MAK HILL Publications Research Journal of Medical Sciences

Case Study
doi: 10.59218/makrjms.2024.4.503.507

Prevalence of Maternal and Neonatal Complications in Operative Vaginal Delivery: A Case-Control Study

[1]Amita Sharma, [2]Shiv Singh Manjhi, [3]Priykant Tomar and [4]Sangeeta Dudve

[1]Department of Obstetrics and Gynecology, Government Medical College, Datia, Madhya Pradesh, India
[2]Department of Pediatrics, SRVS Government Medical College, Shivpuri, Madhya Pradesh, India
[3]Department of Pediatrics, District Hospital, Jabalpur, Madhya Pradesh, India
[4]Department of Pediatrics, MGM Medical College, Indore, Madhya Pradesh, India

ABSTRACT

Operative vaginal delivery involves the use of forceps, a vacuum device, or another instrument by the operator to facilitate fetal extraction from the vagina, with or without concurrent maternal pushing efforts. The primary objective of this study is to compare the maternal and neonatal outcomes between normal delivery and operative vaginal delivery. This prospective case-control study was conducted at a tertiary care center in India, comprising 193 cases of instrumental delivery and 191 cases of normal delivery. The criteria outlined by the American College of Obstetricians and Gynecologists were employed to define outlet vacuum and outlet forceps deliveries. Control participants, who had normal vaginal deliveries, were matched for age and parity. Data collection was performed using a structured interview schedule and statistical analyses were conducted to fulfill the study's objectives. The incidence of vaginal lacerations was notably higher in the instrumental delivery group compared to the normal delivery group. Additionally, complications such as post-partum hemorrhage (PPH), puerperal complications, 1-minute Apgar scores below 7, cephalohematoma and hyperbilirubinemia were observed, with statistically significant differences between the two groups. Operative vaginal deliveries were associated with significantly higher rates of maternal complications, particularly vaginal lacerations and PPH, compared to normal deliveries. Neonatal complications, including low Apgar scores at 1 minute, cephalohematoma, hyperbilirubinemia and facial marks, were also more prevalent in operative vaginal deliveries.

OPEN ACCESS

Key Words
Forceps delivery, instrumental delivery, operative vaginal delivery, vacuum delivery, complications

Corresponding Author
Sangeeta Dudve,
Department of Pediatrics, MGM Medical College, Indore, Madhya Pradesh, India
sangeetadudve@gmail.com

Author Designation
[1]Associate Professor
[2,4]Senior Resident
[3]Postgraduate Medical Officer

Received: 11 March 2024
Accepted: 15 April 2024
Published: 26 April 2024

Citation: Amita Sharma, Shiv Singh Manjhi, Priykant Tomar and Sangeeta Dudve, 2024. Prevalence of Maternal and Neonatal Complications in Operative Vaginal Delivery: A Case-Control Study. Res. J. Med. Sci., 18: 503-507, doi: 10.59218/makrjms.2024.4.503.507

Copy Right: MAK HILL Publications

INTRODUCTION

Operative vaginal delivery refers to a procedure where a trained obstetrician or birth attendant uses instruments like a vacuum extractor or forceps during the second stage of labor to aid in delivery. Over the past few decades, there has been a decline in the rate of operative vaginal births, contributing to the rise in cesarean delivery rates. Between 1992 and 2013, the percentage of operative vaginal births decreased from 9.01-3.3% of all deliveries, concurrent with the increased rate of cesarean births. Nevertheless, operative vaginal delivery remains an essential aspect of contemporary obstetric care and when appropriately indicated, can be utilized to safely avoid cesarean deliveries[1-3].

Indications for operative vaginal delivery, whether using forceps or vacuum, encompass maternal, fetal, or combined factors. Fetal reasons may include suspected compromise (e.g., abnormal fetal monitoring, thick me conium), while maternal indications could involve a lack of progress in labor or exhaustion. Combined indications often coexist, necessitating assisted vaginal delivery. The classification of operative vaginal deliveries considers the fetal head's station and the required rotation for delivery. Lower fetal head positions with minimal rotation reduce the risks of maternal and fetal injury. However, vacuum extraction is not recommended for pregnancies below 34 weeks[4-7].

