Result

Discussion
RESULTS AND DISCUSSION

Assisted vaginal delivery is one of the six critical functions of basic emergency obstetric care. Over the past two decades, however, most countries have observed a decline in instrumental delivery rates while rates of caesarean delivery have increased. It is worth noting however, that caesarean delivery does not guarantee successful newborn outcomes. UN agencies\(^6\) recommend instrumental delivery rates between 5% and 15%. Although deliveries by vacuum extraction and forceps are certainly not a substitute for caesarean delivery, they are safe obstetric practices with many benefits when protocols are followed.

The present study was conducted at the Department of Obst. & Gynae, Pt. J.N.M. Medical College & Dr. B.R.A.M. Hospital, Raipur from Aug 2007 to Feb 2009.

During the study period, a total of 8279 women were delivered, with an overall caesarean section rate of 30.4%. 163 were instrumental deliveries. We have selected 120 cases in our study and recorded 14.1% failures among assisted deliveries.

In our study, mean age was 23.81±3.6 years (Table no. 1). The two groups did not vary significantly with respect to age.

Similar observation was made by Prapas N.\(^6\) He found no significant difference between vacuum-assisted and forceps deliveries as regards to maternal age (26 ± 5 years and 27 ± 4.6 years, respectively).
Okunwobi YS et al\(^{36}\), noted a mean age of 28.9 yrs in ventouse group & 29.2 yrs in forceps group, in their prospective analysis done at Distt. General Hospital, Ireland.

No significant difference has been found with respect to parity in the two study groups. *(Table no. 2)*

In a retrospective case note review of all instrumental deliveries carried out at the Armed Forces Hospital, Riyadh, Mesleh Ratib A\(^{39}\) concluded that forceps is more likely to be used in the primigravida and prolonged 2nd stage of labour and less likely to fail.

Similarly, BK Opoku\(^{50}\), in his study found that about two-thirds of parturients were of low parity, 0-2. More than half were below 30 years. In our study, 64.1% women were nulliparous.

In a population based study in US & New Jersey by Demissie\(^{41}\), nulliparous women were more likely to deliver by assisted methods than parous women.

**Table no. 3** summarizes neonatal characteristics viz. gestational age, birth weight and Apgar score at 1 & 5 mins. Mean birth weight in our study was 2.80±0.39 kg. Birth weight >3.5 kgs were significantly more in the forceps group. *(p= 0.015)*

Sui Wu Wen\(^{38}\), in a population based historical cohort study in the Canadian province of Quebec; found that the use of instruments was more frequent in infants with higher birth weight and gestational age.

The forceps in premature babies are more helpful because it acts as a protective 'helmet' and prevent the delicate scalp from injuries\(^2\).
As in our study, Prapas N et al found that the neonatal outcome in terms of gestational age and birth weight essentially similar between the two groups. But, the rate of neonates with Apgar scores ≤5 at 1 min. was significantly higher after forceps compared with vacuum delivery (18% vs 5.2% respectively, \( p=0.0003 \)). Also, the neonatal intensive care (NICU) admissions were more in the forceps group (38% vs 11%, \( p=0.0003 \)).

Johnson RB in a multicentre randomised controlled trial conducted at four district general hospitals in the West Midlands found that VE was more likely to be associated with low 5 min Apgar scores. (OR 1.67; 95%, CI 0.99-2.8)

**Classification for Operative Vaginal Delivery (Adapted from ACOG 1989)**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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| **Outlet** | • Fetal scalp visible without separating the labia  
• Fetal skull has reached the pelvic floor  
• Sagittal suture is in the antero-posterior diameter or right or left occiput anterior or posterior position (rotation does not exceed 45 degrees)  
• Fetal head is at or on the perineum |
| **Low** | • Leading point of the skull (not caput) is at station plus 2 cm or more and not on the pelvic floor  
• Two subdivisions:  
  a. rotation of 45 degrees or less  
  b. rotation more than 45 degrees |
| **Mid** | • Fetal head is 1/5 palpable per abdomen  
• Leading point of the skull is above station plus 2 cm but not above the ischial spines  
• Two subdivisions  
  a. rotation of 45 degrees or less  
  b. rotation more than 45 degrees |
| **High** | Not included in classification |
Other specialty organizations, RCOG\textsuperscript{16}, SCOG\textsuperscript{40} have adopted this classification.

