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Incidence And Prevalence Of Birth Injuries In Instrumental Vaginal Deliveries

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ABSTRACT

Background: Instrumental vaginal deliveries, utilizing forceps or vacuum devices, remains a critical intervention for expediting delivery in select maternal or fetal conditions. However, these interventions carry risks of neonatal and maternal complications, most notably birth injuries.

Objective: To determine the incidence and prevalence of birth injuries in instrumental vaginal deliveries and to compare maternal and neonatal outcomes between forceps and vacuum-assisted deliveries.

Methods: This retrospective cross-sectional study analyzed 268 cases of term singleton pregnancies delivered via forceps or vacuum at our center. Data were collected on maternal demographics, comorbidities, delivery method, and outcomes. Neonatal variables included type of birth injury, need for resuscitation, NICU admission, and discharge status. Maternal outcomes such as perineal trauma, postpartum hemorrhage, and fever were also recorded. Statistical analysis was performed using SPSS 25, with Chi-square tests used to assess associations between variables.

Results: Of the 268 instrumental vaginal deliveries, vacuum extraction was more commonly employed (57.5%) than forceps (42.5%). The overall incidence of birth injuries was 19.8%, with cephalohematoma, brachial plexus injury, clavicle fracture, facial nerve palsy, intracranial hemorrhage, and skull fracture observed at low individual frequencies. Most neonates (80.2%) had no birth injury. The type of instrument used did not significantly affect the incidence or pattern of birth injuries ($p = 0.730$). However, the type of injury was significantly associated with neonatal outcomes at discharge ($p = 0.008$), with more severe injuries linked to higher rates of mortality and ongoing treatment. NICU admission was required for 54.1% of infants, with higher rates seen in those with clavicle fractures, intracranial hemorrhage, or no injury. Maternal complications-including fever (20.9%), perineal tears (20.5%), and postpartum hemorrhage (20.9%)-were evenly distributed between forceps and vacuum groups. The maternal population had a mean age of 29.86 years, with high rates of hypertension (52.2%) and diabetes (48.1%).

Conclusion: The incidence of birth injuries in instrumental vaginal deliveries at our center was 19.8%. The choice between forceps and vacuum did not significantly influence the risk or severity of neonatal injuries, resuscitation needs, NICU admissions, or maternal complications.

1. INTRODUCTION

Instrumental vaginal delivery, involving the use of forceps or vacuum devices, is a critical obstetric intervention employed to expedite the second stage of labor when maternal or fetal indications arise. These indications commonly include prolonged second stage, non-reassuring fetal heart rate patterns, or the need to reduce maternal effort due to medical conditions. Globally, the prevalence of instrumental vaginal deliveries varies widely, reported between approximately 1.5% and 15% depending on geographic region, healthcare setting, and clinical practice patterns. For example, rates in the United Kingdom range from 10% to 15%, while in the United States, forceps or vacuum-assisted deliveries accounted for about 3.6% of births in 2010 [1-3].

Despite their utility in avoiding cesarean sections and facilitating timely delivery, instrumental vaginal deliveries carry inherent risks, notably birth injuries to the neonate. Birth injuries encompass a spectrum of trauma, including cephalohematoma, subgaleal hemorrhage, bone fractures, intracranial hemorrhage, and, in severe cases, neurodevelopmental impairment or neonatal death. Recent large cohort studies have documented birth injury rates of approximately 20% among neonates delivered instrumentally, with cephalohematoma being the most common injury, accounting for over half of cases [1]. The risk of injury increases with factors such as combined use of vacuum and forceps, multiple instrument applications, and labor induction [1]. Moreover, neurodevelopmental follow-up has revealed that a subset of affected neonates exhibit delays, particularly in communication and personal-social domains [1].

The incidence and severity of birth injuries vary by instrument type. Vacuum extraction, favored for its ease of application and lower maternal trauma, is associated more frequently with scalp injuries such as cephalohematoma and subgaleal hemorrhage. Forceps deliveries, while less common in recent decades due to declining use-from over 60% of instrumental deliveries in the early 1990s to under 10% in some regions-are linked with higher rates of facial nerve injury and maternal perineal trauma [3, 4]. Sequential or combined use of both instruments further elevates the risk of neonatal injury [1].