The choice between vacuum and forceps depends on the obstetrician's proficiency and the specific indication. Proper use of these instruments requires expertise to minimize risks. Critical factors for successful and safe operative vaginal delivery include assessing fetal weight, maternal pelvic adequacy, fetal position and anesthesia sufficiency. Attempting operative vaginal delivery is not advised if the fetal head is not engaged or its position is unclear. Safety criteria for assisted vaginal births include comprehensive examinations, adequate cervical dilation, known fetal head position, manageable caput and molding, maternal preparation and appropriate analgesia. A backup plan for potential complications is crucial, ensuring readiness for cesarean delivery if needed, especially in midpelvic births. Personnel should be trained for neonatal resuscitation.

Training obstetricians in operative vaginal delivery is beneficial for eligible cases as it avoids the morbidities associated with cesarean sections and can be faster and safer. Cesarean delivery risks include hemorrhage, infection, longer recovery times and potential complications in subsequent pregnancies. Additionally, cesarean deliveries are costlier than operative vaginal births. Successful operative vaginal births can also reduce labor duration for compromised fetuses[8]. Studying maternal and neonatal outcomes in operative vaginal deliveries is crucial for understanding associated complications. The objective of this study is to evaluate the outcomes of women who underwent operative vaginal deliveries, focusing on maternal and early neonatal well-being.

MATERIALS AND METHODS

This prospective case-control study was conducted in the inpatient service of the Department of Obstetrics and Gynecology in collaboration with the Department of paediatric at an Indian Hospital. A total of 384 subjects were enrolled, comprising 193 cases of instrumental delivery and 191 cases of normal delivery. Participants were matched for age and parity and the study duration spanned one year. Informed consent was obtained from each participant in their native language. Data collection involved administering a questionnaire and conducting interviews with the participants. The inclusion criteria encompassed patients aged 20-29 with term singleton pregnancies and cephalic presentation, who were either nulliparous or Para 1. Exclusion criteria included parity greater than one, babies with congenital anomalies, preterm deliveries, non-cephalic presentation, multiple pregnancies and vaginal birth after cesarean.

Various parameters were assessed in each patient, including demographic details, medical and obstetric history, physical examinations, laboratory investigations and neonatal assessments performed in conjunction with a pediatrician. Indications for operative vaginal deliveries were documented, with all deliveries conducted by postgraduate students or faculty members. Maternal complications were classified into third-stage complications (e.g., vaginal lacerations, PPH) and puerperal complications (e.g., urinary tract infections, episiotomy infections). Neonatal complications such as low Apgar scores, birth asphyxia, seizures, cephalohematoma, HIE, facial marks and hyperbilirubinemia were also evaluated. Statistical analysis was performed using SPSS version 20, including frequency Tables, Student's t-test and Chi-square test to compare outcomes between instrumental and normal deliveries, as well as forceps and vacuum deliveries. Statistical hypotheses were tested with a two-tailed p-value.

RESULTS AND DISCUSSIONS

In (Table 1), a comparison between Normal and Instrumental delivery modes across various categorical variables shows remarkably similar distributions between the two delivery methods. There were no significant differences observed in the distribution of clinico-demographic characteristics among the study groups. According to (Table 2), vaginal lacerations were notably more prevalent in the Instrumental group compared to the "Normal" group, indicating a significant difference. However, cervical lacerations, third and fourth-degree perineal tears and traumatic

Table 1: Clinico-demographic characteristics of study participants

	Operative Delivery		Normal Delivery		Total			
Variable	**n**	**Percentage**	**n**	**Percentage**	**n**	**Percentage**	**Chi-square**	**p-value**
Age								
20-24 years	123	63.73	120	62.83	243	63.28	0.045	0.84
25-29 years	70	36.27	71	37.17	141	36.72		
Parity								
Nullipara	169	87.56	163	85.34	332	86.46	0.579	0.47
Primipara	24	12.44	28	14.66	52	13.54		
Gestational age								
<37 years	13	6.74	14	7.33	27	7.03	0.575	0.91
37-38 years	51	26.42	53	27.75	104	27.08		
38-39 years	62	32.12	60	31.41	122	31.77		
39-40 years	66	34.2	64	33.51	130	33.85		
>41 years	1	0.52	0	0	1	0.26		

