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Non VI SED ARTE - Not by Force But by Skills - A Retrospcetive Observational Study on Operative Vaginal Deliveries at a Tertiary Care Center

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Abstract: ***Instrumental vaginal delivery, involving the use of forceps or vacuum, is a critical obstetric intervention aimed at ensuring safe delivery during maternal or fetal complications. This study explores the prevalence and outcomes of instrumental deliveries in a tertiary care hospital setting over one year. Data collected from hospital records provided insights into maternal and neonatal outcomes associated with vacuum and forceps use. Results indicate that forceps were more frequently employed, particularly in preterm cases and to expedite delivery for maternal indications. Key findings highlight the relative benefits of vacuum extraction in minimizing maternal tissue trauma, while forceps delivery remains beneficial for specific fetal weight ranges and situations requiring swift delivery. The study underscores the value of instrumental delivery in reducing Caesarean rates and emphasizes the need for enhanced training to maintain proficiency in these techniques, particularly in resource - limited settings.***

Keywords: instrumental delivery, forceps, vacuum extraction, maternal outcomes, neonatal outcomes

1. Introduction

A vaginal delivery accomplished with the help of instruments either Forceps or Vacuum is termed as instrumental vaginal delivery. The Obstetric forceps have a history from the time of the Chamberlain family in the seventh century [1, 2]. Vacuum extraction has recently gained popularity because of new designs of vacuum cups and ease of use of the instrument [3].

Operative vaginal birth is performed to accomplish or hasten a safe vaginal birth for maternal or fetal indications such as lack of progress of labour (for 3 hours in second - stage labour with regional analgesia or 2 hours without regional analgesia in nulliparous women) maternal exhaustion or distress and medical indications to avoid Valsalva manoeuvre, suspected fetal compromise in the second stage (cardiotocography pathological, abnormal fetal blood sampling result, thick meconium stained liquor) [4].

Healthcare professionals need to deliver the women who require Instrumental delivery every year makes vacuum extractor or obstetric forceps an essential part of obstetric care, and mandated them choose from instruments for assisted vaginal delivery. Although there is demand to attenuate assisted vaginal delivery, clinical experience provides recurring evidence that leaving all to nature or the scalpel will not accomplish any goals. The fear of medicolegal litigations made the art of instrumental delivery as the method which is very harmful for the mother and baby [5, 6].

However correct judgment of clinical situation, appropriate selection of parturient and choice of instruments play vital role in the better outcome for both mother and fetus [7]. India is the fastest growing country in terms of population and by 2030 will be the most populous country in the world. The high birth rates in India can help us evaluate the different modes of delivery
WHO - EMOC* has recommended Instrumental vaginal delivery as one of its essential components of Basic obstetric care [8]. To curtail the rising Caesarean rate, it is important to use instrument such as forceps and vacuum to deliver our women [9].

The rate of operative vaginal birth has decreased over the past few decades, accounting for part of the increase in Caesarean birth rates. The overall prevalence of Caesarean section in India was 21.50% in 2019 - 21 which had risen from 16.72% in 1998 - 99 [10]. Among the developed countries the rates of instrumental vaginal delivery range between 5 - 20% of all births. In the U. K. incidence is between 10 - 15%, in the United States of America is 3 - 4.5% 4. As per the Indian study Gayatri et al., reported 3.9% forceps assisted vaginal deliveries [11].

The general trends of instrumental vaginal deliveries vary in obstetric practice and also the incidence varies from country to country and even in the same country from one obstetrician to others [12, 13]. Most of these randomized and non - randomized trials comparing maternal and fetal effects of vacuum extractor and forceps delivery agree upon the maternal benefits of vacuum extractor over forceps, namely less maternal soft tissue trauma. According to the WHO and UN Agencies, assisted vaginal delivery is one of the six critical functions of basic EMERGENCY Care [8].

Consider the wide need of instrumental vaginal delivery it should be made available in resource limited settings in developing countries like India. Operative vaginal birth is beneficial for women because it avoids Caesarean birth and its associated morbidities, and it can be safely accomplished more quickly than Caesarean birth.

Rationale of the study

Thus, there is a need for studies on the subject of operative vaginal delivery in the modern era of elective and repeat Caesarean sections where the morbidities of labour to women have multiplied, simultaneously leading to an increase in the incidence and rate of Caesarean sections, along with the fact that the younger obstetricians' expertise and knowledge of instrumental deliveries are dwindling and fading.