Maternal complications related to instrumental deliveries include perineal tears, postpartum hemorrhage, and infections. While vacuum-assisted deliveries tend to have lower rates of severe maternal trauma compared to forceps, the overall risk remains significant, especially in settings with limited operator experience or inadequate training [4, 5]. The global trend shows a decline in instrumental vaginal delivery rates, partly due to increased cesarean section rates and concerns over safety; however, instrumental delivery remains a vital skill, particularly in low-resource settings where cesarean access is limited [5, 6].

The purpose of current study was to determine the incidence and indications of instrumental vaginal deliveries at the study center and to compare the maternal and neonatal outcomes between forceps and vacuum-assisted deliveries. Specifically, the study aims to assess the frequency of birth injuries, Apgar scores, need for neonatal resuscitation and NICU admission, as well as maternal complications such as perineal trauma and postpartum hemorrhage

Objective:

To determine the incidence and prevalence of birth injuries in instrumental vaginal deliveries

2. METHODOLOGY

This retrospective cross-sectional study analyzed 268 cases of instrumental vaginal deliveries to assess the incidence and prevalence of birth injuries. Data were collected from medical records of term singleton pregnancies delivered via forceps or vacuum, excluding cases with prematurity, congenital anomalies, or incomplete documentation. Maternal variables (age, parity, comorbidities, instrument type, and maternal outcomes) and neonatal outcomes (birth weight, APGAR score, resuscitation, NICU admission, type of birth injury, and discharge status) were recorded. Statistical analysis was performed using SPSS 25. with descriptive statistics applied to summarize the data. Incidence and prevalence rates of birth injuries were calculated, and associations between maternal and neonatal variables were evaluated using the Chi-square test, with significance set at $p < 0.05$.

3. RESULTS

In current study 268 deliveries using either forceps or vacuum extraction, vacuum was the more commonly used instrument (57.5% vs. 42.5%). Most neonates (80.2%) experienced no injury, while the remainder sustained various birth injuries such as brachial plexus injury, cephalohematoma, clavicle fracture, facial nerve palsy, intracranial hemorrhage, or skull fracture, each occurring at relatively low frequencies (Table 1), indicating that the choice of delivery instrument does not significantly affect injury incidence or type. However, the type of injury was significantly associated with outcomes at discharge ($p = 0.008$) (Table 2), with injured neonates-particularly those with intracranial hemorrhage and skull fractures-showing higher rates of death and ongoing treatment compared to those without injuries.

Table 1: Type of Instrument Used * Type of Injury Crosstabulation

		Type of Injury								Total
		Brachial Plexus Injury	Caput Succedaneum	Cephalohematoma	Clavicle Fracture	Facial Nerve Palsy	Intracranial Hemorrhage	none	Skull Fracture	
Type of Instrument Used	Forceps	2	2	5	3	2	2	96	2	114
	Vacuum	9	5	6	7	3	2	119	3	154
Total		11	7	11	10	5	4	215	5	268

Table 2: Outcome at Discharge * Type of Injury Crosstabulation

		Type of Injury								Total
		Brachial Plexus Injury	Caput Succedaneum	Cephalohematoma	Clavicle Fracture	Facial Nerve Palsy	Intracranial Hemorrhage	none	Skull Fracture	
Outcome at Discharge	Death	2	0	3	2	1	3	3	2	16
	Ongoing Treatment	4	3	5	4	3	1	77	2	99
	Recovered	5	4	3	4	1	0	135	1	153
Total		11	7	11	10	5	4	215	5	268

