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Original Research Article

Maternal indications, trends, and fetal outcomes of instrument-assisted vaginal deliveries in the United Arab Emirates

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ABSTRACT

Background: Instrument-assisted vaginal deliveries (IAVDs), using vacuum or forceps, are vital for expediting childbirth in cases such as fetal distress or prolonged labor. While effective in preventing cesarean sections and reducing maternal-fetal morbidity, they carry risks including perineal trauma and neonatal injury. This study assessed the clinical indications and outcomes of IAVDs in a UAE tertiary hospital.
Methods: A retrospective review was conducted at Thumbay University Hospital, Ajman, including women who underwent IAVDs between January 2022 and January 2025. Data on maternal demographics, instrument type, clinical indications, and maternal-neonatal outcomes were collected using a validated form. Cesarean deliveries and incomplete records were excluded. Data were analyzed with SPSS v29 using descriptive statistics and Chi-square tests, with significance at $p<0.05$.
Results: Among 116 IAVD cases, most women were primigravida, aged 21-34, and delivered at full term. Indications included poor maternal effort (60.3%), prolonged second stage (39.7%), and fetal distress (37.9%). Vacuum was the predominant instrument. Neonatal outcomes were favorable, with 93.1% of newborns having normal birth weight. Common complications included respiratory distress (19.8%), NICU admission (14.7%), and cephalohematoma (12.9%). Maternal outcomes included episiotomy (82.8%) and vaginal tears (8.6%), with minimal serious complications.
Conclusions: IAVDs remain a safe and effective option for managing prolonged labor or fetal compromise. When guided by appropriate clinical judgment and technique, they yield favorable maternal and neonatal outcomes. Emphasis on early recognition of indications, ongoing operator training, and vigilant monitoring can further optimize safety.

Keywords: Cephalohematoma, Instrument assisted vaginal deliveries

INTRODUCTION

Instrumental or assisted vaginal deliveries (IAVDs) is commonly used to expedite birth for the benefit of either mother or baby or both. It is sometimes associated with significant complications for both mother and baby.[1] In the United Kingdom, instrumental vaginal deliveries account for approximately 10% to 15% of births, a rate that has remained relatively stable over time. However, there has been a shift in the preferred instrument used.[2]

Most clinical reports indicate that vacuum-assisted delivery is safe for both the mother and fetus when performed correctly.[3] While these techniques can be life-saving, they are also associated with a range of maternal and neonatal complications. A study from Ethiopia

reported a maternal complication rate of 12.1%, with common outcomes including second- and third-degree perineal tears and episiotomy extensions. Furthermore, the study found that women who underwent forceps-assisted delivery were 3.4 times more likely to develop complications compared to those who had vacuum-assisted births.[4] The addition of a midline episiotomy to operative vaginal deliveries has also been shown to increase the risk of anal sphincter trauma in both primigravida and multigravida women.[5]

A large-scale analysis using the Dutch National Obstetric Database revealed anal sphincter injuries in 3.0% of vacuum-assisted and 4.7% of forceps-assisted deliveries. Key risk factors identified included primiparity, occiput posterior fetal position, higher birth weight, and prolonged second-stage labor in vacuum deliveries.[6]

Maternal complications were significantly more common in forceps (OR 6.9) and vacuum-assisted deliveries (OR 3.0) compared to spontaneous vaginal births. Neonatal complications followed a similar trend, with increased odds in both forceps (OR 3.5) and vacuum (OR 3.8) deliveries.[7]

The American College of Obstetricians and Gynecologists (ACOG) published guidelines on the use of operative vaginal delivery (both forceps and vacuum), which included a list of accepted indications for such procedures. One common indication is a prolonged second stage of labor. It is also used when there are non-reassuring fetal heart rate patterns or suspected fetal compromise, allowing for expedited delivery. Additionally, vacuum assistance may be employed to electively shorten the second stage of labor in cases where pushing is contraindicated due to maternal cardiovascular or neurological conditions. Maternal exhaustion, although subjective and less clearly defined, is another situation where vacuum delivery may be considered.[8]

