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MATERNAL AND NEONATAL OUTCOMES OF FORCEPS-ASSISTED VAGINAL DELIVERIES: A RETROSPECTIVE OBSERVATIONAL STUDY AT A TERTIARY CARE HOSPITAL

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Abstract

Background:

Forceps-assisted vaginal delivery remains an essential component of operative obstetrics, particularly in low- and middle-income countries where cesarean access may be limited. This study aimed to evaluate maternal and neonatal outcomes associated with forceps use in a tertiary care setting.

Methods:

A retrospective observational study was conducted at Saveetha Hospital, Chennai, over a 12-month period (November 2023 to October 2024). Medical records of 50 singleton pregnancies delivered using Wrigley's outlet forceps were reviewed. Maternal outcomes included episiotomy extension, genital tract trauma, postpartum hemorrhage, and length of hospital stay. Neonatal outcomes included Apgar scores, NICU admission, birth injuries, and perinatal mortality. Data were analyzed descriptively.

Results:

The primary indication for forceps delivery was non-reassuring fetal heart rate (54%), followed by maternal exhaustion (18%). Maternal morbidities included episiotomy extension (14%), genital tract injuries (12%), postpartum hemorrhage (6%), and one uterine rupture. Neonatal complications included Apgar score <7 at 1 minute in 24% of cases, NICU admissions in 12%, and minor birth trauma in 10%. There were two stillbirths and one early neonatal death, yielding a perinatal mortality rate of 6%.

Conclusions:

When appropriately indicated and skillfully performed, forceps-assisted vaginal delivery is associated with acceptable maternal and neonatal outcomes and serves as a valuable alternative to cesarean section in the second stage of labor. Continued emphasis on training and clinical protocols is essential to safely preserve this obstetric skill.

Keywords: Forceps delivery, maternal morbidity, neonatal outcomes, operative vaginal delivery, retrospective observational study

INTRODUCTION

Operative vaginal delivery, including the use of obstetric forceps, has long been an integral component of intrapartum care, particularly for facilitating childbirth during the second stage of labor when maternal or fetal indications demand expedited delivery. Historically, forceps have provided a critical alternative to cesarean section in settings where rapid delivery is necessary but surgical intervention may not be immediately feasible or desirable. The use of forceps is associated with both maternal and neonatal risks, such as perineal trauma, postpartum hemorrhage, facial nerve palsy, and low Apgar scores; however, these risks may be mitigated with proper technique and case selection(1,2).

In recent years, a noticeable decline in the use of forceps has been reported worldwide, attributed to increasing cesarean rates, medico-legal concerns, and reduced training opportunities for residents in operative vaginal techniques(3,4). This trend has raised concerns about overutilization of cesarean delivery and its associated long-term morbidities, such as uterine rupture, placenta accreta spectrum, and increased surgical complications in future pregnancies(5,6). In low- and middle-income countries (LMICs), where access to timely surgical care may be limited, forceps-assisted vaginal delivery remains an essential skill to reduce maternal and perinatal mortality.

Given this context, the present study seeks to re-evaluate the clinical utility and safety of forceps delivery in a contemporary Indian tertiary care setting. By systematically examining maternal and neonatal outcomes associated with forceps use, this investigation aims to provide evidence to guide obstetric practice and training.

The primary objective of this study was to evaluate maternal and neonatal outcomes associated with forceps-assisted vaginal deliveries conducted in a tertiary care hospital. The secondary objectives included identifying the most common clinical indications for forceps application, documenting the frequency and types of maternal complications such as episiotomy extension, genital tract injuries, and postpartum hemorrhage, and analyzing key neonatal outcomes including Apgar scores, NICU admissions, birth trauma, and mortality. The prespecified hypothesis was that forceps-assisted deliveries, when performed under appropriate clinical indications and with skilled supervision, would be associated with acceptable levels of maternal and neonatal morbidity and could serve as a safe and effective alternative to cesarean section, particularly in the second stage of labor.

