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Original Article

The Perinatal and Maternal Outcomes of Instrumental Vaginal Delivery

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ABSTRACT

Instrumental vaginal delivery is necessary under special circumstances to facilitate a safer delivery process. **Objective:** To assess the perinatal and maternal outcomes of instrumental vaginal delivery. **Methods:** This retrospective study was conducted at King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia and included patients from July 2018-June 2021. All females with singleton pregnancy who underwent instrumental delivery using vacuum or forceps were included. Data were analyzed using SPSS 19. **Results:** There was a total of 346 instrumental delivery cases during these three years, out of which 337 (97.4%) were vacuum and 9 (2.6%) were forceps. A significant difference was observed between both groups regarding 3rd & 4th-degree tears and hospital stay, where the mean hospitalization and the rate of 3rd & 4th-degree tears were higher among forceps groups than the vacuum group (4.1±2.8 forceps vs 2.1±1.0vacuum, p value<0.0001) and (44.4% forceps vs 9.5% vacuum, p value=0.009) respectively. There was a significant difference between the two groups regarding Apgar score at 1 m and Apgar score at 5 m, where the means of both Apgar scores were higher among the vacuum group than the forceps group (8.1±1.6 vacuum vs 6.4±3.2 forceps, p value=0.002) and (9.5±1.3 vacuum vs 8.3±3.2 forceps, p value=0.006) respectively. **Conclusions:** It is critical to renovate the training and use of operative vaginal delivery to improve these skills which is underutilized today. When it is performed by a skilled provider it is a perfect alternative to Caesarean delivery in the chosen patients.

INTRODUCTION

Vaginal delivery is a normal physiological process that once interrupted might harm the mother and\or the fetus. Physicians should always allow the normal delivery to take place unless there is an indication to facilitate or to help the mother\fetus. In some cases, an instrumental vaginal delivery could be the safest choice [1]. Instrumental delivery is divided into forceps delivery, breech extraction, and vacuum extraction [1]. This mode of delivery has been advocated by the American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine as a strategy to reduce the cesarean delivery rate [2,3]. Throughout the past years, instrumental delivery has earned a bad reputation due to the possibility of poor maternal and neonatal outcomes in terms of physical health and cognitive development [4,5]. This made some physicians prefer cesarean section over instrumental delivery when indicated, which unfortunately resulted in a lack of enough training for residents [1,6]. It has been known that cesarean section has many implications in both the short and long terms, such as infection, hemorrhage, venous thromboembolism, and risk to subsequent pregnancies. World Health Organization (WHO) has considered 10-15% as the ideal rate for cesarean section [7-9]. A local study in Saudi Arabia done by Ba'aqeel reported that there is an 80.2% overall increase in the cesarean delivery rate during the period from 1997 to 2006 [10]. This alarming finding demonstrated the importance of learning how to decide between unassisted vaginal delivery, instrumental delivery, and cesarean section, to provide adequate care without putting the mother and fetus at avoidable risks. To address all aspects of instrumental delivery, (ACOG) has published a recent guideline in 2015, which included details on the indications of instrumental delivery such as prolonged second stage of labor, suspicion of immediate or potential fetal compromise, and shortening of the second stage of labor

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for maternal benefit [11]. The choice between vacuum or forceps has usually been based on the physician's preference and the current situation [12, 13]. Generally, each instrument has its own maternal and fetal risks, for example, forceps increase the risk of bleeding compared to vacuum, anal sphincter injury, in addition to causing significant harm to the fetus, such as facial lacerations, facial nerve palsy, and skull fractures [14]. However, vacuum extraction can also cause lacerations and subgaleal or intracranial hemorrhages [10-12]. Despite all the adverse effects of instrumental delivery, it is still the safest choice to minimize the rate of caesarean section rate worldwide [15]. A similar study was done in Saudi Arabia in 2001 and concluded that forceps are more likely to be used in primigravida due to the prolonged 2nd stage of labor and less likely to fail, while the vacuum is more likely to be used by registrars [16]. In light of such information, this study aimed to evaluate perinatal and maternal outcomes in instrumental delivery in a tertiary health care center in Saudi Arabia. This study is of particular importance because it will benefit the institution by providing suggested changes to the established protocols, which will ultimately result in better patient care and outcome.