A Swedish national cohort study found traumatic intracranial hemorrhages in 6 per 10,000 and non-traumatic hemorrhages in 14 per 10,000 term newborns delivered by vacuum extraction (VE). The study confirms the association between VE-assisted birth and increased risk of neonatal intracranial hemorrhages, highlighting high birth weight as a significant risk factor for cerebral complications.[9]

A retrospective study at Singapore General Hospital (2012–2017) analyzed 906 operative vaginal deliveries, including 461 forceps and 445 vacuum-assisted deliveries. Neonatal cephalohematomas were more frequent after vacuum-assisted deliveries. Most clinically significant neonatal events were attributed to shoulder dystocia.[10]

Understanding the outcomes of instrument-assisted vaginal deliveries is essential for optimizing obstetric care and ensuring patient safety. By identifying trends, associated risks, and differences between vacuum and forceps deliveries, this study will provide valuable insights to enhance clinical decision-making, improve maternal and neonatal care, and minimize complications associated with operative vaginal deliveries. This study aims to assess the trends and fetal outcomes associated with instrument-assisted vaginal deliveries using record-based data.

METHODS

This retrospective study was conducted at Thumbay University Hospital, a tertiary care facility in Ajman, UAE, over a three-year period from January 2022 to January 2025. The primary objective was to examine the clinical indications, patterns, and associated maternal and neonatal outcomes of instrument-assisted vaginal deliveries (IAVDs). Ethical approval was obtained from the hospital's research committee prior to data collection.

Eligible participants included all women who underwent IAVDs using either vacuum or forceps during the study period. Cases involving cesarean sections or incomplete documentation were excluded. Data were extracted from patient records using a structured, investigator-designed proforma that was reviewed for content validity. Collected variables included maternal age, parity, gestational age at delivery, type of instrument used, and specific clinical indications for IAVD, such as prolonged second stage of labor, inadequate maternal effort, or non-reassuring fetal status.

All data were entered and analyzed using IBM SPSS Statistics version 29. Categorical variables were summarized using frequencies and percentages. Associations between maternal characteristics, clinical indications, and outcomes were analyzed using the Chi-square test, with statistical significance set at $p<0.05$.

RESULTS

A total of 116 cases of instrument-assisted vaginal deliveries (IAVDs) were analyzed during the study period. From Table 1, the majority of women were primigravida (64.7%, n=75), while 22.4% (n=26) had previous live births and 12.9% (n=15) had a history of abortion. In Table 2, most participants (80.2%, n=93) were between 21 and 34 years of age, with 12.9% (n=15) aged 35 years or older and only 6.9% (n=8) aged 20 years or younger. According to Table 3, gestational age at delivery was predominantly full term (64.7%, n=75), followed by preterm deliveries (31.9%, n=37), and a small proportion of late-term pregnancies (3.4%, n=4).

Table 1: Distribution of parity among the participants.

Parity	Frequency	Percentage
Primi	75	64.7
Abortion	15	12.9
Previous live birth	26	22.4

Table 2: Distribution of maternal age among the participants.

Maternal age	Frequency	Percentage
Less than equal to 20	8	6.9
21-34	93	80.2
More than equal to 35	15	12.9

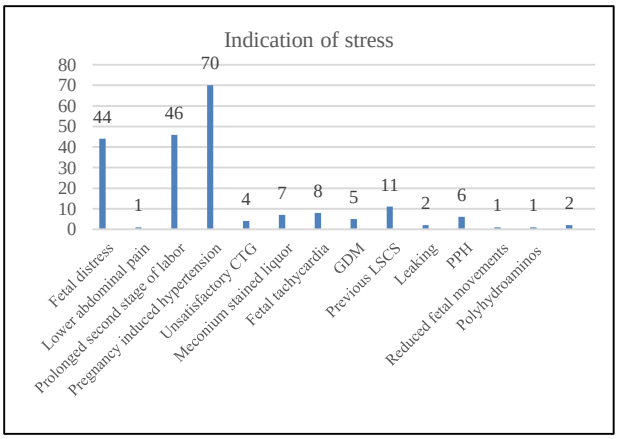

Figure 1: Maternal clinical indications of stress.

