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Original Research Article

A study of second stage caesarean sections at term

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ABSTRACT

Background: Caesarean section (CS) in the second stage of labour is a technically demanding procedure associated with significant maternal and neonatal morbidity. Its rising incidence, driven by declining use of instrumental vaginal delivery and increasing medicolegal concerns, makes it an important area of study. This study aimed to assess the incidence, indications, intraoperative and postoperative complications, and fetomaternal outcomes of second stage CSs at a tertiary care teaching hospital in North India.

Methods: A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology, Christian Medical College and Hospital (CMCH), Ludhiana. Obstetric records of all patients who underwent CS in the second stage of labour between 1st January 2018 and 30th June 2020 were reviewed and analysed.

Results: Of 1372 total CSs performed during the study period, 103 (7.5%) were in the second stage of labour. The majority of women (79.6%) were aged 21-30 years; 66% were primigravidae. Induced labour was present in 56.3% of cases. Cephalopelvic disproportion was the most common indication (33.3%), followed by fetal distress (22.9%). The head push method was used in 71.8% of cases for delivery of the impacted fetal head. Uterine atony was the most common intraoperative complication (21.3%). The majority of women (72%) had no postoperative complications. Fifty-eight percent of neonates had no complications; birth asphyxia (10.7%) and meconium aspiration syndrome (6.8%) were the most common neonatal morbidities.

Conclusions: Second stage CS is associated with significant fetomaternal morbidity. Proactive antenatal assessment, judicious intrapartum management, and structured training in operative vaginal delivery and fetal head disimpaction techniques are essential to reduce its incidence and associated complications.

Keywords: Caesarean section, Second stage of labour, Cephalopelvic disproportion, Fetal distress, Impacted fetal head, Fetomaternal outcome

INTRODUCTION

Global caesarean section (CS) rates rose from 7% in 1990 to 21.1% as of recent estimates, with projections of nearly 29% by 2030.¹ This escalation is driven not only by medically indicated deliveries but increasingly by non-medically indicated sections.²

India mirrors this trend, with NFHS-5 (2019-2021) reporting a national CS rate of 21.5% above the WHO-recommended range of 10-15% reaching 47% in private facilities versus 14.3% in public institutions.³

The second stage of labour begins with full cervical dilatation and ends with expulsion of the fetus. Risk factors for a prolonged second stage include epidural analgesia, occipito-posterior position, nulliparity, short maternal stature, fetal macrosomia, and a high fetal station at complete dilatation.⁴ A cohort study of over 51,000 women found that each additional hour of second stage significantly increased the risk of postpartum haemorrhage, anal sphincter injury, and operative delivery.⁵

CS at full cervical dilatation termed second stage CS is an increasingly prevalent obstetric challenge. Its difficulty

arises from distorted pelvic anatomy, a thinned oedematous lower uterine segment, and a deeply impacted fetal head.⁶ Recognised indications include cephalopelvic disproportion, deep transverse arrest, arrest of descent, fetal distress, failed instrumental delivery, persistent occipito-posterior position, and obstructed labour.⁷

Several techniques have been described for delivery of the deeply impacted fetal head. In the head push method, the assistant's hand placed vaginally cups the fetal head and lifts it towards the uterine incision while the surgeon simultaneously delivers it from above.⁸ In Patwardhan's technique, the anterior shoulder is delivered first by hooking the arm, followed by the posterior shoulder, then the trunk with fundal pressure, and the deeply impacted head is delivered last.⁹ In the modified Patwardhan's technique, the anterior shoulder is delivered first, followed sequentially by the ipsilateral leg, contralateral leg, both arms, the trunk, and finally the deeply impacted head.¹⁰ The choice of technique depends on the degree of head impaction and operator experience.

On the basis of WHO data, CS rates of 10-15% at population level are associated with reduced maternal and neonatal mortality; rates exceeding this threshold confer no additional benefit.¹¹ The rising incidence of second stage CS reflects declining use of instrumental delivery, inadequate junior staff training, erosion of expertise in assisted vaginal delivery, and medicolegal concerns.^{12,13} In our centre this is compounded by delayed referrals from peripheral units, with patients often arriving in advanced or obstructed labour.