2. Materials and Methods

Study type - Retrospective observational study.

Study duration - 1 year (January 2018 - December 2019).

Data collected from online pdf records of patients and will be plotted on Excel sheet.

The clinical data will be collected using a check list, case recordings of intrapartum fetal and maternal state, clinical profile of the parturient, labour details type of instrument used for OVD*, indication of the procedure were documented in a clinical case record form. Maternal outcomes were genital tract injuries like vaginal wall tear, cervical tear, vulvovaginal hematoma, and 3rd and 4th - degree perineal tears, episiotomy complications like hematoma, need for blood transfusion, urinary retention, need for exploration for traumatic Postpartum hemorrhage, need for peripartum hysterectomy and maternal mortality. The neonatal outcomes were documented in terms of low 5 - minute Apgar score, need for admissions to NICU* for perinatal hypoxia, chignon formation, forceps marks, skull fractures, cephal - hematoma, facial nerve palsy, scalp lacerations for each patient in the hospital clinical record and immediate fetomaternal outcomes. The case record forms will be enclosed herewith in Annexure 1.

Data Analysis will be done SPSS software version 25.

The chi - square test and student t - test were applied to find out the significance of the association and p - value <0.05 was considered as statistically significant.

INSTITUTIONAL ETHICS COMMITTEE NOWROSJEE WADIA MATERNITY HOSPITAL issued approval IECNWMH/AP/2021/065VERSION 03. The modified proposal now bearing project IEC - NWMH/AP/2022/065 VERSION 03 submitted on 22 nd August 2022 has been reviewed by IEC - NWMH. The modified proposal has been approved by IEC - NWMH on 24 th August 2022. .

Types of instruments used -
- Vacuum extraction Silastic 40mm and 60mm cups. The negative pressure applied was up to 0.6kg/cm. T
- Forceps - Wrigley's outlet forceps.

Aims and Objectives

Primary Objective:
- To find the prevalence of vacuum and forceps delivery in a tertiary care hospital.

Secondary objectives
- To evaluate maternal outcomes in instrumental vaginal deliveries in terms of morbidity and mortality.
- To evaluate fetal and neonatal outcomes in instrumental vaginal deliveries

Inclusion criteria
1) All primigravidae and multigravidae >28 weeks of gestation
2) Parturients with spontaneous and induced labours
3) Singleton fetuses
4) Fetuses with Vertex presentation

Exclusion Criteria
1) Parturients <28 weeks of gestation
2) Parturients with antenatally diagnosed malformed fetuses
3) Parturients with confirmed Cephalopelvic disproportion
4) Non vertex presentation of fetus
5) Multiple pregnancies
6) Fetuses who were delivered after failed imstrumentation by Cesarean section

3. Results

Total number of deliveries in year January 2018 - January 2019 was 4274. Total number of OVD - 493 (prevalence of OVD - 11.53%) [14]. In our study majority of participants were in the age group of 20 - 34 years (n=452; 91.7%).1% of the study group comprised of teenage pregnancies (n=5), and 7.3% comprised of women with advanced maternal age (n=36) (Table 1).

Forceps were preferred more than vacuum extraction in our institution accounting for 61.25% of operative vaginal delivery (n=302), while ventouse was used in 25.81% (n=191) parturient [15, 16]. Most of the OVD* were conducted in term pregnancies (n=447; 90.7%). The majority of deliveries were term (≥37 weeks) reflecting the preference for OVD in more mature foetuses, which is consistent with obstetric practice guidelines.

Among the preterm delivery group (n=46; 7.3%) (Table 1), the preferred instrument was Forceps used in 34 parturient (73%), and the ventouse was used in 12 parturient (26.1%). This was statistically significant (p<0.05) (Table 2) [17]. The majority of the parturient in our study were primigravida (n=316). Multigravida with one or more living child were 177 (Table 1) [18, 19].

Among women of 303 (61.5%) were in spontaneous labour, whereas women of 190 (38.5%) parturient had induced labour (Table 1). About 38.5% of deliveries were induced, with methods including Foley's catheter (33.5%) and PGE Tablet/Gel (14.0%). Indicating that a significant proportion of OVDs were performed in cases where labour was induced, possibly due to maternal or fetal indications.