From Figure 1, the primary clinical indications for IAVD were poor maternal effort (60.3%, n=70), prolonged second stage of labor (39.7%, n=46), and fetal distress (37.9%, n=44). Other less common indications included gestational diabetes mellitus (9.5%, n=11), meconium-stained liquor (6.9%, n=8), unsatisfactory cardiotocography (6.0%, n=7), fetal tachycardia (4.3%, n=5), pregnancy-induced hypertension (3.4%, n=4), and leaking (5.2%, n=6).

According to Figure 2, with respect to maternal outcomes, episiotomy was the most common intervention, performed in 82.8% (n=96) of deliveries. Extended episiotomy was reported in 16.4% (n=19), while 8.6% (n=10) experienced vaginal wall tears. Severe complications were infrequent: perineal tears and difficulty passing urine occurred.

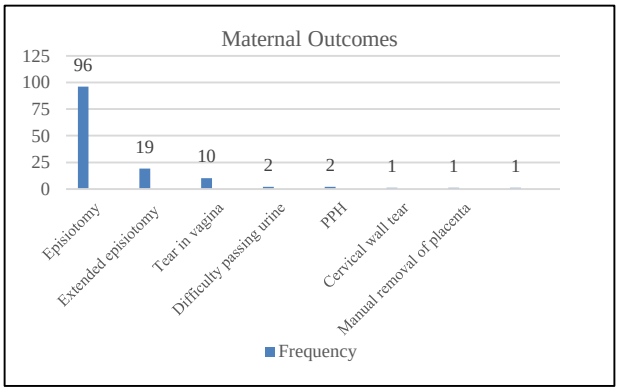

Figure 2: Maternal outcomes.

Table 3: Distribution of gestational age among the study participants.

Gestational age	Frequency	Percentage
Preterm	37	31.9
Full term	75	64.7
Late term	4	3.4

Table 4: Relationship between fetal distress and maternal factors such as parity, age, and gestational age.

Fetal distress		Frequency		P value
Parity	Primi	26 (24.7)	49 (65.3)	0.299
	Abortion	8 (53.3)	7 (46.7)	
	Previous live birth	12 (46.2)	14 (53.8)	
Maternal age	21-34	33 (35.5)	60 (64.5)	0.405
	≥35	7 (46.7)	8 (53.3)	
Gestational age	Preterm	12 (32.4)	25 (67.6)	0.404
	Full term	32 (40.5)	47 (59.5)	

Table 5: Association between prolonged second stage of labor and maternal factors like parity, age, and gestational age.

Prolonged second stage of labor		Frequency		P value
Parity	Primi	26 (34.7)	49 (65.3)	0.299
	Abortion	8 (53.3)	7 (46.7)	
	Previous live birth	12 (46.2)	14 (53.8)	
Maternal age	21-34	38 (40.9)	55 (59.1)	0.581
	≥35	5 (33.3)	10 (66.7)	
Gestational age	Preterm	15 (40.5)	22 (59.5)	0.894
	Full term	31 (39.2)	48 (60.8)	

Table 6: Association between poor maternal effort and factors such as parity, maternal age, and gestational age.

Poor maternal effort		Frequency		P value
Parity	Primi	45 (60)	30 (40)	0.745
	Abortion	8 (53.3)	7 (46.7)	
	Previous live birth	17 (65.4)	9 (34.6)	
Maternal age	21-34	54 (58.1)	39 (41.9)	0.262
	≥35	11 (73.3)	4 (26.7)	
Gestational age	Preterm	23 (62.2)	14 (37.8)	0.784
	Full term	47 (59.5)	32 (40.5)	

Table 7: Neonatal complications frequency.

