birth^{4,5}. The incidence of second-stage CS has grown, with recent data showing an increase from 0.9% to 2.2% in some populations, highlighting a concerning trend in contemporary obstetric practice¹.

Many factors contribute to this rise, including a lack of experience among junior staff in making decisions during advanced labour and limited proficiency in assisted vaginal delivery⁶. According to the Royal College of Obstetricians and Gynaecologists (RCOG), 6% of primary CS are performed at full dilatation, and in half of these, no prior attempt was made at instrumental vaginal delivery. The presence of experienced obstetricians is therefore crucial, as the absence of skilled personnel can result in unnecessary surgeries and increased maternal and neonatal morbidity⁷.

Performing a CS at full cervical dilatation presents several technical challenges⁴. Delivering a deeply engaged fetal head may require specialized techniques such as the Patwardhan or push methods, both of which add to operative complexity and risk⁷. Second-stage CS are associated with higher maternal morbidity, including uterine angle extensions, postpartum haemorrhage (PPH), and longer operative times. Additional complications such as bladder injuries and postoperative fevers are also more frequently observed⁸.

Neonates delivered by second-stage CS also face increased risks, including a higher likelihood of admission to neonatal intensive care units (NICU), fetal acidemia, and extended NICU stays. Low Apgar scores and abnormal fetal heart rate patterns are more common in this group⁹. This underscores the importance of prompt and expert decision-making to minimise risks for both mothers and neonates.

Non-progression of labour is the most common indication for second-stage CS, with fetal distress and obstructed labour also frequently cited. These indications are consistently associated with adverse maternal and neonatal outcomes, reinforcing the need for diligent perioperative management.

Technical difficulties during second-stage CS, such as unintentional uterine incision extensions and increased risk of infection and bleeding, are well documented. Specialized delivery techniques are often necessary, but they bring their own set of risks, including increased operative time and postoperative complications⁷.

The impact on neonatal outcomes is notable, with respiratory distress syndrome (RDS) and hypoxic-ischemic encephalopathy (HIE) being the leading causes of NICU admission among babies delivered by second-stage CS. These conditions carry significant short- and long-term health implications.

Finally, the rising incidence of second-stage CS poses challenges for healthcare systems, including increased hospital stays, resource use, and costs¹⁰. Women undergoing these procedures are more likely to experience slower recoveries, a higher incidence of wound infections, and delays in returning to daily activities¹¹. Thus, access to skilled obstetric and neonatal care is critical, as timely interventions and expert management play a key role in reducing the risks associated with second-stage CS.

METHODOLOGY:

This cross-sectional was conducted at a tertiary care hospital Abbottabad from 1st January 2024 to 30th June 2024. Ethical approval was obtained from the institutional review board via the letter Number (*File No.CMH-Atd-ETH-157-Gyne-24*) and the informed consent was collected form all participants. Sample size was calculated through *non-probability consecutive sampling technique*. *Inclusion criterion* encompassed pregnant women between ages 20-45 years with a singleton pregnancy, and gestation age greater than 37 weeks. *Exclusion criterion* encompassed pregnancies with a documented medical condition present before conception, pregnancies characterized by significant foetal malformations and restricted fetal growth, preterm and multiple pregnancy cases. After the informed consent from the eligible participants, demographics and clinical details were recorded using a predesigned Performa. The study evaluated indications for caesarean section, preoperative instrumentation, intraoperative complications such as uterine incision extension, haemorrhage, and atonic post-partum haemorrhage (PPH), as well as postoperative complications including wound infection, febrile illness, and neonatal morbidity and mortality. SPSS version 21 was utilized to analyse the data. Continuous variables were presented as mean and standard deviation, while categorical data was represented as frequency and percentage.

RESULTS

During the research period, there were a total of 1,195 deliveries. Of these, 642 (54%) were caesarean sections, and 25 (3.8% of caesarean cases) were performed during the second stage of labour.

The primary indications for opting for caesarean section in these second-stage cases are presented in Figure 1. Maternal complications observed during the study are summarised in Table 1. Importantly, there were no maternal deaths recorded.

Among notable complications, one patient developed a broad ligament haematoma requiring a peripartum hysterectomy.

Another patient experienced uterine rupture during the second stage of labour, necessitating an emergency caesarean section; this patient subsequently developed a pulmonary embolism post-operatively, which was managed conservatively, resulting in favourable outcomes for both mother and infant.

Fetal outcomes following second-stage lower segment caesarean section (LSCS) are detailed in Table 2, with no neonatal deaths or stillbirths reported. Demographic and clinical variables for all study participants are presented in Table 3. All data analyses were performed using SPSS version 21.