**Table no. 4** illustrates various indications of instrumental vaginal deliveries. Most common indication was to cut short 2\textsuperscript{nd} stage of labour (pre-eclampsia, previous caesarean section, heart disease, anaemia) followed by prolonged 2\textsuperscript{nd} stage of labour, fetal distress and maternal exhaustion. Forceps was the chosen method in cases of fetal distress in significantly more no. of parturients (35\%) as compared to ventouse (8.33\%).

This was comparable to a retrospective analysis of all instrumental deliveries over a 1-year period in a University tertiary health care facility performed by Lurie S et al.\textsuperscript{48} The decision-to-delivery interval was 8.6±5.4 and 13.8±6.2 min for forceps and vacuum deliveries, respectively (p= 0.0001). It appears that it is quicker to accomplish forceps delivery in cases of fetal distress than VE.

Carmona\textsuperscript{64}, in a randomized trial comparing elective low forceps delivery with spontaneous vaginal delivery in 50 term patients, found no significant immediate differences in maternal or neonatal outcome. They noted shorter time to delivery (10.2 minute versus 18 minutes) in the forceps group. However, Yancey MK\textsuperscript{65}, in a large randomized study comparing outlet forceps with spontaneous vaginal delivery in 333 women at term showed that, although the use of forceps had no immediate adverse effects on the neonate, there was no significant shortening of the second stage of labor. But, the incidence of maternal perineal trauma increased in primiparous women.
Olagundoye V66, found forceps appropriate in the presence of suspected fetal hypoxia in which case speed is the essence.

In a study by Vacca67, primary indications were arrest of descent (66%), non-assuring fetal heart status (26%), pre-eclampsia (5%), & maternal heart condition (2%) cases.

In our study, only outlet forceps and vacuum applications were done. Occipito-anterior was the most common position of application. (Table No. 5) Occito-posterior position was the cause of failure in 1 case which eventually resorted to caesarean section. (p=0.005)

Forceps and vacuum should not be attempted in cases which require rotation of more than 45 degrees because this has been found to be associated with 1% major neonatal trauma which is not acceptable.

Cricton68, proposed a clinical estimation of the descent of fetal head in fifths, as palpable above the pelvic brim. In general, if only the sinciput is palpable, the head is one-fifth above the pelvic brim and this corresponds to the lowest part of the fetal bony skull being at the level of the ischial spines. It is a good working rule never to apply the forceps if the sinciput can still be felt per abdomen. By identifying the posterior fontanel of the fetal head, the position (OA, OT, OP) can be readily identified. If the posterior fontanel is easily palpable, the head must be well flexed which presents the smallest diameter to the pelvis. The ear as a landmark can be useful in assessing the level of the head as it is just below the maximum biparietal diameter. Thus, if it is easily felt during maternal bearing down effort, there is unlikely to be significant disproportion.
The figures in Table No. 6 reveals that vacuum can be applied in less than full cervical dilatation (10cm). Use of the vacuum extractor before full cervical dilatation still is accepted by some authorities, but only in highly selected circumstances. These include delivery of a second baby of twin, multipara and when caesarean section carries a very high risk of maternal morbidity and mortality. (Milkovsky 2001). Patel, also concluded that vacuum is more useful in multigravida especially when dilatation is 8-9 cm and rim is present.

Table No. 7 illustrates that there were more failures if no. of tractions were >5. Tractions upto 15 were applied in 2 cases, both eventually came out to be unsuccessful.

Correct position of the vacuum cup on the fetal scalp is the major determinant of success. The "flexion point" or the "pivot point" lies on the sagital suture, 3 cm in front of the posterior fontanel & thus 6 cm posterior to the anterior fontanel. The center of a correctly placed vacuum cup is directly overlying the flexion point. The traction force must be applied in the direction of the pelvic axis and perpendicular to the cup. The recommended pressure for vacuum extraction is 0.6 to 0.8 kg/cm² (550-600 mm Hg, 11.6 psi). Traction is applied concurrently with uterine contractions. There is no agreement on what is the maximum number of tractions safe for the fetus. Some have suggested that a traction force of 22.7kg is the upper limit for fetal safety. The average traction force with forceps is 16kg in nulliparous and 12kg in multiparous patients. In contrast, the average traction force with the vacuum is 8-15 Kg.
Operative vaginal delivery should be abandoned where there is no evidence of progressive descent with each pull or where delivery is not imminent following three pulls of a correctly applied instrument by an experienced operator\textsuperscript{77,78}.