Figure 1: Bar Chart Type of Injury and Instrument used

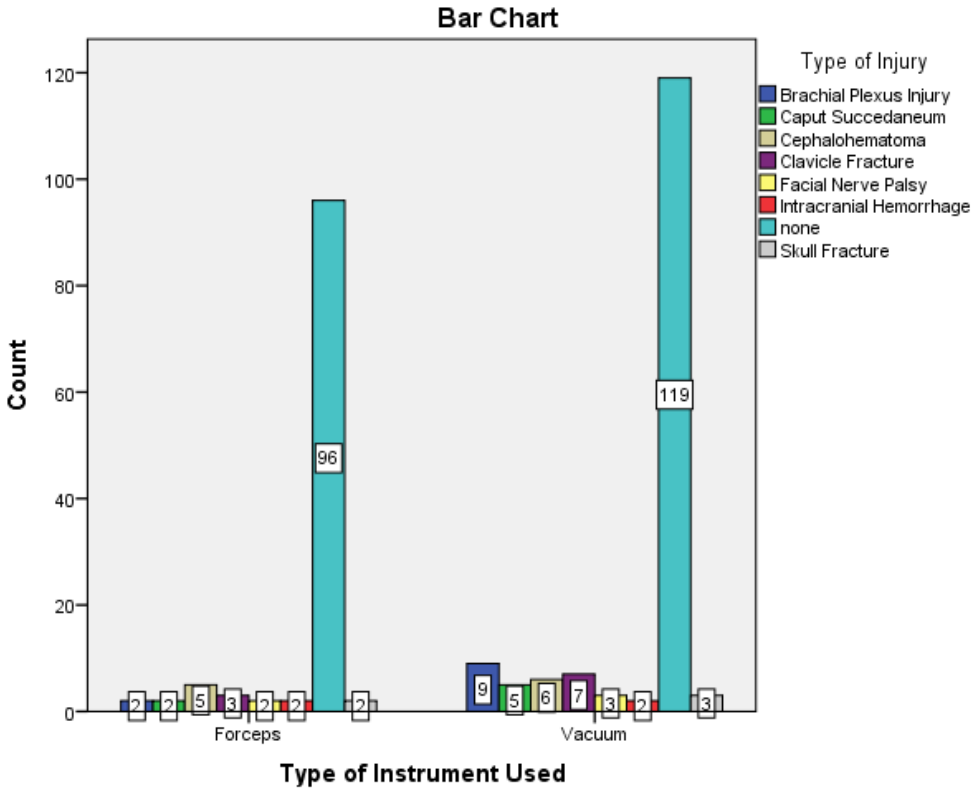
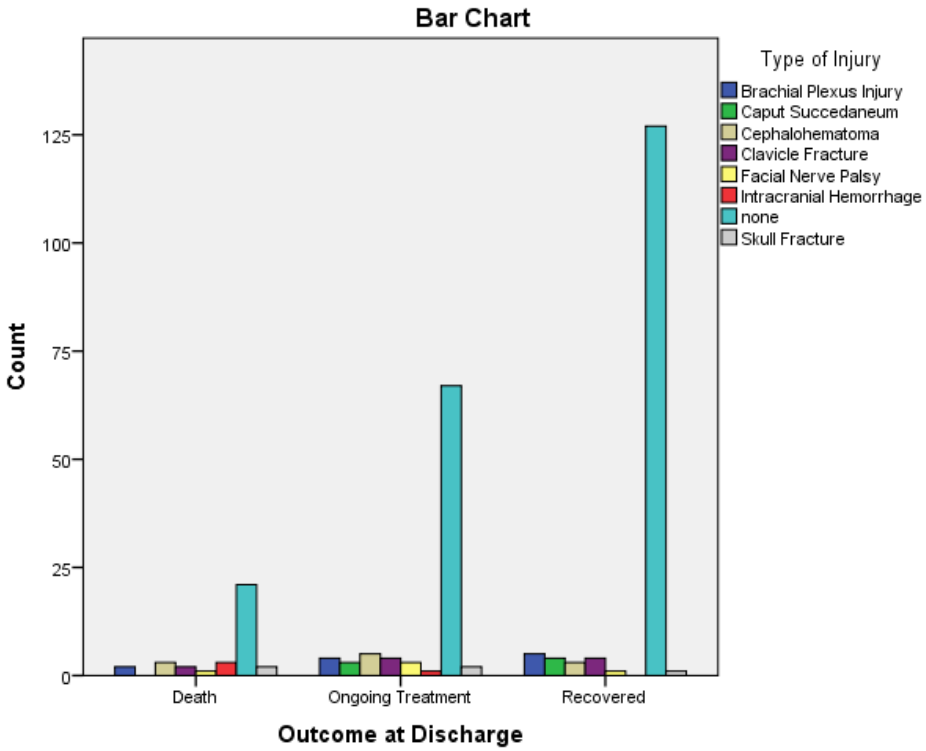