DISCUSSION

In recent years, both global and national rates of caesarean sections (CS) have increased, particularly at full cervical

dilatation, raising concerns about maternal and neonatal health. This trend is driven by factors such as medicolegal pressures, maternal and fetal morbidities linked to sociodemographic factors, and more frequent instrumental interventions. In Pakistan, CS rates rose from 3.2% in 1990

Figure 1: Indications of second Stage LSCS

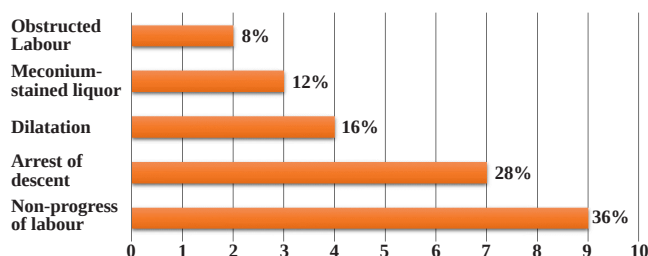


Table 1: Maternal complications

Maternal Complications	N (%)
Atonic PPH	8 (32%)
Uterine Incision Extension	2 (8%)
Postoperative Fever	3 (12%)
Wound Infection Requiring Re-suturing	3 (12%)
Maternal Death	0
Bowel Or Bladder Injury	1 (4%)
Blood Transfusion Required	7 (28%)
Blood Stained Urine	1 (4%)

Table 2: Perinatal complications

Perinatal complications	N (%)
Meconium stained liquor	3 (12%)
Apgar score <7 at 5 min	5 (20%)
Neonatal deaths	0
Stillbirth	0
Respiratory distress (RDS)	9 (36%)
Hypoxic-ischaemic encephalopathy (HIE)	8 (32%)

Table 3: Sociodemographic Profile

Variables	N (%)
AGE	
Age (years)	28.45±4.4
20-30 years	15 (60%)
31-40 years	8 (32%)
Above 40 years	2 (8%)
PARITY	
Primiparous	17 (68%)
Multiparous	8 (32%)
LABOUR	
Induced	17 (68%)
Spontaneous	8 (32%)
Labour duration	7.43±2.3

to 19.6% in 2018, reflecting shifts in clinical practice and a higher incidence of high-risk pregnancies at tertiary hospitals. Our hospital reported a CS rate of 54%, exceeding national averages, and 3.8% at full dilatation, higher than rates documented in Sudan. These increases are linked to the complexity of cases referred from catchment areas. Recent studies indicate that the growing use of advanced diagnostic technologies has contributed to earlier detection of potential complications, influencing decisions towards elective caesarean sections. Additionally, emerging evidence suggests that patient preference and evolving cultural attitudes about childbirth play an increasing role in the rise of CS rates. Researchers are also exploring the long-term impacts on maternal health and subsequent pregnancies, which may prompt the development of revised guidelines to optimise outcomes for mothers and infants. Caesarean sections performed during the second stage of labour are technically more challenging due to changes in pelvic anatomy, such as widened and stretched muscles and ligaments, as the baby descends. This makes extraction more difficult, increasing the risk of maternal and neonatal complications like severe bleeding,

pelvic tissue trauma, and injuries to the baby. The higher CS rate at our hospital is likely because it serves as a referral centre for a large, remote area with limited medical facilities, and may also reflect more cases of arrested labour or failed labour induction.

Maternal complications that have been associated with second-stage CS, are well-documented, and include a higher incidence of postpartum haemorrhage (PPH), bladder injury, uterine rupture, infection, and prolonged hospital stay.^{4,5,6} In our study we have found that, atonic PPH was the most common maternal complication, which was observed in 32% of cases. This rate was lower in comparison to a rate of 47.5% which was shown by Mamoon et al¹⁶ and comparable to rate of 25% cases suffering from atonic PPH as published by Anusha et al in their study (maternal /fetal outcome)¹⁰ The difference in rate here can be attributed to the fact that institutional policies are strict in our setup mandating regular follow ups and better staff to patient ratio.¹⁶ In our study blood transfusion which was done in 28% of patients after the CS, which is significantly more than the value of 8.2% posted in the study by Omer Mander in Sudan, in 15.38% of patients in study by Bijal in India, and less than a value of 73.8% shown by Seval Yilmaz in Turkey.^{17,18,19} In our setting we postulate this increased rate of blood products transfusions to the fact, that most of our patients who required CS, are referred cases with history of poor handling in the periphery which is concurrence to a short communication published by Noore Saba.²⁰ In our study we observed that postoperative fever and wound infection were manifested in 12% of cases respectively, figures that were slightly less than a value of 24.1% occurrence rate shown by Nasreen in her study.²¹ Again we

postulate this betterment to the fact that our setup has strict protocols and mechanisms that ensure implementation of these protocols as well.