One randomized study of 94 women comparing a one-step rapid application of vacuum with conventional stepwise application found a significant reduction in the time from application to delivery (6 minute) without any difference in maternal or neonatal morbidity\textsuperscript{75,75}

\textbf{Aldo Vacca}\textsuperscript{67}, attempted 50 VE comprising 32 low and 18 mid-cavity deliveries at Queensland Hospital, Australia. Overall, 86\% of the extractions were completed in four or fewer pulls but, the number varied with station and position of the fetal head and whether the application of the cup was flexing or deflexing. Fewer no. of tractions were required in low, non-rotational and flexing cup application. It appears clear, however, that the risk of injury to the infant is related to the number of pulls of the vacuum extractor, thus, the importance of complying with the guidelines of 30 min or three pulls.

Among the \textbf{FDA recommendations}\textsuperscript{79} for use of the vacuum device, two are particularly useful:

1. Rocking movement or torque should not be applied to the device; only steady traction in the line of the birth canal should be used.

2. Clinicians caring for the neonate should be alerted that a vacuum device has been used so that they can adequately monitor the neonate for the signs and symptoms of device related injuries.
In the present study, cup detachments were once in 41.6%, twice in 25%, thrice in 5% & four times in 3.3% of cases. (Table no. 8)

A number of predisposing factors have been linked to unsuccessful vacuum extraction & failure of autorotation. Arguably, one of the important factor is incorrect application of the vacuum cup on the fetal scalp.

S. Archanna carried out a study in which 226 cases were delivered by vacuum. 5 cases were unsuccessful due to cup slipping during traction. Ultimately, 3 of these patients were delivered with forceps, as sufficient descent had occurred with ventouse. In the other two, a recourse to caesarean section has to be undertaken. Cup detachment should probably not be regarded as a safety mechanism, but rather a warning sign of incorrect application or cephalo-pelvic disproportion. Most authors have suggested a maximum of 2 to 3 cup detachments.

Many authorities recommend 15-20 mins time to limit the risk of complications.

Table No. 9 & 10 summarizes failure rates of assisted delivery. Unexpected failure of instrumental delivery is not rare. In the present study, 12 cases in the ventouse group & 5 cases in the forceps group were failed (14.1%). Cephalo-pelvic disproportion was the cause in majority. (47%)

Earlier published reports were small retrospective studies that suggested outcome was no worse after failed operative delivery. In a recent study, Towner D demonstrated significantly higher incidences of
intracranial haemorrhage and other birth trauma following a failed operative vaginal delivery. Unless the pre-operative assessment is highly suggestive of a successful outcome trial of operative vaginal delivery in best avoided.

De Jonge\textsuperscript{23}, carried out a retrospective study of patients' records over a 5-year period. A total of 37113 patients were delivered, with an overall caesarean section rate of 14.6\% and a rate of 11.1\% for instrumental deliveries (4.0\% ventouse, 7.1\% forceps). He reported a failure rate of 1 in every 58 assisted deliveries. Trial of instrumentation should be bypassed in cases of absolute feto-pelvic disproportion with or without fetal distress and/or more than one-fifth of the fetal head above the pelvic brim. This is an indication of primary caesarean section.

Groom KM\textsuperscript{47} found that failure rates for vacuum extraction of 20\% or higher are not uncommon.

Of greater concern is the fact that serious neonatal and maternal injuries have been attributed to the use of multiple instruments. RCOG guidelines\textsuperscript{16} states that sequential use of instruments should be avoided wherever possible and should not be attempted by inexperienced operators.

Available evidence appears to be against attempting multiple efforts of operative vaginal delivery with different instruments, unless there is compelling and justifiable reason.\textsuperscript{83}

Bhide A\textsuperscript{84} reviewed 400 ventouse deliveries at St. Jeorge Hospital, London. Failed ventouse delivery was associated with an increased chance of fetal malposition (OR 3.7, 95\% CI 2.6-5.5).
Ventouse should be the chosen method especially for occipito-posterior deliveries where the vacuum simply facilitates the natural rotation of the head.85

In our study, maternal morbidity were significantly less in VE group as compared to forceps group. (p = 0.002) (Table No. 11) Perhaps, the strongest evidence in favour of the vacuum extractor comes from the results of meta-analyses published by Cochrane Database (1999).86 It showed that the vacuum extractor was associated with a lower caesarean section rate, a lower usage of regional and general anaesthesia, with apparently less pain at delivery, significantly less pain at 24 hrs and significantly less likely to cause serious maternal injury than forceps. It seemed that the vacuum extractor could 'do no wrong'.