Methods

This was a retrospective descriptive observational study conducted in the Department of Obstetrics and Gynaecology at Saveetha Hospital, a tertiary care government institution located in Chennai, India. The study covered a 12-month period from November 2023 to October 2024. Data were retrieved from labor room registers, maternal case records, and neonatal files. All cases of forceps-assisted vaginal deliveries during the study period were screened, and a total of 50 cases meeting the eligibility criteria were included. Inclusion criteria comprised singleton pregnancies with cephalic presentation delivered using Wrigley's outlet forceps at a gestational age of 34 weeks or more. Exclusion criteria included multiple pregnancies, non-cephalic presentations, cesarean conversions after attempted forceps delivery, and incomplete documentation. As this was a descriptive study focusing on a single group, no active follow-up was required; outcomes were recorded during delivery and immediate postpartum or neonatal periods.

The exposure variable was the application of forceps during vaginal delivery. The maternal outcomes assessed included extension of episiotomy, genital tract injuries such as vaginal or cervical lacerations, third- and fourth-degree perineal tears, paraurethral tears, uterine rupture, postpartum hemorrhage (PPH), need for blood transfusion, and prolonged hospital stay beyond 48 hours. Neonatal outcomes assessed were Apgar scores at 1 and 5 minutes, NICU admissions, birth trauma (scalp/facial bruises, subconjunctival hemorrhage, facial palsy), stillbirths, and early neonatal deaths. Potential confounding factors considered were parity, birth weight, gestational age, and previous cesarean section. Diagnostic definitions included PPH as blood loss exceeding 500 mL after vaginal delivery, low Apgar score as <6, stillbirth as fetal death beyond 28 weeks without signs of life, and early neonatal death as death within the first 7 days of life.

Data were collected using a standardized proforma and cross-verified from multiple hospital records to enhance accuracy. All assessments were performed in a uniform clinical environment under standard institutional protocols. To reduce selection bias, all consecutive forceps deliveries during the defined period were included. Information bias was minimized by consulting multiple records, although observer bias inherent to retrospective studies could not be fully eliminated.

The study size was based on the total number of eligible forceps deliveries during the one-year period; no formal sample size calculation was performed. Quantitative variables such as maternal age, gestational age, Apgar scores, and birth weight were expressed as means with standard deviations. Grouping of some variables was performed based on conventional clinical thresholds: for instance, birth weight was categorized as <2000 g, 2000–3000 g, 3000–4000 g, and >4000 g; Apgar scores were stratified as 0–3, 4–6, and 7–10 for both 1-minute and 5-minute assessments.

Descriptive statistics were used for data analysis. Categorical variables were reported as frequencies and percentages, and continuous variables were summarized using mean ± SD. No subgroup analysis or interaction effects were examined due to the absence of comparison groups. Missing data were minimal and excluded during case selection. Since this was a hospital-based short-term study, loss to follow-up was not applicable. No sensitivity analysis was undertaken.

Results

A total of 57 women who underwent forceps-assisted vaginal deliveries were initially identified from institutional records during the study period. After assessing for eligibility, 50 cases were included in the final analysis. Seven were excluded due to incomplete documentation (n = 4), conversion to cesarean section following failed forceps

attempt (n = 2), and malpresentation (n = 1). All included participants were followed until postpartum discharge, and no cases were lost to follow-up.

The sociodemographic and obstetric profile of the study population is summarized as follows: the majority of the women (40%) were in the age group of 20–30 years, followed by 28% in the 30–40 year age range, 24% below 20 years, and 8% above 40 years. Primigravida constituted 68% of the cohort, and 84% of the deliveries occurred at term (37–40 weeks), with 12% post-term and 4% preterm. No missing data were recorded for these variables. All deliveries involved the use of Wrigley's outlet forceps applied in the second stage of labor. Potential confounding factors such as parity, gestational age, prior cesarean delivery, and neonatal birth weight were taken into consideration during data interpretation.

Sociodemographic and Obstetric Profile of Study Participants

Characteristics	**Number**	**Percentage (%)**
Age < 20 years	12	24
Age 20–30 years	20	40
Age 30–40 years	14	28
Age > 40 years	4	8
Primigravida	34	68
Multigravida	16	32
Gestational Age < 37 wks	2	4
Gestational Age 37–40 wks	42	84
Gestational Age > 40 wks	6	12

TABLE-1

The primary indications for forceps application included non-reassuring fetal heart rate patterns in 54% of cases, followed by maternal exhaustion (18%), failure of fetal head descent (10%), and the need to shorten the second stage of labor (8%). Less frequent indications included prior lower segment cesarean section (4%), eclampsia (4%), and severe maternal anemia (2%).