Table 2: Maternal complications

	Operative Delivery		Normal Delivery		Total		
Complication	**n**	**Percentage**	**n**	**Percentage**	**n**	**Percentage**	**p-value**
3rd stage labour complications							
Vaginal lacerations	8	4.15	2	1.05	10	5.20	<0.05
PPH	7	3.63	2	1.05	9	4.68	<0.05
Atonic PPH	7	3.63	2	1.05	9	4.68	<0.05
Third-degree perineal tear	5	2.59	2	1.05	7	3.64	0.23
Blood transfusion requirement	3	1.55	1	0.52	4	2.07	0.45
Paraurethral tear	3	1.55	1	0.52	4	2.07	0.39
Fourth-degree perineal tear	1	0.52	0	0	1	0.52	0.51
Cervical lacerations	0	0	0	0	0	0.00	0.97
Traumatic PPH	0	0	0	0	0	0.00	0.89
Puerperal complications							
UTI	10	5.18	7	3.66	17	8.84	0.63
Episiotomy infection	9	4.66	5	2.62	14	7.28	0.42
Urinary retention	9	4.66	3	1.57	12	6.23	0.15
Puerperal fever	2	1.04	0	0	2	1.04	0.58

Table 3: Neonatal complications post delivery

	Operative Delivery		Normal Delivery		Total		
Complication	**n**	**Percentage**	**n**	**Percentage**	**n**	**Percentage**	**p-value**
NICU Admission	18	9.33	11	5.76	29	15.09	0.81
Positive sepsis screening	12	6.22	8	4.19	20	10.41	0.31
Hyperbilirubinemia	13	6.74	5	2.62	18	9.36	<0.05
Severe birth asphyxia	3	1.55	1	0.52	4	2.07	0.32
Ventilatory support required	3	1.55	1	0.52	4	2.07	0.35
HIE	2	1.04	1	0.52	3	1.56	0.51
Cephalohematoma	3	1.55	0	0	3	1.55	<0.05
Facial marks	3	1.55	0	0	3	1.55	<0.05
Neonatal seizures	1	0.52	1	0.52	2	1.04	0.98
Facial nerve palsy	0	0	0	0	0	0	0.95
Erb's palsy	0	0	0	0	0	0	0.96

Table 4: Neonatal outcomes post delivery

	Operative Delivery		Normal Delivery		Total		
Neonatal outcome	**n**	**Percentage**	**n**	**Percentage**	**n**	**Percentage**	**p-value**
Baby Outcome							
Live baby	191	98.96	191	100	382	99.48	0.15
Stillbirth	2	1.04	0	0	2	0.52	
Neonatal death	0	0	0	0	0	0	
Birth Weight							
>2.5 Kg	175	90.67	173	90.58	348	90.63	0.88
<2.5 Kg	18	9.33	18	9.42	36	9.38	

Table 5: Apgar scores of neonates post delivery

	Operative Delivery		Normal Delivery		Total		
Apgar Score	**n**	**Percentage**	**n**	**Percentage**	**n**	**Percentage**	**p-value**
at 1 min							
>7	171	88.6	182	95.29	353	91.93	<0.05
4-7	18	9.33	8	4.19	26	6.77	
≤3	4	2.07	1	0.52	5	1.3	
at 5 min							
>7	185	95.85	187	97.91	372	96.88	0.17
<7	8	4.15	4	2.09	12	3.13	

PPH exhibited very low percentages in both groups, with no significant differences between them. PPH and atonic PPH were more common in Instrumental deliveries compared to Normal deliveries. The need for

a blood transfusion did not show a significant difference between the two delivery modes. Paraurethral tears had a slightly higher occurrence in the Instrumental group although this difference was not statistically significant.