METHODS

A retrospective study was conducted at King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia. In the period between July 2018 to June 2021. Patients' files were reviewed following the hospital's policy and after approval by the biomedical ethics research committee. Ethical approval was granted by Research Office, King Abdullah International Medical Research Centre. Approval Number is RSSJ0713-016. The Inclusion criteria Included all females with singleton pregnancy at term gestation who underwent vacuum or forceps delivery. All deliveries must've been performed by attending physicians or residents under the direct supervision of a senior consultant. Exclusion criteria were patients who had multiple pregnancies, underwent cesarean section, had positions other than cephalic, and had placenta abnormality. A structured form (data collection sheet) was used to collect the data, it included demographic data, an indication of instrument application, and maternal and fetal outcomes. SPSS 19 was used for data analysis. Categorical data were presented using numbers and percentages, while numerical data were presented using mean SD. Comparison between the two ways of instrumental delivery was done using Chi-square for categorical data and by independent t-test for numerical data. P value < 0.05 considered as significant.

RESULTS

Out of 346 instrumental delivery cases, 337 (97.4%) were vacuum and 9 (2.6%) were forceps, with a mean age score of 27.2±5.9. The majority of the cases were prim-parity 238 (68.8%), term 320 (92.5%), and booked 298 (86.1%). There was no significant difference between the two methods of delivery regarding age, parity, (Gestational age) GA, and booking status (p value> 0.05)(Table 1 and Figure 1).

Variable		Instrumental delivery method		Total	p-value
		Vacuum	Forceps		
Maternal age^ (mean± SD)		27.2±5.6	26.1±4.8	27.2±5.9	0.516
Parity # N (%)	Prim Parity	230 (68.2%)	8 (88.9%)	238 (68.8%)	0.418
	Multiparty	107 (31.8%)	1 (11.1%)	108 (31.2%)	
GA # N (%)	Pre-term	24 (7.1%)	2 (22.2%)	26 (7.5%)	0.160
	Term	313 (92.9%)	7 (77.8%)	320 (92.5%)	
Booking status# N (%)	Booked	291 (86.4%)	7 (77.8%)	298 (86.1%)	0.362
	Un-booked	46 (13.6%)	2 (22.2%)	48 (13.9%)	

Table1: Demographic data of participants
Data were presented as N (%) or as Mean± SD
^ Comparison was done using an independent t-test
# Comparison was done using the Chi-square test
* p value < 0.05 considered significant

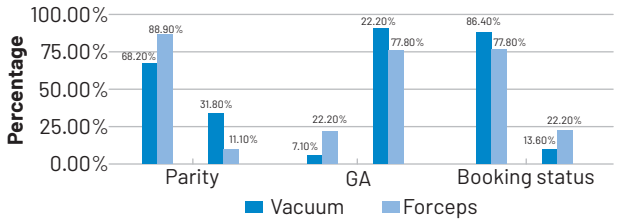

Figure 1: Demographic data of participants in form of bar graph.

Table 2 shows the indications of instrumental delivery where they are as follows; Fetal distress in 182(52.8%) cases, followed by poor maternal efforts in 74(21.4%) cases, then prolonged 2nd stage in 23(6.7%) cases, and lastly, maternal heart disease in 2(0.6%) cases (Figure 2). There was no significant difference between the two methods of delivery regarding the four indicators (p value> 0.05). Even the rates of poor maternal efforts and Prolonged 2nd stage were higher in the forceps group, while the rates of fetal distress and maternal heart disease were higher in the vacuum group (Table 2 and Figure 2).

Variable (indication)		Instrumental delivery method		Total	p-value
		Vacuum	Forceps		
Poor maternal efforts# N(%)	No	265 (78.9%)	6 (66.7%)	271 (78.6%)	0.518
	Yes	71 (21.1%)	3 (33.3%)	74 (21.4%)	
Fetal distress N (%)	No	156 (46.4%)	7 (77.8%)	163 (47.2%)	0.104
	Yes	180 (53.6%)	2 (22.2%)	182 (52.8%)	
Prolonged 2nd stage# N (%)	No	315 (93.7%)	7 (77.8%)	322 (93.3%)	0.127
	Yes	21 (6.3%)	2 (22.2%)	23 (6.7%)	
Maternal heart disease# N (%)	No	335 (99.4%)	9 (100%)	344 (99.4%)	0.970
	Yes	2 (0.6%)	0 (0.0%)	2 (0.6%)	

Table 2: Indications of instrumental delivery
Data were presented as N (%) or as mean± SD
^ Comparison was done using an independent t-test
# Comparison was done using the Chi-square test
* p value < 0.05 considered significant