Second stage CS is associated with uterine angle extension, prolonged surgical time, bladder injury, postpartum haemorrhage, and prolonged hospital stay.¹⁴ Neonatal morbidity includes low Apgar scores, birth asphyxia, meconium aspiration syndrome, and fetal acidemia.^{15,16} Importantly, second stage caesarean delivery is associated with increased risk of early-term and late preterm birth in subsequent pregnancies.¹⁷

This study assessed the incidence, indications, intraoperative and postoperative complications, and fetomaternal outcomes of second stage CSs at our institution from January 2018 to June 2020.

Aims and objectives

Aim and objectives were to study the frequency and indications of second stage CS and to study the maternal and fetal outcomes of second stage caesarean deliveries.

METHODS

Study design and setting

This was a retrospective observational study conducted in the Department of Obstetrics and Gynaecology, CMCH, Ludhiana a tertiary care teaching hospital in Punjab, North

India. The study was approved by the research committee and institutional ethics committee of CMC, Ludhiana. As the study involved retrospective review of de-identified obstetric records, a waiver of informed consent was granted by the institutional ethics committee.

Study period and population

Obstetric records of all patients who delivered by CS in the second stage of labour at CMC, Ludhiana, between 1st January 2018 and 30th June 2020 (a period of two-and-a-half years) were reviewed. The total number of cases included in the study was 103.

Inclusion criteria

All singleton term pregnancies (37-42 weeks of gestation) delivered by second stage CS at CMC, Ludhiana, during the study period.

Exclusion criteria

Patients with second stage CSs performed outside CMC and referred for postoperative management and preterm deliveries (less than 37 weeks of gestation) were excluded.

Definitions of indications

Deep transverse arrest (DTA)

The fetal head is deep in the pelvic cavity with the sagittal suture placed in the transverse bispinous diameter, with no progress in descent for 30–60 minutes following full cervical dilatation despite adequate uterine contractions.

Cephalopelvic disproportion (CPD)

A disparity between the size of the fetal head and the maternal pelvis, either due to a normally-sized baby with a contracted pelvis, a macrosomic or hydrocephalic baby with a normal pelvis, or a combination of both.

Obstructed labour

Failure of progressive descent of the presenting part despite adequate uterine contractions, due to a mechanical obstruction from fetal or maternal factors, such that further progress without operative assistance is impossible.

Failed instrumental delivery

A deliberate attempt at operative vaginal delivery using forceps that has failed to achieve delivery of the fetus.

Arrest of descent

No change in station of the presenting part over a period of at least two hours, despite adequate uterine contractions, following full cervical dilatation.

Data collection and analysis

Data were collected from obstetric case records using a pre-designed semi-structured proforma. Variables recorded included patient age, parity, gestational age, booking status, body mass index, antenatal complications, onset of labour (spontaneous or induced), duration of first and second stages of labour, station of the presenting part at the time of CS, anaesthesia type, method of fetal head delivery, intraoperative complications, postoperative complications, total blood loss, birth weight, Apgar scores, and NICU admissions. Data were entered into Microsoft Excel and analysed using descriptive statistics. Categorical variables are presented as frequency and percentage; continuous variables as mean±standard deviation (SD). The study was conducted in compliance with STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines.

RESULTS

Incidence and delivery trends

The total number of deliveries at CMC, Ludhiana, during the study period (January 2018-June 2020) was 2795, of which 1372 were caesarean deliveries. Of these, 103 (7.5%) were performed in the second stage of labour. The year-wise distribution of deliveries is shown in Table 1.

Demographic profile

The maternal demographic features are summarised in Table 2. Of the 103 women, 61 (59.22%) were unbooked patients and 42 (40.78%) were booked, the majority of the unbooked cases being delayed referrals from primary healthcare centres and district hospitals. The majority of women (79.61%, n=82) were aged 21-30 years; 18.45% (n=19) were above 30 years, and 1.94% (n=2) were below 20 years of age. Sixty-six percent (n=68) were primigravidae and 34% (n=35) were multigravidae.