Figure 2: Bar chart Type of injury and outcomes



NICU admission was required for 54.1% of infants, with notably higher admission rates among those with clavicle fractures, intracranial hemorrhage, or even those without any recorded injury, suggesting that factors beyond injury alone may influence NICU utilization. Maternal complications, including fever (20.9%), perineal tears (20.5%), and postpartum hemorrhage (20.9%), were evenly distributed between forceps and vacuum deliveries, indicating no difference in maternal morbidity related to the instrument used. Demographically, mothers averaged 29.86 years of age, with a high prevalence of hypertension (52.2%) and diabetes (48.1%), which may contribute to overall maternal and neonatal risk profiles.

Taken together, these findings suggest that while the method of instrumental delivery does not significantly impact the incidence or severity of neonatal injuries, resuscitation needs, NICU admissions, or maternal complications, the presence and type of neonatal injury remain critical determinants of neonatal outcomes. This underscores the importance of vigilant neonatal monitoring and tailored clinical management following instrumental deliveries, irrespective of the instrument used.

4. DISCUSSION

The findings of our study align closely with existing literature comparing forceps and vacuum-assisted deliveries in terms of neonatal and maternal outcomes. Consistent with prior research, we observed that the type of instrumental delivery-forceps versus vacuum-did not significantly influence the overall incidence or severity of neonatal injuries, resuscitation requirements, NICU admissions, or maternal complications in our cohort. This corroborates earlier studies reporting no significant differences in serious neonatal morbidity or mortality between the two methods, though specific injury patterns differ by instrument type [7,8]

Our data showed a higher frequency of cephalohematoma and caput succedaneum in vacuum-assisted deliveries, while forceps deliveries were associated with more facial injuries and maternal birth canal trauma, echoing findings from multiple studies. For instance, a study found that forceps use was linked to increased rates of major perineal and vaginal tears and neonatal bruising, whereas vacuum extraction resulted in more cephalohematomas and molding [8]. Similarly, a study reported that forceps deliveries had lower rates of cephalohematoma but higher rates of severe perineal lacerations compared to vacuum deliveries [8,9]. Our observation of comparable NICU admission rates, with some higher admissions even among infants without injury, is also reflected in the literature, where NICU admission is influenced by multiple factors beyond instrumental trauma alone [7].

Regarding maternal outcomes, our findings of no significant difference in rates of fever, perineal tears, and postpartum hemorrhage between forceps and vacuum deliveries contrast somewhat with earlier reports that forceps deliveries tend to have higher maternal morbidity, including increased birth canal trauma and blood loss [10]. This discrepancy may reflect

differences in clinical practice, operator skill, or patient selection in our cohort. The high prevalence of maternal hypertension and diabetes in our population may also modulate risks and outcomes, a factor less emphasized in previous studies.

Our results support the prevailing view that both forceps and vacuum extraction are viable options for assisted vaginal delivery, with distinct but generally manageable patterns of neonatal and maternal morbidity. The choice of instrument should therefore be guided by clinical indications, operator expertise, and individual patient circumstances rather than concerns over overall injury risk or outcomes. Continued vigilance in monitoring neonatal injury types and maternal complications remains essential to optimize perinatal care following instrumental delivery.

5. CONCLUSION

This study showed that the choice between forceps and vacuum for instrumental vaginal delivery does not significantly affect the incidence or severity of neonatal injuries, the need for resuscitation, NICU admissions, or maternal complications. While specific patterns of injury may differ slightly between the two methods, the overall risk remains comparable.

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