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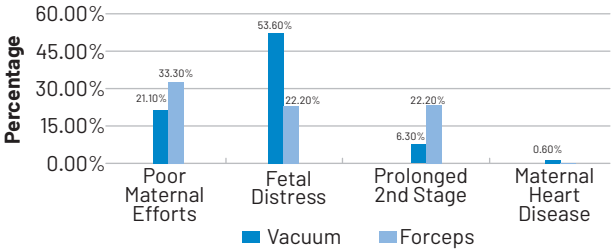

Figure 2: Indications of instrumental delivery in form of bar graph

There was a significant difference between the two groups regarding 3rd & 4th-degree tears and hospital stay, where the mean hospitalization and the rate of 3rd & 4th-degree tears were higher among forceps groups than the vacuum group (4.1±2.8 forceps vs 2.1±1.0vacuum, p value<0.0001) and (44.4% forceps vs 9.5% vacuum, p value=0.009) respectively. On the other hand, there was no significant difference between the two methods of delivery regarding episiotomy and 1st & 2nd-degree tears. Even though the rates of both of them were higher in the forceps group. No cases were reported in both groups for the following; post-partum hemorrhage, blood transfusion after delivery, sphincter damage, and post-partum Hysterectomy (Table 3 and Figure 3).

Variable (Maternal outcome)		Instrumental delivery method		Total	p-value
		Vacuum	Forceps		
Episiotomy# N (%)	No	59 (17.5%)	1 (11.1%)	60 (17.3%)	0.518
	Yes	278 (82.5%)	8 (88.9%)	286 (82.7%)	
1st & 2nd-degree tear# N (%)	No	269 (79.8%)	7 (77.8%)	276 (79.8%)	0.573
	Yes	68 (20.2%)	2 (22.2%)	70 (20.2%)	
3rd & 4th-degree tear# N (%)	No	305 (90.5%)	5 (55.6%)	310 (89.6%)	0.009
	Yes	32 (9.5%)	4 (44.4%)	36 (10.4%)	
Post-partum hemorrhage# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
blood transfusion after delivery# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
Sphincter Damage# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
Post-partum Hysterectomy# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
hospital stay^ (mean± SD)		2.1±1.0	4.1±2.8	2.1±1.0	0.0001**

Table 3: Frequency and percentage of different maternal outcomes by use of instrumental delivery

Data were presented as N (%) or as mean± SD

^ Comparison was done using an independent t-test

Comparison was done using the Chi-square test

* p value < 0.05 considered significant

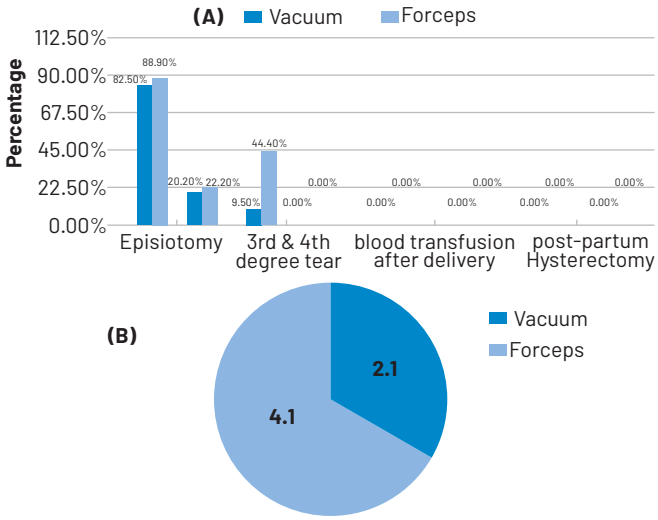

Figure 3: Percentage of different maternal outcomes by use of instrumental delivery in form of bar graph. (B) Hospital stays of forceps and vacuum instrumental delivery

There was a significant difference between the two groups regarding Apgar score at 1 m and Apgar score at 5 m, where the means of both Apgar scores were higher among the vacuum group than the forceps group (8.1±1.6 vacuum vs 6.4±3.2forceps, p value=0.002) and (9.5±1.3 vacuum vs 8.3±3.2 forceps, p value=0.006) respectively. On the other hand, there was no significant difference between the two methods of delivery regarding NICU admission, Cephalohematoma, Neonatal jaundice, Perinatal mortality, Birth weight, and Fetal blood pH. Even though the rates of them were higher in the vacuum group except the rate of Perinatal mortality was higher in the forceps group. No cases were reported in both groups for Brachial plexus injury and subconj hemorrhage (Table 4 and Figure 4).