Risk factors and antenatal complications

Analysis of risk factors revealed that 36 women (34.95%) were overweight (BMI 25-29 kg/m²) and 13 (12.62%) were obese (BMI ≥30 kg/m²). There were 7 cases of elderly primigravida, 3 cases of gestational diabetes mellitus, and 7 cases of short stature. Gestational hypothyroidism was the most prevalent antenatal complication (21.36%, n=22). The complete distribution of antenatal complications is presented in Table 3.

Labour characteristics

Labour was induced in 58 cases (56.3%) and spontaneous in 45 cases (43.7%). Analysis of labour stages revealed that 26 nulliparous and 13 multiparous women had a prolonged first stage of labour, which is a recognised risk factor for second stage CS. On per vaginal examination at the time of CS, the presenting part was at +1 station in

54.4% (n=56), at 0 station in 37.9% (n=39), and at +2 station in 7.8% (n=8) of cases.

Indications for CS

The indications are presented in Table 4. Cephalopelvic disproportion was the most common indication, accounting for 33.3% (n=32) of cases, followed by fetal distress in 22.9% (n=27), arrest of descent in 19.8% (n=18), and obstructed labour in 17.7% (n=17). The majority of patients were delayed referrals from primary health centres and district hospitals to our tertiary care hospital.

Method of delivery of the impacted fetal head

The head push method was the most commonly used technique, employed in 71.8% (n=74) of cases. This was followed by Patwardhan's technique in 14.6% (n=15) and the modified Patwardhan's technique in 13.6% (n=14) of cases.

Intraoperative complications

Uterine atony was the most common intraoperative complication, occurring in 21.3% (n=22) of cases. Blood transfusion was required in 7.8% (n=8). Uterine wound extension, attributable to the difficulty encountered during delivery of the deeply engaged head, occurred in 5.8% (n=6). Episiotomy was performed in 7.8% (n=8) of cases to facilitate vaginal disimpaction of the fetal head. Bladder injury was observed in 1.0% (n=1) of cases. The distribution of intraoperative complications is illustrated in Figure 1.

Postoperative complications

The majority of women-72% (n=74)-did not experience any significant postoperative complication. Among those who did, prolonged urinary catheterisation was required in 10.7% (n=11) and haematuria was observed in 5.8% (n=6), attributable to bladder wall oedema and congestion from the intimate proximity of the drawn-up bladder to the lower uterine segment in advanced labour. Postoperative fever was recorded in 3.9% (n=4) of cases. Surgical site infection requiring wound resuturing was observed in 1.9% (n=2) of cases. Prolonged hospital stays (beyond five days) occurred in the 5.8% (n=6) of cases. The distribution of post-operative complications is illustrated in the Figure 2.

Neonatal birth weight

The majority of neonates (85.4%, n=88) weighed between 2500 and 4000 grams. Neonates weighing 1500–2499 grams accounted for 11.7% (n=12), those weighing more than 4000 grams for 1.9% (n=2), and those weighing less than 1500 grams for 0.9% (n=1). The birth weight distribution is illustrated in Figure 3.

Neonatal complications

Neonatal outcomes are presented in Table 5. The majority of neonates 58.3% (n=60) had no complications and were discharged under satisfactory conditions. Birth asphyxia was the most common neonatal complication (10.7%, n=11), followed by meconium aspiration syndrome and

pneumonia (6.8% each, n=7). Hypoxic ischaemic encephalopathy was observed in 2.9% (n=3) and neonatal seizures in 1.9% (n=2). Transient tachypnoea of the newborn occurred in 1.0% (n=1). Other complications including calcaneovalgus deformity, G6PD deficiency, neonatal hyperbilirubinaemia, macrosomia, and neonatal hypoglycaemia collectively observed in 11.7% (n=12).