Significantly, a higher percentage of cases in the Normal delivery group experienced no complications, in contrast to the Instrumental group. However, the percentages of cases with specific complications, such as UTI, urinary retention, puerperal fever and episiotomy infection, exhibited only minor variations between the two delivery modes, with no significant differences detected in their occurrence. These findings emphasize the importance of monitoring puerperal complications, highlighting that while overall complication rates differ, specific complications are similarly distributed between Instrumental and Normal deliveries (refer to Table 2).

(Table 3) provides data on neonatal complications associated with both Instrumental and Normal delivery modes. Notably, there is a minor difference in the occurrence of severe birth asphyxia between the two groups, but this difference is not statistically significant. Similarly, complications such as HIE, neonatal seizures, facial nerve palsy and Erb's palsy show low percentages and no significant differences between the two delivery modes. However, cephalohematoma and facial marks exhibit a higher percentage in the Instrumental group and these differences are statistically significant. Hyperbilirubinemia and the need for ventilatory support have slightly higher percentages in the Instrumental group, with statistically significant differences. Admission to NICU and a positive sepsis screen showed higher percentages in both groups, with no significant differences.

(Table 4) provides insights into neonatal outcomes. The majority of babies in both groups had a live birth. Neonatal death was rare and stillbirth had a very low percentage in the Instrumental group. These outcomes did not exhibit significant differences between the two delivery modes. Birth weight distributions were quite similar with no significant difference in birth weight distribution between the two groups. (Table 5) presents data on Apgar scores at 1 minute and 5 minutes after birth. At 1 minute, the majority of infants in both delivery modes had Apgar scores >7. In contrast, the percentage of infants with Apgar scores between 4 and 7 was higher in the Instrumental group compared to the Normal group. At 5 minutes, both groups had a higher percentage of infants with Apgar scores >7, with no significant difference between them. These data highlight that at 1 minute, infants in Instrumental deliveries are more likely to have Apgar scores between 4 and 7 or 3 or lower, indicating potential short-term health concerns. However, by 5 minutes, the Apgar scores show no significant variation between the two delivery modes, suggesting that most infants recover well after a brief period.

In a detailed analysis of this case-control study comparing outcomes between instrumental deliveries and normal deliveries, it was observed that women in both groups shared similarities in age, gestational age and parity[1]. However, the instrumental delivery group experienced more intrapartum complications than the normal delivery group, although this trend was similar between vacuum and forceps deliveries[2]. Maternal exhaustion emerged as the primary indication for vacuum deliveries, while prophylaxis was the predominant reason for forceps deliveries[3]. Notably, instrumental deliveries showed a significantly higher incidence of vaginal lacerations compared to normal deliveries, with forceps deliveries having a slightly higher rate than vacuum deliveries[4].

Similarly, the incidence of post-partum hemorrhage was significantly higher in instrumental deliveries compared to normal deliveries, although forceps deliveries and vacuum deliveries did not show a significant difference in this regard[5]. Atonic post-partum hemorrhage was notably elevated in the instrumental delivery group compared to the normal delivery group, with no significant difference between forceps and vacuum deliveries. However, traumatic post-partum hemorrhage was comparable between groups and only noted in the vacuum group[6]. Regarding perineal tears, cervical lacerations, paraurethral tears and the need for blood transfusions, no significant differences were observed between instrumental and normal deliveries, as well as between forceps and vacuum deliveries[7]. Puerperal complications also showed no significant variation between instrumental and normal deliveries, as well as between forceps and vacuum deliveries[8]. However, a low Apgar score at 1 minute was significantly more frequent in instrumental deliveries compared to normal deliveries[9]. No significant differences were found in Apgar scores at 5 minutes between instrumental and normal deliveries, as well as between forceps and vacuum deliveries[10].

Significant associations were noted between instrumental deliveries and cephalohematoma incidence, while no cases were observed in normal deliveries. However, the difference between forceps and vacuum deliveries was statistically insignificant[11]. Facial marks were significantly associated with instrumental deliveries and forceps deliveries compared to normal and vacuum deliveries, respectively[12]. Hyperbilirubinemia incidence was notably higher in instrumental deliveries than in normal deliveries[13]. NICU admissions were significantly more frequent in instrumental deliveries compared to normal deliveries, with no significant differences between forceps and vacuum deliveries[14].