Nexus, performing a CS during the second stage has its association with maternal morbidity owing to the manoeuvrability required for extraction of a deeply engaged foetal head.⁹ Owing to this extensive handling of the pelvic area during the CS we observed that uterine incision extension was observed in 8% of cases which is less as compared to a risk of 58.5% and 54.2% as published by Gilad Karawani and Renana et al.^{22,23} This significant difference may be due to the reason that both these studies were conducted over a span of 5 years and had a bigger proportion of the patients were involved in the studies. Other possibilities, may due to the employment of the extensive obstetrical team that handles such cases in our setup and the bulk of the patients are regular booked due to institutional policies. Nonetheless, the risk of complications remains substantial, and careful preoperative assessment and planning are essential highlighting the urgency and complexity of decision-making in the second stage of labor, where timely intervention is critical to prevent adverse outcomes for both mother and baby.

The impact of second-stage CS on neonatal outcomes is equally significant. Studies consistently report a higher rate of neonatal intensive care unit (NICU) admissions, birth asphyxia, and respiratory distress among infants delivered by second-stage CS compared to those delivered by first-stage CS.⁷ We report diagnosed neonatal admissions with percentages of, 36% admissions with respiratory distress syndrome, 32% with hypoxic ischemic encephalopathy, 20% with APGAR score of <7 and 12% with meconium-stained labour. These results are in comparison to the data published by Ahazeej who has reported a neonatal admission rate of 30% with birth asphyxia, 40% with meconium aspiration and 8.3%/10% for TTN and Grunting.⁴ Similarly, the study conducted by Anusha demonstrated that neonatal admissions consisted of birth asphyxia with 16.66%, respiratory distress with 41.66% and meconium aspiration with 25 % of cases.¹⁰ Neonatal outcomes are affected by the timing and circumstances of CS. The risk of birth asphyxia, respiratory distress, and NICU admission is significantly higher in second-stage CS cases, reflecting the challenges related with delivering a deeply engaged fetal head and the potential for intraoperative hypoxia.^{7,9} In our study, the absence of stillbirths and neonatal deaths is a noteworthy finding and may, in large part, be credited to the presence of timely and effective neonatal resuscitation protocols, as well as the immediate availability of neonatal intensive care services. These factors likely played a critical role in stabilizing compromised neonates who were delivered during the particularly high-risk period of the second stage of labour. The presence of trained neonatologists, rapid assessment at birth, and access to advanced supportive care such as

mechanical ventilation, intravenous therapy, and continuous monitoring likely contributed to the favourable short-term outcomes observed in our cohort. While our institution's preparedness and efficient neonatal care may have mitigated the most severe consequences, the possibility of significant neonatal morbidity persists. In this context following were some limitations that have been identified in the study.

Limitations of the study.

1. Single center design: since the study has been performed in only one institute and with a peculiar clientele the results cannot be generalized in other settings particularly catering for the resources available at our center.
2. Cross-sectional study design: in order to get an elaborate data about the maternal and foetal outcomes, extensive studies with long term follow ups are necessitated.
3. Small sample size: during the study period available only 25 patients had a caesarean delivery in the second stage which does not permit a robust statistical analysis.

In conclusion, CS performed in the second stage of labor is associated with increased maternal and neonatal morbidity, including higher rates of postpartum hemorrhage, infection, and NICU admission.⁷ The technical difficulty of the procedure and the altered pelvic anatomy at this stage contribute to these risks, underscoring the need for skilled obstetric care and timely intervention.⁹ The findings from our study and its comparison with available data, highlight the importance of careful decision-making, preoperative planning, and postoperative care in optimizing outcomes for both mother and baby.

CONCLUSION

Second-stage caesarean sections comprised 3.8% of all procedures, mainly due to non-progress of labour, and were linked to maternal and fetal complications. The findings stress the need for expert obstetric judgment, careful use of instrumental delivery, and diligent perioperative care to improve outcomes in this high-risk group.

Authors Contribution:

Sadaf Moin: Corresponding Author
Ayesha Akram: Co Author (Data Entry & Analysis)
Shazia Iffet: Co Author (Literature Search)
Farwah Arif: Co Author (Data Collection)
Maryam Nisar: Co Author (Data Analysis)
Nayab Gull: Co Author (Data Collection)

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