Out of 190 parturient with induction of labour, women of 121 (15.70%) were induced with Foley's catheter and women of 69 (14%) were induced with prostaglandin used as either tablets or as gel (Table 1). In women of 360 (68.2%) parturient of OVD* labour was augmented with oxytocin drip (Table 1).

Maternal bearing down efforts (Irresistible urge to push when the fetal head has descended till the perinium) were adequate in 207 cases (42%) and inadequate in 286 of cases (58%) (Table 1). There was no significant difference (137 Vs 75 i. e.63.3% vs 36.7% OR=0.86) for both forceps assisted and vacuum extraction in parturient with adequate bearing down efforts (Table 2). However, those parturient with inadequate efforts both vacuum and forceps use was comparable (115 & 171 i. e.40.2% vs 59.8%).

The most common indication for OVD* was maternal exhaustion (n=244 i. e.49.5%). There was no statistically significant difference between use of Vacuum (n=112) and Forceps (n=135) (Table 2). Next common indication was to cut short the second stage of labour (42.2%) (Table 1). There was a significant difference in the indication of OVD* with forceps - assisted vaginal delivery (n=150, i. e.72.1%) being preferred more to cut short the second stage of labour over vacuum extraction (n=58; 27.9%) (P= < 0.001) (Table 2).

Maternal morbidity such as cervical, vaginal or perineal tear were observed in 7% of cases of OVD* (Table 3), with no significant difference between forceps - assisted deliveries and vacuum extraction (Table 3) [20]. There was no peripartum hysterectomy or maternal mortality in our study.

Baby weight at birth was between 2 to 3.5 kg in most cases of OVD* (89.9%) (Table 3). However, there was statistical significance in birth weight when two groups of forceps - assisted deliveries and vacuum extraction were compared. Forceps were preferred for babies weighing less than 2kg (2.9% vs.0.5% with vacuum extraction) and more than 3.5kg (9.9% vs 5.2%) vacuum extraction (p= 0.026) (Table 3).

There was a significant difference in the 5 - minute APGAR score with fewer babies delivered by Vacuum extraction having 5 - minute APGAR score of more than 8 (1.5%) compared to forceps - assisted vaginal deliveries (6.2%) (p= 0.013) (Table 3) [21, 22].

There were no neonatal complications in 94.3% of cases of OVD* (Table 1). However, when methods of OVD* were compared, procedure - associated complications such as Chignon formation were seen with vacuum extraction, and forceps marks were seen with forceps - assisted vaginal deliveries (p= 0.002) (Table 3) [21 - 23]. The number of instruments applied by consultants were (Vacuum n=170; 39.4%) and (forceps n=261; 60.6%) and the trainees (Vacuum n=21; 33.9 %) and (Forceps n=41; 66.1%). However, the p value was not significant.

4. Result

Tables

Table 1: Background characteristics of instrumental vaginal deliveries.

Characteristics	Instrumental deliveries N=493 (%)
Age (years)	
18 - 19	5 (1.0)
20 – 34	452 (91.7)
35 – 40	36 (7.3)
Gestational age	
Preterm (28 - 37 weeks)	46 (9.3%)
Term (≥37 weeks)	447 (90.7%)
GPLA (Parity)	
Primigravida	316
Multigravida	177
Types of Labor	
Induced	190 (38.5)
Spontaneous	303 (61.5)
Method of Induction of Labor	
No of IOL	190
Foley's catheter	121 (15.70%)
PGE Tablet / Gel	69 (14.0%)
Oxytocin augmentation	
Yes	336 (68.2)
No	157 (31.8)
Amniotic fluid types	
Meconium	5 (1.0)
Clear	488 (99.0)
Maternal Expulsive efforts	
Inadequate	286 (58.0)
Adequate	207 (42.0)
Indications	
CSSS*	208 (42.2)
Fetal	39 (7.9)
Maternal	244 (49.5)
Both fetal & maternal	2 (0.4)
Maternal outcomes	
Good	486 (98.6)
Cervical/Vaginal/Perineal Tears Neonatal	7 (1.4)
1 minute APGAR scores	
0 - 5	489 (99.2)
6 - 8	4 (0.8)

5 minute APGAR scores	
0 - 8	471 (95.0)
9	22 (4.5)
Baby weight (grams)	
≤ 2.0	10 (2.0)
2.0 to 3.49	443 (89.9)
≥ 3.50	40 (8.1)
Neonatal complications	
No complications	465 (94.3)
Forceps marks	22 (4.5)
Chignon	4 (0.8)
MSB, NICU admission	2 (0.4)

Table 2: Sociodemographic and clinical characteristics among the vacuum and forceps instrumental vaginal deliveries.

