

# Fetomaternal Outcome in Operative Vaginal Deliveries in a Tertiary Care Centre: A Descriptive Retrospective Study

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## Abstract

**Background:** Operative vaginal delivery is safe and effective when applied by well-trained personnel. However, it is an underutilized component of obstetric care. We aimed to estimate the frequency of operative vaginal delivery in a tertiary care center and evaluate the immediate maternal and fetal morbidities.

**Methods:** This descriptive retrospective study was carried out in the Department of Obstetrics and Gynecology, Chitwan Medical College and Teaching Hospital. Medical records of all operative vaginal deliveries conducted from May 2019 to April 2020 were retrieved. Data regarding demography, delivery characteristics, maternal and fetal morbidity and mortality associated with operative vaginal deliveries were collected.

**Results:** The frequency of operative vaginal delivery was found to be 2.3% among 3060 deliveries. It was more commonly used in nulliparous women (n = 54, 76.1%); the commonest age group being 20 to 35 years. The commonest indication was fetal distress (n = 32, 45.1%) followed by prolonged second stage of labor (n = 26, 36.6%). The associated maternal morbidities included postpartum hemorrhage (n = 12, 16.9%), need of blood transfusion (n = 9, 12.7%), fever (n = 6, 8.5%), cervical tear (n = 3, 4.2%) and third/fourth degree perineal tears (n = 3, 4.2%). One neonate had cephalhematoma and 14 neonates (19.7%) needed admission in neonatal intensive care unit.

**Conclusion:** Operative vaginal delivery accounted for 2.3% of the total deliveries and was associated with a few maternal and fetal morbidities.

**Keywords:** maternal outcome, neonatal outcome, operative vaginal delivery, vacuum

Operative vaginal delivery is one of the components of basic as well as comprehensive essential obstetric care and is still underused in low-income countries like Nepal. It is less preferred over the years in favor of cesarean section owing to legal jurisdictions, less stringent indications for cesarean section besides decreased transfer and acquisition of skills of conducting the delivery. The choice of forceps and vacuum has varied among regions and over time. It depends on the level of clinical expertise, availability of instruments and anesthesia service, and knowledge of risks and benefits associated with each instrument. In a large prospective study of low- and middle-income countries, the operative delivery rate declined from 1.6 to 0.3%, while the cesarean rate doubled to reach 14.4%.<sup>1</sup> In recent decades, vac-

uum extraction has progressively replaced forceps as the instrument of choice, particularly in Asia and Africa.<sup>2-4</sup> It is also less traumatic to the mother.

Maternal complications related to instrumental delivery range from minor laceration of the vagina and perineum to major complications such as traumatic hemorrhage, bladder injury, and pelvic muscle injury.<sup>5</sup> The most obvious fetal injuries are self limiting minor abrasions and lacerations of the scalp. Cephalhematoma is associated with the vacuum extraction, but apart from causing neonatal jaundice, is rarely of clinical significance. The rare but serious neonatal injuries are subgaleal and intra-cranial hemorrhage.<sup>6</sup>

The primary objective of this study was to estimate the frequency of operative vaginal delivery in a tertiary care center in a low-income country. Secondary objectives were to evaluate the immediate maternal and fetal morbidity and mortality associated with the use of instrumental delivery.