Variable (Neonatal outcome)		Instrumental delivery method		Total	p-value
		Vacuum	Forceps		
NICU admission# N (%)	No	322 (95.5%)	8 (88.9%)	330 (95.4%)	0.391
	Yes	15 (4.5%)	1 (11.1%)	16 (4.6%)	
Cephalohematoma# N (%)	No	336 (99.7%)	9 (100%)	345 (99.7%)	0.556
	Yes	1 (0.3%)	0 (0.0%)	1 (0.3%)	
Brachial plexus injury# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
Neonatal jaundice# N (%)	No	335 (99.4%)	9 (100)	344 (99.4%)	0.547
	Yes	2 (0.6%)	0 (0.0%)	2 (0.6%)	
subconj hemorrhage# N (%)	No	337 (100%)	9 (100%)	346 (100%)	
Perinatal mortality# N (%)	No	332 (98.5%)	8 (88.9%)	343 (98.3%)	0.073
	Yes	5 (1.5%)	1 (11.1%)	6 (1.7%)	
Birth weight^ (mean± SD)		3.1±0.38	2.9±0.4	3.1±0.38	0.363
Apgar score at 1 m <5^ (mean± SD)		8.1±1.6	6.4±3.2	8.1±1.6	0.002*
Apgar score at 5 m <7^ (mean± SD)		9.5±1.3	8.3±3.2	9.5±1.3	0.006*
Fetal blood pH^ (mean± SD)		7.2±0.4	6.9	7.2±0.2	1.000

Table 4: Frequency and percentages of different neonatal outcomes by using instrumental delivery

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Data were presented as N(%) or as mean± SD
^ Comparison was done using an independent t-test
# Comparison was done using the Chi-square test
p value < 0.05 considered significant

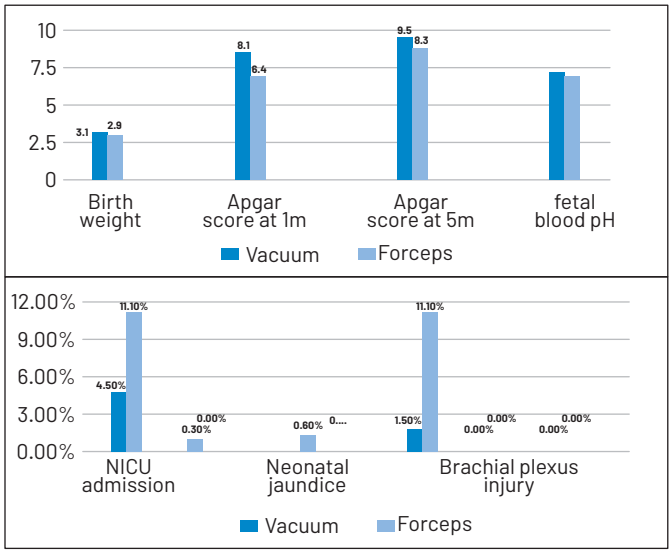

Figure 4: (A) Means of different neonatal outcomes by using instrumental delivery in form of bar graph. (B) Neonatal Outcomes in terms of need of neonatal Intensive care unit, neonatal jaundice and brachial plexus injury

