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Original Research Article

Vacuum Assisted Vaginal Delivery in Singleton Term Pregnancies: Short Term Maternal and Neonatal Outcome in a Tertiary Hospital of Nepal

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ABSTRACT:

Introduction: Other than cesarean delivery, assisted vaginal delivery is an alternative procedure for delivery in emergency obstetrics. Presently, vacuum delivery has gained more popularity than forceps for operative/assisted vaginal delivery, when and where indicated, with success as well as lesser neonatal and maternal complications. This study was done to estimate the short term maternal and fetal morbidity/mortality due to vacuum assisted vaginal delivery. **Methods**: A prospective observational study was conducted at Lumbini Medical College Teaching Hospital from January 2015 to May 2016. One hundred and four pregnant women who had successful vacuum assisted vaginal deliveries were enrolled. Fetal and maternal outcome were assessed. **Results**: One hundred and four (2.9%) successful vacuum deliveries were conducted among 3457 deliveries during our study period. Sixty seven (64.4%) were primigravida and most (*n*=59, 56.7%) parturients were of age group 20-30 years. The commonest (*n*=65, 62.5%) indication for vacuum application was prolonged second stage of labor. Among the maternal morbidities, 6.7% (*n*=7) had genital tract injury, 3.8% (*n*=4) had primary post-partum hemorrhage, 3.8% (n=4) had urinary retention, 2.8% (*n*=3) needed blood transfusion. Among neonatal morbidity indicators, 19.2% (*n*=20) neonates had birth asphyxia, 4.8% (*n*=5) neonates had cephalohematoma, 0.96% (*n*=1) had brachial plexus injury. There was one early neonatal death due to meconium aspiration syndrome. **Conclusion**: A successful vacuum assisted delivery can be achieved with lesser maternal and neonatal morbidity with timely assessment of labor, skilled operator, and availability of neonatal team.

Keywords: cesarean section • maternal • morbidity • obstetrical vacuum extraction • treatment outcome

INTRODUCTION:

Vacuum delivery is one of the operative vaginal procedures in obstetrics performed as an active measure for delivery. A vacuum device is applied over the fetal scalp to facilitate fetal head delivery and was originated at 1700 A.D.[1] Operative vaginal delivery includes either vacuum extraction or forceps extraction for fetal head delivery. Cesarean section is an alternate option for operative vaginal delivery.[2] With refinement in design of cup from crude metal to pliable silastic and invention of hand-held pump and gauge with a measurable suction pressure, vacuum extractor is gaining popularity over forceps. It has become an instrument of choice for operative vaginal delivery with ratio of 4:1 in current obstetric practice in United States.[3] The safety and success of procedure depends on operator skill, proper timing, and justified indications.[4,5] An operative/assisted vaginal delivery should be performed by an operator who has the knowledge, experience, and skills necessary to assess and use the instruments and manage complications that may

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arise as a result of its use.[6]

With increasing patient awareness and medico-legal issues regarding complications to mother and fetus secondary to instrumental delivery, obstetricians at present prefer cesarean delivery. Cesarean section (CS) can be regarded as a second line procedure where we have ground for assisted vaginal delivery. This lowers maternal and neonatal morbidity as compared to that of abdominal delivery (CS).[7]

We have estimated the outcome of vacuum assisted vaginal delivery in terms of maternal and fetal morbidity in a well-equipped tertiary hospital.

METHODS:

A prospective, observational study was conducted at department of Obstetrics and Gynecology of Lumbini Medical College Teaching Hospital, Palpa, Nepal for the period of 17 months (January 2015 to May 2016). One hundred four pregnant women with singleton pregnancy with cephalic presentation who had successful vacuum assisted vaginal deliveries at term (after 37 completed weeks of pregnancy) during our study period were enrolled in the study.

Indication for vacuum assisted vaginal delivery were:[8]

A. Fetal: Presumed fetal distress/compromise
(At least one of these criteria):
1. heart rate ≤110 bpm or ≥160 bpm
2. Non-reassuring fetal heart status in cadiotocography
3. Thick pea soup like Meconium

B. Maternal:
1. Prolonged second stage.
2. To cut short and reduce the effect of second stage of labor (known cardiac disease class III/IV, pregnancy hypertensive crisis, maternal anemia, myasthenia gravis, spinal cord injury at risk of autonomic dysreflexia, proliferative retinopathy)

Vacuum was applied after the pre-requisites were fulfilled.[9-12] All parturients were provided analgesia in the form of local infiltration of lidocaine 1% into the perineum.

Assessment of maternal morbidity variables ie., genital tract trauma, urinary retention, primary postpartum hemorrhage, need for blood transfusion, or development of puerperal sepsis were done and noted. All the neonates were received and examined by neonatal team to rule out cephalohematoma, skull fracture, sub-galeal hemorrhage, intracranial hemorrhage, and brachial plexus injury. Neonatal admission to intensive care unit was done if required. Further investigation of the neonates were done if warranted.

Low and outlet (when fetal head is below two cm from ischial spine) vacuum assisted vaginal delivery was conducted. Proper cup was applied at flexor point (along the sagittal suture, approximately three centimeters in front of the posterior frontanelle and approximately 6 centimeters from the anterior frontanelle). Soft cup was chosen. The entire cup circumference was palpated before and after vacuum traction was created to prevent maternal soft tissue entrapment. Vacuum was created gradually by increasing the suction at 0.2 kg/cm^2 every two minutes until negative pressure of 0.8 kg/cm^2 was attended. Instrument handle was grasped and traction was initiated. Traction effort was intermittent and coordinated with maternal expulsive efforts and uterine contraction towards downwards and outwards direction. During pulls, the operator placed the non-dominant hand within vagina, with the thumb on the extractor cup and one or more fingers on the fetal scalp. Between contractions, the suction level was lowered. Once the head was extracted, the vacuum pressure was relieved, the cup removed, and the usual techniques to complete vaginal delivery were followed. The procedure was abandoned when there was no evidence of progressive descent with moderate traction during each contraction or where delivery was not imminent following three contractions (3 pulls) of a correctly applied instrument. It was categorized as 'failed vacuum' and cesarean section was performed.[11-13]

The data were entered in Microsoft Excel 2007 and analysis was done with SPSS-17 software. Descriptive data were described as mean, standard deviation and percentages.