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## METHODS

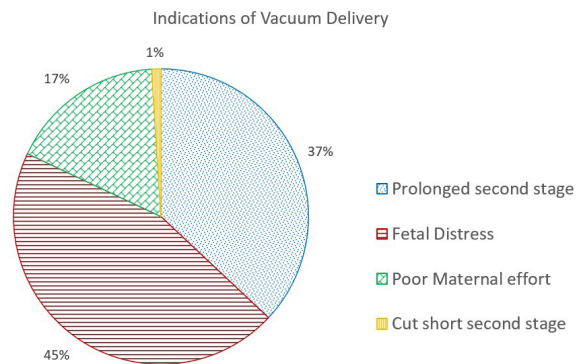
This retrospective study was conducted after ethical clearance from the Institutional Review Committee of Chitwan Medical College and Teaching Hospital (CMCTH). Medical records of all operative vaginal deliveries conducted in the Department of Obstetrics and Gynecology of CMCTH during the one year period from May 2019 to April 2020 were retrieved from the record section. Demographic variables including age, parity, gestational age at delivery, and obstetric risk factors were noted. Delivery characteristics like an indication of intervention, type of instrument used, induction of labor, augmentation of labor, use of episiotomy, time of birth were recorded. The maternal outcomes included extended episiotomy, third- or fourth-degree tears, postpartum hemorrhage (PPH), the requirement of blood transfusion, fever, urinary retention, and days of hospital stay. Fetal outcomes included birth weight, cephalhematoma, fractures, admission in neonatal intensive care unit (NICU), Apgar score at 1 min and 5 mins, and intrapartum fetal demise. Data was entered in predesigned proforma and entered into Microsoft Excel. The analysis was done after importing the data to SPSS version 20. Categorical variables were described using frequency distribution and percentages. Continuous variables were described by means and standard deviations (SD) or medians and interquartile range (IQR).

## RESULTS

There was a total of 3,060 deliveries during the study period, out of which 1,326 were delivered vaginally while 1,734 underwent cesarean section. There was no missing data. The frequency of operative vaginal delivery was found to be 2.3% (n = 71). There were three patients with failed vacuum who underwent cesarean section, and they were excluded from this study as morbidities due to cesarean section in the second stage of labor were beyond the scope of the study.

The age (mean  $\pm$  SD) of the 71 patients undergoing vacuum delivery was  $25.85 \pm 5.03$  years. Among them, 87.3% (n = 62) patients belonged to the age group of 20 to 35 years, seven patients were teenagers (18 to 19 years) while two were of advanced maternal age of more than 35 years. Most of them (76.1%, n = 54) were nullipara (Table 1). The most common indication for the application of vacuum was fetal distress, seen in 45.1% (n = 32) patients, followed by a prolonged second stage of labor (Fig. 1).

It was found that 84.5% (n = 60) of patients who had to undergo vacuum-assisted vaginal delivery had sponta-

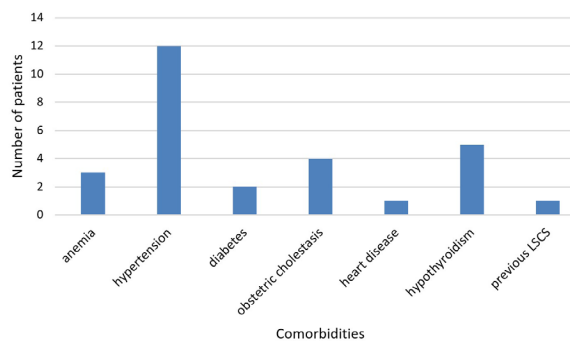


**Figure 1.** Indications of vacuum delivery

**Table 1.** Frequency table of parity of patients undergoing vacuum delivery (n = 71)

Parity	Frequency (percentage)
1	54 (76.1%)
2	13 (18.3%)
3	3 (4.2%)
4	1 (1.4%)

neous onset of labour while 15.5% (n = 11) had undergone medical induction. Among them, 91.5% had been augmented with oxytocin, and the median (IQR) duration of augmentation was found to be 3 (1 to 5) hours. The obstetric risk factors or comorbidities observed are shown in figure 2.



**Figure 2.** Obstetric comorbidities in patients undergoing vacuum delivery

The immediate maternal complications observed in the study are shown in table 2. The most common complication was PPH which was seen in 12 (16.9%) patients. One patient of PPH required a laparotomy and peripartum hysterectomy for ruptured uterus following application of vacuum after a trial of vaginal birth after cesarean section and had a primary PPH. The median (IQR) duration of hospital stay was found to be 2 (0 to 2) days.