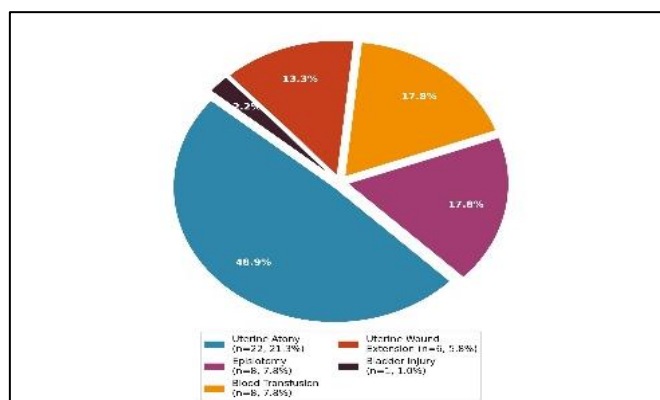


Figure 1: Distribution of intraoperative complications in patients who underwent second stage CS at CMCH, Ludhiana, from January 2018 to June 2020 (n=103).

*Uterine atony was the most common intraoperative complication, occurring in 21.3% (n=22) of cases.

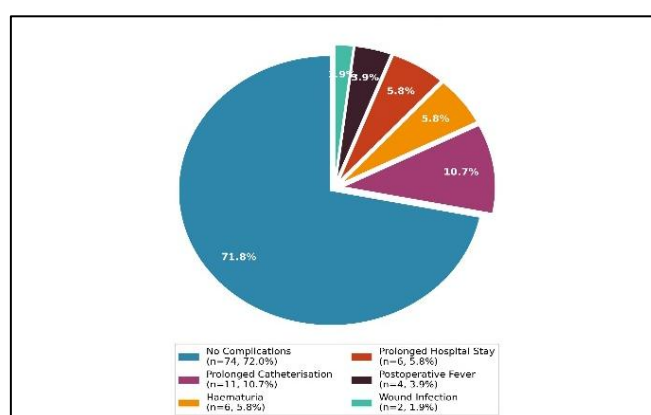


Figure 2: Distribution of postoperative complications in patients who underwent second stage CS at CMCH, Ludhiana, from January 2018 to June 2020 (n=103).

*The majority of women (72%, n=74) did not experience any significant postoperative complication. Urinary tract-related complications were the most frequently observed among those who did.

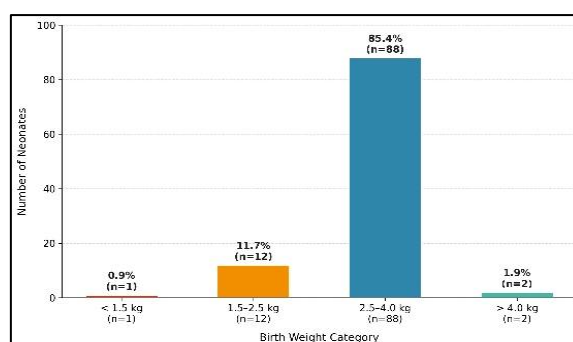


Figure 3: Birth weight distribution (in kg) of neonates delivered by second stage CS at CMCH, Ludhiana, from January 2018 to June 2020 (n=103).

*The majority of neonates (85.4%, n=88) weighed between 2.5 and 4.0 kg.

Table 1: Year-wise distribution of deliveries at CMC, Ludhiana, during the study period (January 2018- June 2020).

Variables	2018	2019	2020 (Jan-Jun)	Total
Total deliveries	1207	1112	476	2795
Vaginal deliveries	608	497	230	1335
Assisted vaginal deliveries	47	31	10	88
Elective LSCS	307	399	186	892
Emergency LSCS	245	185	50	480
Total LSCS	552	584	236	1372

Table 2: Maternal demographic features of the study population, (n=103).

Features	N	Percentage (%)
Age (in years)		
<20	2	1.94
21-30	82	79.61
>30	19	18.45
Gravida		
Primigravida	68	66.0
Multigravida	35	34.0
Unbooked	61	59.22
Booked	42	40.78

Table 3: Distribution of antenatal complications in the study population, (n=103).