Indications for Forceps-Assisted Vaginal Delivery

Indication	Number	Percentage (%)
Non-reassuring fetal heart rate	27	54
Maternal exhaustion	9	18
Failure of descent	5	10
To cut short second stage	4	8
Previous LSCS	2	4
Eclampsia	2	4
Severe anemia	1	2

TABLE-2

Indications for Forceps-Assisted Vaginal Delivery

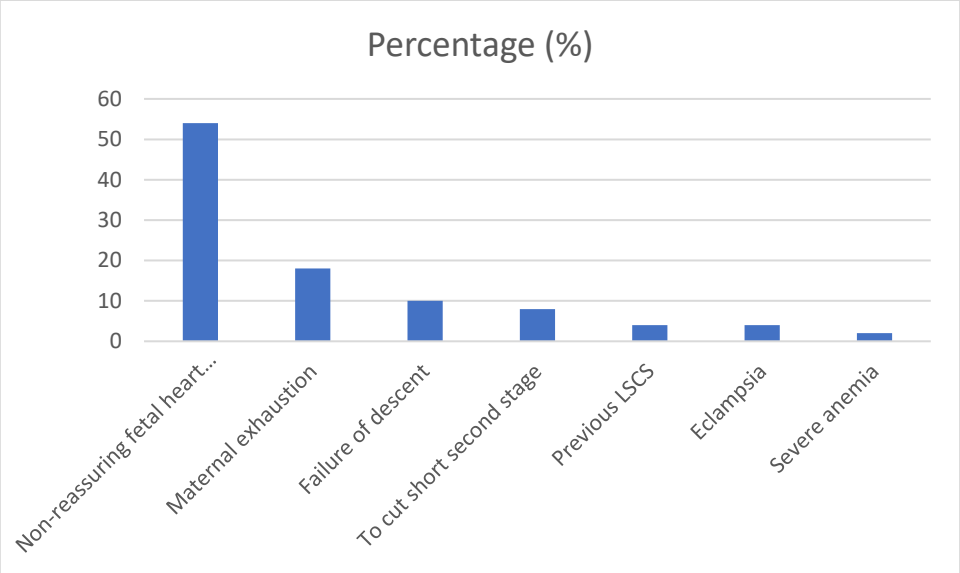

FIGURE-1

Maternal complications were documented in several cases. Episiotomy extension was the most common complication, noted in 14% of participants. Vaginal and cervical lacerations occurred in 4%, while third- or fourth-degree perineal tears, paraurethral tears, and vulvovaginal hematomas were each observed in 2% to 4% of patients. One case of uterine rupture was identified in a patient with a previous cesarean delivery. Postpartum hemorrhage requiring blood transfusion occurred in 6% of cases. Additionally, prolonged hospital stay beyond 48 hours was noted in 8% of patients due to perineal repair or observation following uterine trauma. No maternal mortality was recorded.

Maternal Complications Associated with Forceps-Assisted Delivery

Morbidity Condition	Number	Percentage (%)
Episiotomy extension	7	14
Vaginal/cervical lacerations	2	4
Perineal tear (3rd/4th degree)	1	2
Paraurethral tear	1	2
Vulvovaginal hematoma	2	4
Uterine rupture	1	2
PPH requiring blood transfusion	3	6
Hospital stay >48 hours	4	8