	Instrumental vaginal deliveries N=493 (%)		**OR (95% CI) ***	**P value**
	Vacuum (n=191)	**Forceps (n=302)**		
Age (years)				
18 - 19	178 (39.4)	274 (60.6)		0.642
20 - 34	1 (20.0)	4 (80.0)		
35 - 40	12 (33.3)	24 (66.7)		
GLPA (parity)				
Primigravida	116 (60.7)	200 (66.2)	0.79 (0.54 - 1.15)	0.215
Multigravida	75 (39.3)	102 (33.8)		
Gestational age				
Preterm (<37 weeks)	12 (26.1)	34 (73.9)	0.53 (0.27 - 1.05)	0.064
Term (≥37 weeks)	179 (40.0)	268 (60.0)		
Types of Labor				
Induced	79 (41.6)	111 (58.4)	0.82 (0.57 - 1.19)	0.306
Spontaneous	112 (37.0)	191 (63.0)		
Method of Induction of Labor				
No IOL	99 (38.2)	160 (61.8)		0.464
Foley's catheter	69 (41.8)	96 (58.2)		
PGE Tablet / Gel	23 (33.3)	46 (66.7)		
Oxytocin augmentation				
Yes	131 (39.0)	205 (61.0)	1.03 (0.70 - 1.52)	0.870
No	60 (38.2)	97 (61.8)	Ref	
Liquor types				
Meconium	2 (40.0)	3 (60.0)	1.05 (0.17 - 6.37)	1.000
Clear	189 (38.7)	299 (61.3)	Ref	
Maternal bearing down efforts				
Adequate	76 (36.7)	131 (63.3)	0.86 (0.60 - 1.25)	0.432
Inadequate	115 (40.2)	171 (59.8)	Ref	
Indications				
CSSS*	58 (27.9)	150 (72.1)		<0.001
Maternal exhaustion	112 (45.9)	132 (54.1)		
Fetal distress	21 (53.8)	18 (46.2)		
Both fetal & maternal	0	2 (100)		
*** OR - Odds ratio was computed for vacuum IVD.**				

Table 3: Outcomes of Instrumental Vaginal Deliveries

	Instrumental vaginal deliveries N=493 (%)		OR (95% CI) *	P value
	Vacuum (n=191)	Forceps (n=302)		
Maternal outcomes				
Cervical/Vaginal/Perineal Tears BT* OH* MM*	3 (42.9)	4 (57.1)	1.19 (0.26 - 5.37)	1.000
Good outcomes	188 (38.7)	298 (61.3)		
1 minute APGAR scores				
0 - 5	1 (25.0)	3 (75.0)	0.52 (0.05.08)	1.000
6 - 8	190 (38.9)	299 (61.1)		
5 minutes APGAR scores				
0 - 8	188 (39.9)	283 (60.1)	4.20 (1.22 - 14.4)	0.013
9	3 (13.6)	19 (86.4)	Ref	
Baby weight (grams)				
≤ 2.0	1 (10.0)	9 (90.0)		0.026
2.0 to 3.49	180 (40.6)	263 (59.4)		

≥ 3.50	10 (25.0)	30 (75.0))		
Neonatal complications				
No complications	183 (39.4)	282 (60.6)		0.002
MSB, NICU	1 (50.0)	1 (50.0)		
* OR - Odds ratio was computed for vacuum IVD.				

Table 3: Segregated Maternal and neonatal outcomes among the instrumental vaginal deliveries.

Table 4: Neonatal Complications

Neonatal Complications	N	%
Forceps marks	240	12
Cephalhematoma	0	0
Skull fracture	0	0
Scalp laceration	20	1
Facial nerve damage	0	0
Neonatal mortality	0	0

5. Discussion

In the present study, the mean age of parturient was 30 years (20 to 34 years) for both groups in a study by Gardella C et al in 2001 mean age of use of forceps and vacuum were 26.4 years and 26.8 years respectively [24]. Similar type of study done by Prameela RC et al in 2014 showed a mean age to be 24.1 years which was similar to present study [25].