Antenatal complications	N	Percentage (%)
Gestational hypothyroidism	22	21.36
BMI		
Overweight (BMI 25-29 kg/m ²)	36	34.95
Obese (BMI ≥30 kg/m ²)	13	12.62
Anaemia	8	7.77
Cholestasis of pregnancy	8	7.77
Elderly primigravida (≥35 years)	7	6.79
Gestational hypertension	6	5.83
Pre-eclampsia	4	3.88
Previous LSCS	4	3.88
Antepartum eclampsia	3	2.91
Fetal growth restriction	3	2.91
Gestational diabetes mellitus	3	2.91
Short stature	3	2.91
Oligohydramnios	2	1.94
Chronic hypertension	1	0.97
Intrapartum eclampsia	1	0.97
Bicornuate uterus	1	0.97

Table 4: Indications for second stage CS, (n=103).

Indications	N	Percentage (%)
Cephalopelvic disproportion	32	33.3
Fetal distress	27	22.9
Arrest of descent	18	19.8
Obstructed labour	17	17.7
Deep transverse arrest	7	6.7
Failed forceps	1	0.9
Persistent occipito-posterior position	1	0.9
Total	103	100

Table 5: Distribution of neonatal complications (n=103).

Neonatal complications	N	Percentage (%)
No complications	60	58.3
Other complications*	12	11.7
Birth asphyxia	11	10.7
Meconium aspiration syndrome	7	6.8
Pneumonia	7	6.8
Hypoxic ischaemic encephalopathy	3	2.9
Neonatal seizures	2	1.9
Transient tachypnoea of the newborn	1	1.0

*Other complications include: calcaneovalgus deformity, G6PD deficiency, neonatal hyperbilirubinaemia, macrosomia, and neonatal hypoglycaemia.

DISCUSSION

This retrospective study analysed 103 second stage CS s among 1372 total caesarean deliveries at a North Indian tertiary care hospital over two-and-a-half years, yielding an incidence of 7.5%. This pre-pandemic analysis provides useful baseline data for comparison with contemporary obstetric practice.

Incidence

Our incidence of 7.5% is comparable to the 7.7% reported by Kumaresan et al and figures from other North Indian tertiary centres.^{7,18} A 2024 Indian retrospective study by Chandrashekhar et al reported a lower rate of 2.71%, possibly reflecting differences in referral patterns and institutional caseload.¹⁹ The higher rate in our study is largely attributable to the 59.22% burden of unbooked patients, the majority being delayed referrals presenting in advanced or obstructed labour-a pattern characteristic of North Indian tertiary referral hospitals.

Demographic profile and risk factors

The predominance of women aged 21-30 years (79.61%) is consistent with Kumaresan et al and Malathie et al.⁷ The high proportion of primigravidae (66%) is expected, as nulliparity predisposes to fetopelvic disproportion and uterine inertia. This aligns with Davis et al (76.2%) and Qadir et al (88%), though our proportion was lower, likely due to inclusion of referred multigravid women with obstructed labour.¹² The prevalence of overweight (34.95%) and obesity (12.62%) is noteworthy, as elevated BMI is a recognised risk factor for prolonged labour and operative delivery.

Labour characteristics

Induced labour was present in 56.3% of cases. Induction with suboptimal cervical ripening or poorly monitored oxytocin carries a risk of dysfunctional labour culminating in second stage operative delivery. The majority had presenting parts at +1 (54.4%) or 0 station (37.9%) at the time of CS, indicating a moderately to deeply engaged head in most cases. The finding that 26 nulliparous and 13

multiparous women had a prolonged first stage further highlights cumulative uterine stress prior to second stage CS.

Indications

Cephalopelvic disproportion was the most common indication (33.3%), consistent with Kumaresan et al (34.8%).⁷ Fetal distress was the second most common (22.9%), followed by arrest of descent (19.8%) and obstructed labour (17.7%). In contrast, Qadir et al and Goswami et al reported deep transverse arrest as the predominant indication (47% and 14% respectively), reflecting differences in population characteristics and referral patterns.^{16,20} The relatively high proportion of obstructed labour (17.7%) in our cohort is characteristic of a high-volume tertiary referral centre receiving advanced cases from peripheral units.