TABLE-3

Maternal Complications Associated with Forceps-Assisted Delivery

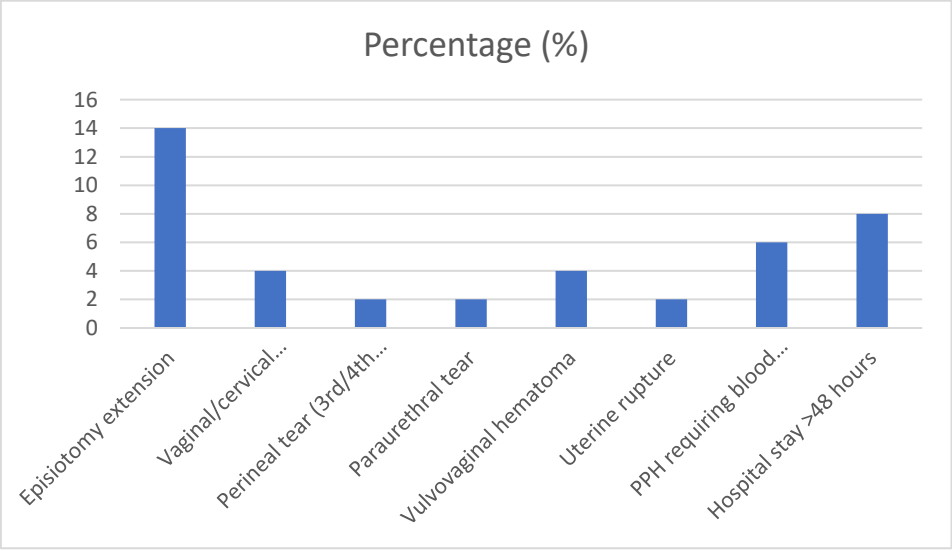

FIGURE-2

In terms of neonatal outcomes, birth weight distribution showed that 52% of neonates weighed between 2000–3000 grams, 36% between 3000–4000 grams, 10% above 4000 grams, and 2% below 2000 grams. The mean birth weight was 2.94 ± 0.41 kg. Apgar scores at 1 minute were below 7 in 24% of cases, with 8% scoring 0–3 and 16% scoring 4–6. At 5 minutes, 10% continued to have scores below 7. A total of 12% of newborns required NICU admission, with most cases attributed to respiratory distress or perinatal depression. Minor neonatal trauma was observed in the form of scalp or facial bruises (10%), facial palsy (2%), and subconjunctival hemorrhage (2%). There were two stillbirths and one early neonatal death, accounting for a total perinatal mortality of 6%.

Meconium-stained amniotic fluid was present in several cases, particularly those with fetal distress, although this was not separately quantified.

Distribution of Neonatal Birth Weights

Birth Weight (g)	Number	Percentage (%)
< 2000	1	2
2000–3000	26	52
3000–4000	18	36
> 4000	5	10

TABLE-4

Distribution of Neonatal Birth Weights

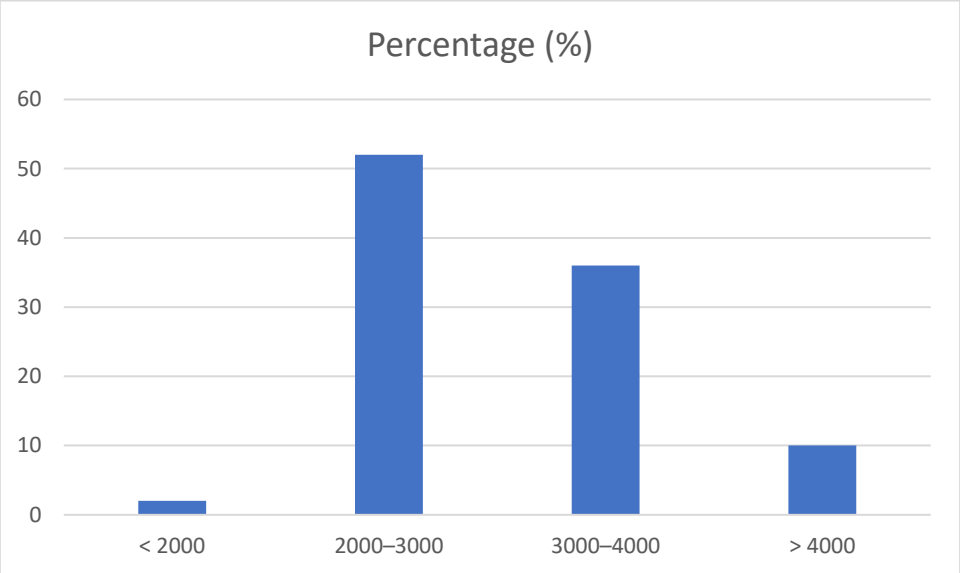

FIGURE-3

Neonatal Morbidity and Outcomes Following Forceps Delivery

Morbidity	Number	Percentage (%)
Apgar 0–3 at 1 minute	4	8
Apgar 4–6 at 1 minute	8	16
Apgar 0–3 at 5 minutes	2	4
Apgar 4–6 at 5 minutes	3	6
NICU admission	6	12
Scalp/facial marks or bruises	5	10
Facial palsy	1	2
Subconjunctival hemorrhage	1	2
Stillbirths	2	4
Early neonatal death	1	2

TABLE-5

Due to the descriptive nature of the study and the absence of a control group, formal statistical testing or confounder-adjusted estimates were not performed. However, outcomes were stratified based on clinically relevant categories such as Apgar scores (0–3, 4–6, ≥7) and birth weights (<2000 g, 2000–3000 g, 3000–4000 g, >4000 g) to facilitate meaningful interpretation. Subgroup observations suggested that severe perineal trauma and uterine rupture were more likely in primigravida patients and those delivering macrosomic infants, particularly in the context of a previous cesarean section. No sensitivity analyses were conducted, but observed trends remained consistent across gestational age and weight categories.