The gestational age (mean  $\pm$  SD) of the fetuses delivered

Table 2: Maternal complications of vacuum delivery (n = 37)

Maternal complications	Frequency (percentage)
Postpartum hemorrhage (PPH)	12 (16.9%)
Blood transfusion	9 (12.7%)
Fever	6 (8.5%)
Perineal tears (3rd/ 4th degree)	3 (4.2%)
Cervical tear	3 (4.2%)
Urinary retention	2 (2.8%)
Extended episiotomy	2 (2.8%)

by vacuum was  $275.5 \pm 9.1$  days. There was a total of 63.4% (n = 45) male babies and 36.6% (n = 26) female babies. The weight (mean  $\pm$  SD) of the babies was  $3.09 \pm 0.42$  kg. One patient had intrauterine fetal death due to severe preeclampsia and was induced later for the same while one patient had an intrapartum stillbirth after application of vacuum for fetal distress due to thick meconium-stained liquor. Only one baby had cephalhematoma while no other injuries were found in any of the babies. The Apgar score (mean  $\pm$  SD) of the babies at 1 min was  $7.1 \pm 1.4$  and that at 5 min was  $8.5 \pm 1.5$ .

## DISCUSSION

This study shows the contribution of instrumental vaginal delivery in the total deliveries to be similar to the worldwide trend. The associated maternal and fetal outcomes in this study were also comparable to other institutions. The frequency of operative vaginal delivery in this study was found to be 2.3%, all of which were vacuum-assisted vaginal deliveries. There were no forceps-assisted vaginal deliveries during the study period. This is in accordance with the worldwide trend of choosing vacuum over forceps for such procedures due to, at least in part, mounting data suggesting that vacuum extraction is associated with less maternal morbidity.<sup>7</sup> The frequency of operative delivery in our study is comparable to that of a prospective cohort study done in 12 public hospitals of Nepal which found the frequencies 3.6%, 3.7%, and 1.2% in high volume, medium volume and low volume hospitals respectively.<sup>8</sup> It is also consistent with the frequencies observed in tertiary care hospitals in Kathmandu and Eastern Nepal.<sup>9,10</sup> Our finding is also comparable to that from the United States Birth Registry of 2017 showing rates of 3.1% among 3.86 million.<sup>11</sup> A recent retrospective population-based cohort study of the US birth records showed that forceps and vacuum delivery decreased significantly in the USA from 2005 to 2013 with rates decreasing to as low as 3.1% in recent times.<sup>12</sup> However, it is much lower than that in the

UK where 10% to 15% of all deliveries are conducted by operative vaginal delivery.<sup>13</sup> This disparity might be due to the easy availability and use of epidural analgesia in the UK leading to a more prolonged second stage.

Instrumental vaginal deliveries are the key armamentarium in preventing cesarean section in the second stage and its associated morbidities. It is of special concern in developing countries where mothers often present late to hospitals with prolonged labor after multiple referrals for unavailability of cesarean section, intensive care, or fear of litigation. The most common indication for operative vaginal delivery was found to be fetal distress in 45.1% of patients. This is comparable to the findings of a study in Nepal where the most common indication was fetal distress in 59% followed by a prolonged second stage of labor in 20%.<sup>9</sup> It is also similar to that found in a study in Istanbul where the vacuum was applied for fetal distress in 51.2%.<sup>14</sup> A prospective randomized study done in India also reported non-reassuring fetal heart rate status as the commonest indication for instrumental delivery.<sup>15</sup>

Operative vaginal deliveries have been known to be associated with both short-term and long-term maternal morbidities. The commonest morbidity in our study was found to be PPH in 16.9%, need of blood transfusion in 12.7%, fever in 8.5%, and cervical tears and third/ fourth degree perineal tears in 4.2%. There was a single case of traumatic PPH due to ruptured uterus, three cases due to cervical or extended perineal tears while most cases were due to atonicity. These findings are similar to those found in the UK where PPH was reported in 10 to 40% and obstetric anal sphincter injuries in 1 to 4% of vacuum deliveries.<sup>13</sup> Operative vaginal delivery is a risk factor for the development of PPH: atonic, traumatic, and mixed. Studies in India and Turkey reported PPH in 2 to 3% of deliveries.<sup>14,16</sup> The higher rate of PPH seen in our study could be because of other patient-related risk factors as shown in Figure 2 and not purely attributable to the mode of delivery.