In the present study, the of use of forceps (n=200; 66.2%) as well as the vacuum (n=116; 60.7%) was similar in primigravida (p=0.215) (OR - 0.79 (0.54 - 1.15). In a study by Johanson R. B et al, use of vacuum was 82% compared to forceps which was about 78% in primigravida. In a study by Gardella C et al, use of forceps 75% was high compared to vacuum 68% in primigravida [24].

This suggests that the choice of instrument may be user and expertise dependent as the number of primigravidae is more in our study it indicates that the perineal elasticity may not be adequate in primigravidae and this may cause delayed second stage of labour in them [26, 27].

In present study, maternal exhaustion and to cut short second stage of labour* (CSSS) were the most common indications for both forceps and vacuum application. In a study by Shihadeh et al, failure of secondary forces was the most common indication for both forceps and vacuum extraction. Prameela R. C et al, found that forceps was used more often for prolonged 2nd stage of labour and failure of secondary forces whereas vacuum was used more frequently for fatal distress and prophylactically [25].

The strongest association was found with indications for OVD. cases where the indication was CSSS * were significantly more likely to involve forceps compared to vacuum extraction (P < 0.001). Thus forceps delivery ensures less failure rate and associated with the aim reduce the time to deliver the baby in second stage e. g. in case of maternal heart disease or prolonged second stage of labour where the baby can deteriorate fast (Cord Ph falls at the rate of 0.5/minute) Maternal indications were also associated with a higher likelihood of forceps use This explains the poor maternal expulsive efforts has been helped with Forceps which does not need active maternal pushing in the second stage of labour.

In terms of maternal and neonatal complications, maternal morbidities such as cervical/vaginal/ perineal tear were seen in 7% cases of OVD* in the present study. There was no significant difference between forceps application and vacuum extraction for maternal morbidity. The proper selection of the case and clinical judgments gives the better outcome for both mother and the baby [23, 24].

Neonatal complications such as forceps marks were seen with forceps application and chignon formation was seen with vacuum extraction (p= 0.002). In the study conducted by Jennifer H. et al more instrument marks and bruising (P <.001) were found in the neonates delivered by forceps, whereas there was a greater incidence of cephalohematomas (P =0.03) and caput and moulding (P= <.001) in the with vacuum Group [27].

There was a significant difference in 5 - minute APGAR scores between vacuum extraction and forceps. Babies delivered by vacuum had higher odds of having APGAR scores of 0 - 8 compared to forceps (OR= 4.20, 95% CI =1.22 - 14.4, p = 0.013). This suggests that neonates delivered by vacuum may have slightly poorer 5 - minute APGAR scores compared to those delivered by forceps [27].

There was a significant association between baby weight and the choice of instrument used. Babies weighing ≤ 2.0 kg were more likely to be delivered by forceps (P = 0.026). Conversely, babies weighing 2.0 to 3.49 kg were more likely to be delivered by vacuum [28].

There was a significant difference in neonatal complications between vacuum extraction and forceps. The odds of experiencing complications were lower with vacuum extraction compared to forceps (p = 0.002). Specifically, forceps deliveries were associated with a higher incidence of complications such as forceps marks and neonatal unit admissions (MSB, NICU) [28].

In a study done Ghidini, et al vacuum - assisted vaginal deliveries, the number of times the vacuum device is used (called pulls) doesn't lead to a higher risk of problems for the baby. This means that whether the vacuum is applied more than once (pop offs) or just once doesn't increase the chances of complications for the newborn [29]. So, doctors can use the vacuum safely multiple times if needed during delivery without it causing more risks for the baby. So, the art of instrumental vaginal deliveries should be propagated through the subsequent generations by way of Simulation training.

6. Conclusion

In today's modern obstetric era the use of operative vaginal deliveries is on a decline. However, our study demonstrated that though proper case selection and individualisation of

clinical situation better maternal and fetal outcome can be achieved. The use of OVD can be to reduce second stage Caesarean section and related short term and long – term morbidity and mortality.

Conflict of interest:
None declared

Ethical approval
The study was approved by the Institutional Ethics Committee

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