Patel2 reported higher rate of extension of episiotomy (forceps 23.17%, VE 7.7%) and cervical tear (forceps 10.49%, VE 7.76%) in the forceps group. This is one area where VE undisruptedly scores over forceps as forceps is a space occupying instrument. Similar rates of episiotomy extension noted in our study (forceps 40.0%, VE 13.3%). According to recent guidelines, routine episiotomy is not necessary for an assisted vaginal birth.87

Dell D88 compared VE to forceps delivery and concluded that more maternal morbidity (soft tissue injury, discomfort) occurs with forceps delivery.

Aliya Islam89, compared maternal complications in a prospective study at Military Hospital, Rawalpindi found that extension of episiotomy
was more likely to occur with ventouse deliveries and third degree perineal tear occurred more with forceps deliveries.

Yarrow C\(^4\)\(^2\), in a study documented no complications in 115 mothers (80%). Complications for the other 29 mothers (20%) were PPH (=500ml), 3\(^{rd}\) & 4\(^{th}\) degree perineal tears, fever, vulvo-vaginal haematoma & complicated lacerations requiring obstetrician repair.

In a randomised controlled trial in 2002, Eason E\(^9\)\(^0\), showed that a decrease of 4.9 in adjusted relative risk in anal spinchter injury when vacuum was used over forceps.

Johanson RB\(^3\)\(^1\), in a randomised prospective study comparing the new vacuum extractor policy with forceps delivery found there were significantly less maternal trauma in VE group. Fewer women have anal sphinchter damage or upper vaginal extensions in the VE group (11% vs 17% OR 0.6; 95% CI, 0.38-0.97).

Two of our parturients had PPH & blood transfusion required in 4 cases in forceps group in the present study. None of the women in VE group had serious morbidity.

The risk of neonatal morbidity was similar between infants delivered by vacuum or forceps (Table No. 12) is in line with the study by Gary L Darmstadt\(^9\)\(^1\) He found perinatal mortality rates were not significantly different between the two instrumental methods (7 trials, N = 1800, OR = 0.80, 95% CI: 0.18-3.52 vacuum extraction vs forceps, respectively). The vacuum extractor was associated with an increase in neonatal cephalhaematomas and retinal haemorrhages, but serious
neonatal injury was uncommon with either instrument and Apgar scores at 1 and 5 min were comparable.

We observed significantly more cephalhaematomas with the vacuum extraction (p=0.0001). Similar reports were made by Chan in a retrospective analysis of deliveries conducted at Kandang Kerbau Hospital, Singapore. (OR 0.33 [0.18-0.61]).

In a study, Williams et al, reported that 20% of babies delivered with vacuum had raised bilirubin as compared to 10% of forceps deliveries in Florida.

The higher rates of neonatal jaundice associated with vacuum delivery may be related to the higher rate of cephalhaematoma.

Aaron B Caughey, carried out a retrospective cohort study to compare perinatal outcomes in forceps & vacuum assisted deliveries. Shoulder dystocia was more frequent in women having vacuum-assisted delivery (3.5% vs 1.5%, p<0.001). Low 5-min Apgar score, cephalhaematoma, admission to neonatal intensive care, and neonatal jaundice also were more frequent in VE group. On the other hand, women having forceps delivery had more 3rd & 4th degree perineal lacerations (36.9% vs 26.8%, p<0.001). Only 2 cases in our study had 3rd & 4th degree perineal tear, both belonging to forceps group.

Srisomboon, inferred that scalp injuries occurred more frequently with the metal than with the rubber cup (p=0.006). VE delivery had a greater tendency to fail when the fetus presents in occipitoposterior position, had excessive caput, or severe degree of moulding.

A randomized study of forceps and vacuum assisted vaginal
delivery identified three factors associated with the development of shoulder dystocia: use of vacuum device (P=0.04), time required for delivery (P=0.03), and birth weight (P=0.001). A trial of labor for macrosomic infants are not contraindicated, although caution should be used given the possibility of shoulder dystocia.93

Nasseri51, presented a case report which showed neonatal subgaleal haemorrhage is a rare, but potentially lethal complication of instrumental delivery particularly, VE. The majority of SGH's are preventable. Education and training on the proper use of vacuum is vital to reduce the incidence of this condition.

Johanson RB3, suggested that although, there were significantly more babies in the vacuum extractor group with cephalhaematoma (9% vs 3%, OR 3.3; 95% CI 1.4-7.4), there were fewer babies in the VE group with other facial injuries.

There is a consensus that outlet forceps delivery imposes no burden on the infant94.

Table 13 showed no significant differences in psychological aspects of mother regarding worries about baby or fear for next delivery.

Jolly J95, reported fear of childbirth in up to 26% of women at 5 years following either operative vaginal delivery or caesarean section compared with 10% following spontaneous vaginal delivery.