DISCUSSION

Instrumental vaginal delivery is one of the common obstetric interventions to help the delivery of the fetus. It is the use of obstetric forceps or vacuum extractors to rise the forceps along the pelvic curve and expedite delivery [17]. The present study aimed to evaluate perinatal and maternal outcomes in instrumental delivery in a tertiary health care center in Saudi Arabia. Out of 346 instrumental delivery cases, the majority (97.4%) were vacuum and less than a tenth (2.6%) were forceps. The majority of the cases were prim-parity 238 (68.8%), term 320 (92.5%), and booked 298 (86.1%). The result shows that the majority of women were young between 20 to 30 years with a mean age score of 27.2±5.9 without significant difference. In India's study, more than half of women were between 20 to 25 years 53.17% followed by 25 to 30 years 34.78% [18]. Also, in Nigeria's study, almost two third of the women were up to 25 years [19]. More than two-thirds (68.8%) of cases were prim gravida and 31.2% multigravida. This result is consistent with Several studies, where in Nigeria's study, the authors reported prim gravida forming 52% and second gravid 18% cases [19]. Also, in Greece's study, prim gravida formed 84.75 % and multigravida 15% cases [20]. And in India's study, 57.19% of cases were prim gravida followed by the second gravida with 24.41% cases [18]. The main indication of this research was that Fetal distress (52.8%) increases, particularly among the vacuum group, and secondly a poor maternal effort (21.4%) is seen, particularly among the forceps group. Similar results were reported in several studies, where according to research conducted in India, prolonged second stage of labor (70.56%) was the main reason for employing instruments, followed by maternal heart illness (14.38%) and fetal distress (11% of cases) [18]. Another research from India found that the second stage was extended in 16% of instances and that 20.83% of cases showed signs of fetal distress [21]. The most frequent symptoms in the Greek research were prolonged second stage of labor (69.73%) and fetal distress (26.47%) [20]. The American College of Obstetricians and Gynecologists (ACOG) released a guideline for the use of Operative Vaginal Delivery Aid in 2000, then updated it in 2015 and 2020 for both Forceps and vacuum which included a list of accepted indications for such procedures (Prolonged second stage of labor, Suspicion of immediate or potential fetal compromise, Shortening of the second stage of labor for maternal benefit), where operative vaginal delivery should only be performed if there is an appropriate indication [10, 22]. In the current study, the main complication was episiotomy with the highest rate of incidence in pregnancies delivered with forceps. On the other hand, the hospitalization duration was significantly higher among the forceps group than the vacuum group. Also, the rate of 3rd & 4th-degree tears was significantly higher among the forceps group than the vacuum group. In India's study, the maternal complications were cervical tear and lacerations by 12.04% followed by episiotomy extension in 9.03 % of cases, then Atonic post-partum hemorrhage in 4% of cases [18]. In another study from India, the incidence of episiotomy extension was 26.66% [21]. In Miami review of over 50000 vaginal deliveries at the University of Miami, the rate of 3rd/4th perineal lacerations were significantly higher in forceps (20%) and Vacuum (10%) as compared to the Spontaneous vaginal delivery [23]. Also, in Pittsburgh, Pennsylvania study, the rate of severe vaginal lacerations was approximately 32% [24]. The result reveals that 16 cases were admitted to NICU, 6 of Perinatal mortality, and 1 case of cephalhematoma without significant difference between the two groups. On the other hand, there was a significant difference between the two groups regarding Apgar score >5 at 1 m and Apgar score >7 at 5 m, where the means of both Apgar scores were higher among the vacuum group than the forceps group. Where more than two-thirds showed good APGAR scores. 70.56% of the newborns in India's study had good APGAR scores >6 at 1min. 82 newborn infants required NICU care owing to delivery hypoxia, 20 babies suffered neonatal jaundice, 2 newborns experienced convulsions (0.66%), and 1 baby developed a cephalhematoma (0.33%), even though there were 2% incidences of fresh stillbirth [18]. Instrumental vaginal delivery revealed in the second India research that

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14.43% of babies required NICU admission [21]. Although the vacuum extractor was linked to an increase in cephalohematoma and retinal hemorrhage, a comprehensive evaluation of 10 studies comparing vacuum extraction with forceps delivery revealed no significant changes in Apgar ratings at one and five minutes and minimal major injuries in newborns [25]. These differences in the percentage could be due to several factors such as socio-economic factors, geographic areas, sample size, and study nature. Regardless of considerable changes in the management of labor and delivery over the last decades, operative vaginal birth is still an important element of modern labor management. The use of obstetric forceps or vacuum extractors necessitates that an obstetrician or other obstetric care provider be aware of the proper use of the instruments and the risks involved. The current study has some limitations, first, the study's nature (retrospective) leads to losing the information because of the withdrawing of cases. Also, the study depends on the information of one center which prevents generalization of the result. This study is of particular importance because it will benefit the institution by providing suggested changes to the established protocols, which will ultimately result in better patient care and outcome.

CONCLUSIONS

When a spontaneous vaginal birth is not possible, the choice to proceed with an operational vaginal delivery must be founded on understanding of the risks to the mother and the fetus. Operative vaginal births should only be done if it is deemed a safe option. However, the risk and advantages of both ways of delivery (forceps and vacuum) must be adapted in each instance to be more suited. In conclusion, instrumental vaginal delivery using vacuums and forceps can have a significant impact on perinatal and maternal outcomes. It is associated with an increased risk of maternal lacerations and perineal trauma, as well as a higher rate of neonatal cranial and facial injuries. However, it can also be a lifesaving intervention in certain situations, such as when the fetus is in distress, or the mother is unable to push effectively. It is important for healthcare providers to weigh the potential risks and benefits of instrumental delivery and to use these instruments with caution and proper training.

Conflicts of Interest

The authors declare no conflict of interest.

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