The average hospital stay was significantly longer for instrumental deliveries compared to normal deliveries, as well as for forceps deliveries compared to vacuum deliveries. Improved training in operative vaginal delivery is recommended to reduce cesarean delivery rates and enhance overall maternal and neonatal outcomes[15].

CONCLUSION

Many women prefer natural, spontaneous vaginal deliveries, but when labor complications arise, providing suitable alternatives beyond cesarean sections is crucial. Offering women the option of a safe operative vaginal delivery requires advancements in clinical care. Instrumental delivery plays a vital role in this context. While it can lead to complications for both mothers and babies, most of these are minor. When performed by a skilled obstetrician judiciously, instrumental vaginal delivery can improve neonatal and maternal outcomes, offering quality care while contributing to reducing the cesarean delivery rate.

REFERENCES

1. Werkmeister, G., M. Jokinen, T. Mahmood and M. Newburn, 2008. Making normal labour and birth a reality-developing a multi disciplinary consensus. Midwifery, 24: 256-259.
2. Murphy, D.J., B.K. Strachan, R. Bahl and Royal College of Obstetricians and Gynaecologists, 2020. Assisted vaginal birth: Green-top guideline no. 26. BJOG., 127: 70-112.
3. Martin, J.A., B.E. Hamilton, M.J.K. Osterman, A.K. Driscoll and P. Drake, 2018. Births: Final data for 2016. Natl. Vital. Stat. Rep., 67: 1-55.
4. Hagadorn-Freathy, A.S., E.R. Yeomans and G.D. Hankins, 1991. Validation of the 1988 ACOG forceps classification system. Obstet. Gynecol., 77: 356-360.
5. Åberg, K., M. Norman and C. Ekéus, 2014. Preterm birth by vacuum extraction and neonatal outcome: A population-based cohort study. BMC Pregnancy Childbirth, Vol. 14 .10.1186/1471-2393-14-42.
6. Peaceman, A.M., 2015. ACOG practice bulletin no. 154: Operative vaginal delivery. Obstet. Gynecol., 126: 56-65.
7. NICE., 2017. Intrapartum care for healthy women and babies. National Institute for Health and Care Excellence, London, UK.,, https://www.nationalwomenshealth.adhb.govt.nz/assets/Womens-health/Documents/Policies-and-guidelines/Intrapartum-Care-Normal-Labour-and-Birth-.pdf.
8. 2014. Executive summary: Neonatal encephalopathy and neurologic outcome, second edition. Report of the American College of Obstetricians and Gynecologists' Task Force on Neonatal Encephalopathy. Obstet. Gynecol., 123: 876-901.
9. Mrelashvili, A., J.B. Russ, D.M. Ferriero and C.J. Wusthoff, 2020. The sarnat score for neonatal encephalopathy: Looking back and moving forward. Pediatr. Res., 88: 824-825.
10. Cloherty, J.P., E.C. Eichenwald and A.R. Stark, 2008. Manual of Neonatal Care. ippincott Williams and Wilkins,, Philadelphia, Pennsylvania, ISBN-13: 9780781769846, Pages: 762.
11. Williams, M.C., 1995. Vacuum-assisted delivery. Clin. Perinatol. 22: 933-952.
12. Weerasekera, D.S. and S. Premaratne, 2002. A randomised prospective trial of the obstetric forceps versus vacuum extraction using defined criteria. J. Obstet. Gynaecol., 22: 344-345.
13. Pelosi, M.A. and M.A. Pelosi, 1992. A randomized comparison of assisted vaginal delivery by obstetric forceps and polyethylene vacuum cup. Obstet. Gynecol., 79: 638-639.
14. Murphy, D.J. and R.E. Liebling, 2003. Cohort study of maternal views on future mode of delivery after operative delivery in the second stage of labor. Am. J. Obstet. Gynecol., 188: 542-548.
15. Lekha, S.B., M.L. Nair and B.A. Mayadevi, 2023. A case-control study on maternal and early neonatal outcomes in instrumental delivery in a tertiary referral hospital. Nat. J. Physiol. Pharm. Pharmacol., 13: 2507-2515.