Neonatal complications	Frequency		Percentage	
	Yes	No	Yes	No
Normocephalic	61	55	52.6	47.4
Respiratory distress	23	93	19.8	80.2
NICU	17	99	14.7	85.3
Cephalohematoma	15	101	12.9	87.1
Moro's asymmetry	7	109	6	94
Caput succedaneum	12	104	10.3	89.7
Chignon	5	111	4.3	95.7
Pseudocyst	1	115	0.9	99.1
Brain edema	1	115	0.9	99.1
Scalp swelling	4	112	3.4	96.6
Scalp laceration	1	115	0.9	99.1

Statistical analysis using Chi-square tests revealed no significant association between maternal age, parity, or gestational age and the three most common indications fetal distress, prolonged second stage of labor, and poor maternal effort (all p>0.05).

According to Table 4, fetal distress occurred more frequently among women with a history of abortion (53.3%) and previous live births (46.2%) compared to primigravida women (34.7%), but these differences were not statistically significant (p=0.299).

Similarly, from Table 5, prolonged second stage of labor was most common among women with a history of abortion (53.3%) and previous live births (46.2%), and in Table 6, it showed poor maternal effort was highest among women with previous live births (65.4%).

Nonetheless, these trends lacked statistical significance, indicating that these maternal characteristics may not be predictive of the need for assisted vaginal delivery in this population.

Figure 3 illustrates the distribution of birth weights among the newborns included in the study. The vast majority, 93.1%, were born with a normal birth weight, which reflects healthy fetal growth and development throughout pregnancy.

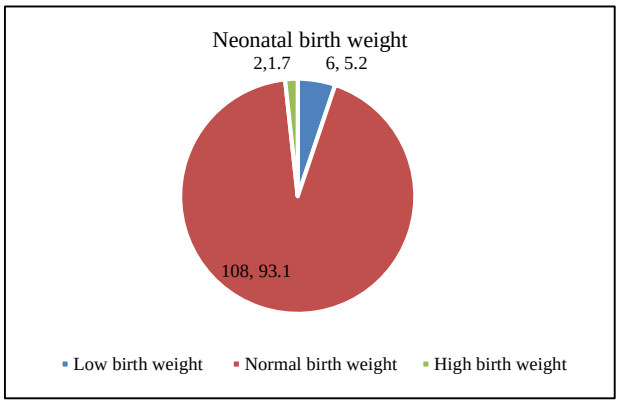

Figure 3: Neonatal birth weight.

Table 7 shows a detailed overview of the types and frequencies of neonatal complications observed in the study population. The most frequently recorded condition was normocephaly, accounting for 52.6% of cases, which reflects a generally healthy and normal cranial shape in over half of the neonates. Respiratory distress emerged as the second most common complication, present in 19.8% of newborns, indicating a considerable number of infants experienced breathing difficulties shortly after birth. Admissions to the neonatal intensive care unit (NICU) were necessary in 14.7% of cases, often due to complications requiring closer monitoring and specialized care.

DISCUSSION

From our study, out of the 116 women who underwent instrument-assisted vaginal deliveries, the majority were primigravida, accounting for 64.7% of cases. Women with previous live births made up 22.4%, while those with a history of abortion comprised 12.9%. In a previous study conducted by Aliyu et al, 52% of women who underwent instrument assisted vaginal delivery were primigravida and second gravida were 18%.[11] In a study carried out by Prapas et al to understand trends of Instrument assisted vaginal delivery, it was concluded that women who were primigravida formed 85% and multigravida was 15% among instrument assisted vaginal delivery.[12]

According to our study, most of the women who underwent instrument assisted vaginal delivery were between 21 and 34 years old, representing 80.2% of the study group. A smaller proportion were aged 35 or older (12.9%) or 20 years and below (6.9%). Aliyu et al observed that women up to 25 years of age formed 62% of cases of instrument assisted vaginal delivery.[11]

In our study, most deliveries occurred at full term, representing 64.7% of cases. In contrast, another study reported that 31.9% of deliveries were preterm, while only 3.4% were classified as late term. Additionally, 93.18% of instrumental deliveries in that study were performed on term patients, followed by 5.68% on post-term patients.[13]

In our study, episiotomy was the most common maternal outcome, observed in 82.8% of instrument-assisted vaginal deliveries. Extended episiotomy occurred in 16.4%, and vaginal wall tears were seen in 8.6% of cases. Less frequent complications included perineal tears and difficulty passing urine (1.7% each), while severe outcomes such as postpartum hemorrhage, cervical wall tears, and manual placenta removal were rare (0.9% each).