A review of over 50,000 deliveries conducted in the University of Miami reported the rates of third- and fourth-degree perineal lacerations as 10% in vacuum and 20% in forceps deliveries which is much higher than that found in our study.<sup>17</sup> This might be attributed to the more liberal use of episiotomy in 91.5% of patients in our study. A systematic review found that mediolateral or lateral episiotomy was protective against obstetric anal sphincter injury in nulliparous women and recommended considering it.<sup>18</sup> Different rates of neonatal morbidity has been reported in the literature. However, most authors agree that serious neonatal injuries are rare with vacuum extraction.<sup>19-21</sup> The various neonatal morbidities are scalp edema, cephalhe-

matoma, scalp lacerations, fractures, intracranial hemorrhage, hyperbilirubinemia, nerve palsies, and rarely fetal death. There was only a single case of cephalhematoma in our study which is far less than 9.4% and 5.2% reported in a systematic review for vacuum deliveries and forceps deliveries respectively.<sup>22</sup> A 5-year review in Nigeria also reported cephalhematoma as the commonest fetal morbidity (18.1%).<sup>23</sup> NICU admission was required in 19.2% of the neonates in our study which is a little less than that reported in a Belgian cohort study where out of 1000 attempted vacuum extractions, 25.4% neonates required NICU admissions.<sup>24</sup> Our admission rate is higher than that found in a study by Prapas et al. where 11% of neonates required NICU admissions.<sup>25</sup> The higher rates of NICU admissions may be due to our hospital being a tertiary care center with referrals for various maternal and fetal indications, which is also reflected by the commonest indication being fetal distress.

There was one case each of antepartum and intrapartum fetal death which probably was due to uncontrolled hypertension and late presentation with fetal distress due to thick meconium in the second stage of labor respectively. Not all neonatal morbidity can be ascribed to the intervention of operative delivery and may be a function of an abnormal labor process.<sup>26</sup> The Apgar score of all other babies at 1 min and 5 min were more than or equal to 6 and 7 respectively although the most common indication of vacuum application was found to be fetal distress. Hence, timely recognition of fetal distress and judicious intervention for expediting labor in the second stage by operative vaginal delivery leads to favorable neonatal outcomes.

Of the essential emergency obstetric interventions, vacuum delivery is most underutilized in low- and middle-income countries.<sup>27,28</sup> Instead, there is often an excessive dependence upon cesarean section, despite its limited availability in low-income countries like Nepal.<sup>29</sup> Hence, obstetricians should be motivated to acquire technical and non-technical skills for performing operative vaginal delivery to tailor it to each patient for the most efficacious and safest delivery experience. The majority of births by operative vaginal methods when performed appropriately by trained personnel result in a safe outcome for the mother and the neonate.

The long-term maternal and fetal morbidities were beyond the scope of this study as it was a retrospective study. The major limitation of the study is the size of the study population as it was a single-year study. The maternal morbidities observed might have been due to other maternal comorbidities and fetal factors and not simply a function of the delivery process. As the maternal compli-

cations in spontaneous deliveries or cesarean section have not been evaluated, this question remains unanswered in our study. Moreover, the deliveries were conducted by different obstetricians with varied expertise and this could have led to bias regarding few maternal morbidities. Despite the availability of a pediatrician at the time of delivery, no routine scalp USG was done to identify subtle degrees of intracranial hemorrhage which may have gone unnoticed. Neonatal hyperbilirubinemia which has been detected later after admission in the NICU could not be estimated.

## CONCLUSION

Operative vaginal delivery accounted for 2.3% of the total deliveries and was associated with a few maternal and fetal morbidities. Knowledge about the magnitude of the possible immediate maternal and fetal outcomes shown by our study may help to avert complications or at least help in preparedness for management of potential complications.

## DECLARATIONS

**Ethics approval and consent to participate:** Ethical approval obtained from the Institutional Review Committee, Chitwan Medical College.

**Consent for publication:** Not applicable

**Availability of data and materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request. All relevant data are within the manuscript and its supporting information files.

**Competing interest:** None

**Funding:** None

**Authors' contributions:** RJ: concept, design, literature search, data acquisition, statistical analysis, and manuscript preparation. SS: data acquisition, manuscript preparation, manuscript editing, and review. JC: data acquisition, manuscript editing, and review. UP: data acquisition, manuscript editing, and review. RT: data acquisition, manuscript editing, and review. All the authors have read and approved the final manuscript.

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