Method of delivery of the impacted fetal head

The head push method was the most commonly used technique (71.8%), in contrast to Kumaresan et al in whom Patwardhan's technique predominated (48%).⁷ This difference likely reflects institutional training practices and operator familiarity. A 2023 systematic review by Gq Peak et al analysing 13 studies comprising 2506 women found that compared to reverse breech extraction, the push method was associated with significantly higher rates of uterine incision extension, blood transfusion, bladder injury, postpartum haemorrhage, NICU admission, and low 5-minute Apgar scores. However, no statistically significant differences were identified between the push method and Patwardhan's technique for these outcomes.²¹ A 2022 systematic review and meta-analysis by Rada et al similarly emphasised individualised technique selection based on the degree of head impaction.²² These findings collectively support the prioritisation of training in reverse breech extraction alongside Patwardhan's technique within postgraduate obstetric curricula.

Intraoperative complications

Uterine atony was the most common intraoperative complication, observed in 21.3% of cases notably higher

than the 8% and 10% reported by Goswami et al and Belay et al respectively.^{16,20} This elevated rate in our cohort is attributable to the greater proportion of induced labours (56.3%), prolonged duration of labour, and the burden of obstructed labour referrals, all of which predispose to uterine muscle fatigue and subsequent atony. Blood transfusion was required in 7.8% of cases, consistent with the 10.76% reported by Qadir et al. Uterine wound extension occurred in 5.8% of cases, considerably lower than rates of 14.6% (Qadir et al) and 17% (Chopra et al) consistent with the comparable complication profile between the head push method and Patwardhan's technique demonstrated by Gq Peak et al.^{20,21} Bladder injury was observed in 1.0% of cases, consistent with published literature.

Postoperative complications

The majority of women (72%) had no significant postoperative complication. Prolonged catheterisation (10.7%) and haematuria (5.8%) were most frequent, attributable to bladder wall oedema and proximity of the drawn-up bladder to the lower uterine segment. Kumaresan et al reported higher rates of 38% and 34.8% respectively likely reflecting a greater proportion of deeply impacted cases.⁷ Postoperative fever (3.9%) and surgical site infection requiring resuturing (1.9%) were uncommon, reflecting structured surgical care at our tertiary centre.

Neonatal outcomes

Notably, 58.3% of neonates had no complications and were discharged satisfactorily. Birth asphyxia (10.7%) and meconium aspiration syndrome (6.8%) were most common, reflecting fetal hypoxia from uterine contractions against the impacted head. Hypoxic ischaemic encephalopathy was observed in 2.9%. These findings are consistent with Chandrashekhar et al who similarly reported elevated NICU admissions from birth asphyxia and non-reassuring fetal heart rate patterns.¹⁹

Future obstetric implications

Second stage CS carries implications beyond the index delivery. Sapis et al confirmed its independent association with increased risk of early-term and late preterm birth in subsequent pregnancies, consistent with Berghella et al.^{17,23} Women should be counselled regarding future obstetric risks at discharge.

CONCLUSION

Second stage CS is a technically challenging procedure associated with significant fetomaternal morbidity. Cephalopelvic disproportion and fetal distress were the most common indications. The head push method predominated, though evidence supports greater adoption of reverse breech extraction. Most women (72%) had no postoperative complications and 58.3% of neonates had no adverse outcomes; however, uterine atony, birth asphyxia,

and meconium aspiration syndrome were significant causes of morbidity. Second stage CS also carries long-term implications including increased preterm birth risk in subsequent pregnancies.

Preventive measures recommended include: careful antenatal fetopelvic assessment; proper use of the partograph; judicious oxytocin augmentation; mandatory postgraduate training in operative vaginal delivery and fetal head disimpaction techniques including reverse breech extraction; early senior obstetrician involvement in prolonged second stage; and timely neonatology team notification for all anticipated second stage caesarean deliveries.

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

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