RESULTS:

One hundred and four (2.9%) successful vacuum deliveries were conducted out of 3457 deliveries during our study period. Among them, 64.5% (*n*=67) were primigravida and 35.5% (*n*=37) were multigravida. Fifty nine (56.7%) women were in age group 20-30 years, followed by 23 (22.2%) in age-group 31-40 years. There were 22 (21.1%) women less then or equal to 19 years of age. The most common (*n*=65, 62.5%) indication for vacuum application was prolonged second stage of labor followed by fetal distress (*n*=20, 19.2%), poor

maternal effort (*n*=10, 9.6%), and to shorten the second stage (*n*=9, 8.6%).

The maternal morbidity variables are presented in Table 1. The overall rate of maternal morbidity with vacuum assisted vaginal delivery was 17.3% with no mortality. The most common morbidity was genital tract injury which occurred in 7 (6.7%) cases.

Neonatal morbidities were present in 26 (25%) neonates and the most common was birth asphyxia in 20 (19.2%) followed by cephalohematoma in 5 (4.8%), and brachial plexus injury in one (0.96%) neonate. There was one early neonatal death due to meconium aspiration syndrome.

DISCUSSION:

The history of vacuum extractor use is much shorter compared to forceps in operative/assisted vaginal delivery but, its use and popularity has been increasing till present as opposed to obstetric forceps. Compared to forceps, it is easy to apply, has pliable soft cups of variable sizes, has measurable suction pressure causing less trauma to parturients and neonates.[14,15]

The rate of operative vaginal delivery in United States (US) is 5% (1 in 20) with ratio of vacuum versus forceps being 4:1. The lowest rates (5%) of instrumental vaginal delivery are seen in the Northeast US and the highest rates (20-25%) are in the South US.[3] In our study, the rate of vacuum delivery is 2.9% which is far less compared to United States and higher compared to Nigerian study with 0.9% incidence rate.[3,16] The rate of operative vaginal delivery is 10-13% in United Kingdom.[17] The rate of vacuum assisted vaginal delivery of our study is similar to that of Giri et al.[18]

In our study, 64.5% (*n*=67) were primigravida and 35.5% (*n*=37) were multigravida similar to the result of Niranjana et al., which had 57.5% primigravida and 42.5% multigravida among 40 vacuum delivery; but in contrast to a study by Prapas et al. with 85% primigravida and 15% multigravida.[19,20] The indications of vacuum delivery in our study were prolonged second stage of labor (62.5%), followed by fetal distress (19.23%), poor maternal effort (9.61%), and to cut short second stage (8.65%) respectively similar to the study by Yakasai et al. which had 18.1% of fetal distress.[16] The study by Giri et al. found the indications for vacuum assisted delivery as fetal distress in 59%, prolonged second stage of labor in 20%, and poor maternal effort in 17%.[18] Singh A et al. presented the major indications of vacuum as pre-eclampsia in 31.6%, prolonged second stage in 20%, previous cesarean in 18.3%, fetal distress in 8.3%, and poor maternal effort in 8.3%, which differed from our study results.[21]

Table 1*: Maternal morbidity variables.*

Maternal morbidity variables		***n***	***%***
Genital tract Injury	Episiotomy extension	2	6.7
	Cervical tear	1	
	Vaginal wall tear	4	
Primary postpartum hemorrhage		4	3.8
Urinary retention		4	3.8
Blood transfusion		3	2.9
Total		**18**	**17.3**

In a study by Vacca A. et al., among 119 attempted vacuum deliveries, there were 80% of nullipara and their neonates were delivered safely with vacuum extractor.[22] In our study, the principal cause of maternal morbidity was genital tract injuries in 6.7% followed by primary PPH in 3.8% which is similar to findings in the study by Hafeez et al. (5.8% genital tract injuries), Giri et al. (6% PPH), and Niranjana et al. (5% PPH, 2.5% genital tract injury).[7,18,19] The overall maternal complications of our study was 17.3% which was similar to that of Giri et al. (20%), Prapas et al. (18.1%), and Singh A. et al. (18.3%).[18,20,21]

The fetal morbidities like cephalohematoma due to vacuum extractor has good fetal outcome with its subsidence in a few days. Birth asphyxia with vacuum application is primarily due to the result of prolonged second stage rather than vacuum use. The fetal trauma is lower with vacuum than forceps delivery considering intracranial and sub-galeal hemorrhage, which has got deleterious effect and poor prognosis.[7,19] Compared to other studies, our neonates had lesser number of cephalohematoma; 4.84% (*n*=5) versus 10.4% (*n*=7) in a study by Hafeez et al, 18% (*n*=38) in another study by Yakasai et al.[7,16] Our study had similar results to that of Giri et al. (3% cephalohematoma, 20% birth asphyxia) and Vacca A. et al. (8.4% cephalohematoma).[18,22] Our result had similar rate of neonatal morbidity (25%) compared to that of Hafeez et al. (22.1%) and less morbidity compared to that of Yakasai et al. (31%).[7,16]

CONCLUSION:

Vacuum assisted vaginal deliveries can be ensured with success, when the criteria are met,

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indications are justified, and skill operators with neonatal team are available round the clock.

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