DISCUSSION

This retrospective observational study aimed to evaluate maternal and neonatal outcomes following forceps-assisted vaginal deliveries in a tertiary care setting. The key findings revealed that most forceps applications were indicated for non-reassuring fetal heart rate (54%) and maternal exhaustion (18%), reflecting established clinical scenarios for operative vaginal delivery. Maternal complications such as episiotomy extension (14%), genital tract trauma (12%), and postpartum hemorrhage (6%) were observed, while neonatal outcomes included low Apgar scores (<7 at 1 minute in 24%), NICU admissions (12%), and minor facial injuries. The perinatal mortality rate was 6%, which is consistent with findings from similar resource-limited settings (7,8).

These results align with those from Johnson et al., who reported an increased risk of maternal trauma in forceps deliveries but no significant difference in major neonatal morbidity when applied judiciously(1). Similarly, a large population-based study by Demissie et al. found that although forceps use was associated with neonatal complications, careful clinical practice minimized adverse outcomes(2). Eskandar et al. also reported that risks for third- and fourth-degree perineal tears were higher in primigravidas and macrosomic births—both factors relevant to the complications observed in our cohort(9).

Despite the reported complications, forceps deliveries offer a critical alternative to cesarean section, particularly in second-stage scenarios where fetal compromise demands immediate delivery. In a systematic review by O'Mahony et al., operative vaginal delivery was associated with lower maternal morbidity compared to cesarean delivery in the second stage, provided it was performed with appropriate skill and indications(10).Furthermore, a meta-analysis by Bahl et al. indicated that neonatal trauma rates were comparable between forceps and vacuum deliveries, though maternal trauma was relatively higher in forceps-assisted cases(11).

The findings also mirror evidence from Indian studies. Singh and Rathore observed similar indications and complication patterns in their comparative study on instrumental vaginal delivery(12).In a study conducted byBhosale et al. reported favorable outcomes with forceps use, emphasizing that adherence to clinical guidelines and training plays a central role in ensuring safety(13).

The **limitations** of the present study must be acknowledged. Its retrospective design is subject to potential information bias due to dependence on clinical records, and the absence of a control group prevents the calculation of relative risk or adjusted odds. The relatively small sample size (n=50) limits the statistical power and may not capture rare complications. Additionally, institutional practices, such as routine episiotomy and operator experience, may have influenced outcomes, limiting extrapolation to other settings. However, selection bias was minimized by including all consecutive eligible cases, and data were triangulated from multiple sources to ensure accuracy.

From an **interpretive standpoint**, the findings affirm the study's hypothesis that forceps, when applied under proper indications and skill, result in acceptable maternal and neonatal outcomes. Notably, the single uterine rupture case occurred in a patient with a prior cesarean section and macrosomic baby, underscoring the importance of cautious decision-making in trial of labor after cesarean (TOLAC). The pattern of low Apgar scores in cases with meconium-stained liquor and fetal distress suggests that poor neonatal condition was likely due to antenatal compromise rather than forceps per se—a distinction supported by Garret et al. and Shamsa et al.(14,15).

In terms of **generalisability**, these results are applicable to tertiary centers in LMICs where forceps remain an essential skill. However, external validity may be limited in settings where vacuum extraction is preferred or cesarean threshold is lower. Given the declining global use of forceps due to medico-legal concerns and reduced training exposure(3,4), the study reinforces the need to preserve operative vaginal delivery competencies through structured training and standardized protocols.

CONCLUSION

In conclusion, this study contributes to the growing body of evidence advocating the safe and judicious use of forceps, particularly in second-stage interventions. It underscores the need for ongoing clinical audit, simulation-based training, and adherence to guideline-based practices to maintain the efficacy and safety of this time-tested obstetric technique.

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