Comparable studies have reported varying complication rates. An Ethiopian study reported a 12.1% overall complication rate, with common issues including episiotomy extension and higher rates of perineal tears.[4] Singh and Rathore noted a 26.6% incidence of episiotomy extension.[14] Similarly, studies by Bradley and Handa, reported vaginal laceration rates ranging from 20% to 50%, highlighting the increased risk of trauma with instrument-assisted births.[15,16]

In our study, the most frequent indication for instrument-assisted vaginal delivery was poor maternal effort, reported in 60.3% of cases. This was followed by a prolonged second stage of labor (39.7%) and fetal distress (37.9%). Other less common indications included gestational diabetes mellitus (9.5%), meconium-stained liquor (6.9%), and unsatisfactory cardiotocography (CTG) readings (6%). Rare indications such as pregnancy-induced hypertension, fetal tachycardia, leaking, polyhydramnios, and reduced fetal movements were each observed in fewer than 5% of cases. In comparison, a study by Singh and Rathore, reported fetal distress as the indication in 20.83% of cases and prolonged second stage in 16%.[14]

Our study showed that the majority of newborns (93.1%) had a normal birth weight, indicating healthy fetal development, while low and high birth weights were observed in 5.2% and 1.7% of cases, respectively. Ghanchi et al. reported that most instrumental vaginal deliveries occurred in babies weighing 2600-3000 grams (55.68%), with 39.2% delivered by forceps and 16.47% by vacuum. The 3100-3500-gram group was the second most common, accounting for 29.54% of such deliveries.[13]

Our study outlined the frequency of neonatal complications, with normocephaly being the most common finding (52.6%), followed by respiratory distress (19.8%) and NICU admissions (14.7%). Less frequent issues included cephalohematoma, caput succedaneum, and Moro's reflex asymmetry. Rare complications such as brain edema, pseudocyst, and scalp laceration occurred in less than 1% of cases. According to Salman et al. (2017), cephalohematoma (aOR 1.21, 95% CI 1.04-1.41), low 5-minute Apgar scores (aOR 2.91, 95% CI 1.26-4.67), and asphyxia (aOR 1.81, 95% CI 1.35-2.44) remained significantly associated with the non-reassuring fetal heart rate group. Additionally, neonatal sepsis was significantly associated with the prolonged second stage of labor (OR 1.77, 95% CI 1.38-2.27).[9]

Prapas et al in their study on IVD showed that 14.43% newborn required NICU admission.[12]

Being a retrospective and single center study, the findings may not be generalizable to other populations or healthcare settings. Potential confounding factors cannot be measured or adjusted for.

CONCLUSION

This study examined the clinical indications and outcomes of instrument-assisted vaginal deliveries (IAVDs) at Thumbay University Hospital. Most IAVDs were performed on primigravida women aged 21-34 years with full-term pregnancies. The primary indications included poor maternal effort, prolonged second stage of labor, and fetal distress, with vacuum extraction preferred over forceps. Maternal outcomes were generally favorable, with episiotomy being the most common intervention. Minor complications such as extended episiotomies and vaginal tears occurred, but serious maternal complications were rare.

No significant associations were found between maternal characteristics (age, parity, gestational age) and the indications for IAVD. Additional influencing factors included gestational diabetes, meconium-stained liquor, and abnormal CTG patterns, highlighting the importance of clinical vigilance.

Neonatal outcomes were mostly positive, with normal birth weights and minimal complications. A small number of cases showed respiratory distress or cephalohematoma, particularly in prolonged labor. Overall, IAVDs proved to be a safe, effective alternative to cesarean delivery.

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

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