

## **Original Research Article**

### **Assisted Vaginal Delivery - Preference of Vacuum or Forceps among Obstetricians**

#### **ABSTRACT:**

##### **Objective:**

To determine the instrument preference among obstetricians practicing operative vaginal deliveries and to determine the prevalence and risks of vacuum or forceps Assisted Vaginal Delivery (AVD)

##### **Methods:**

This cross-sectional study was carried out in ACS Medical and Hospital, Chennai. A total of 520 obstetricians included in the study. An online questionnaire was sent to all obstetricians in Chennai. The choice of procedure for specific circumstances, instrument preference [use of vacuum or forceps] and views on the complications encountered in both vacuum and forceps use at vaginal delivery were explored. For the replies, we computed means and percentage for the entire group and distinct subgroups. Risk assessment of outcome with exposure as suitable p-value was included in the statistical analysis.

##### **Results:**

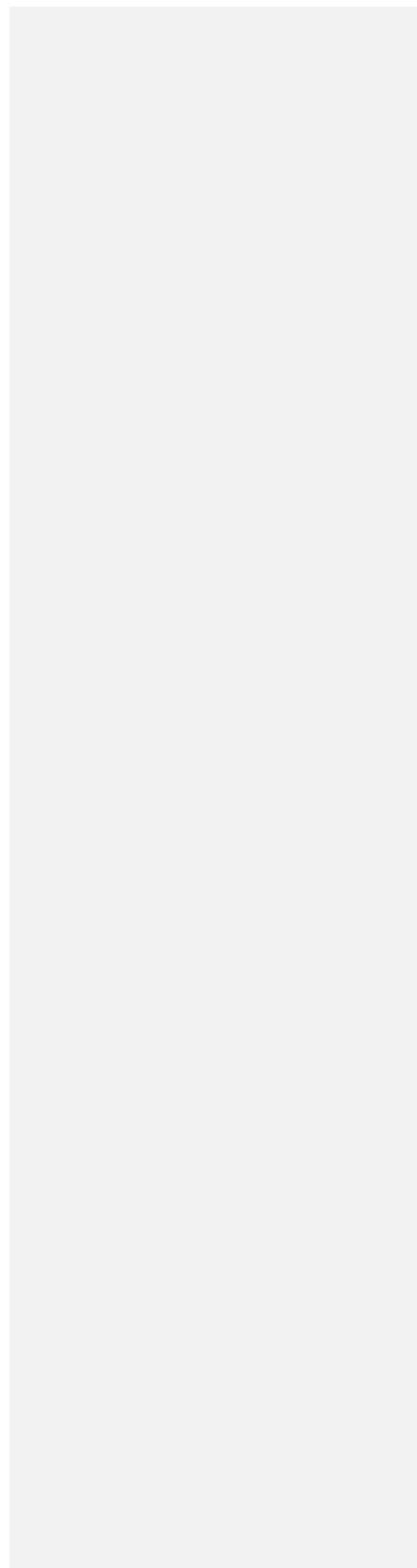
Response rate for questionnaire was 97% (504/520). The findings suggest that obstetricians preference was more towards vacuum due to their ease of usage. Baseline characteristics were similar between the two groups. Failed vacuum due to slipping of cup was the most common complication faced - 62%, followed by caput succedaneum 25%, both were statistically significant. The most significant finding was that maternal injuries in the vacuum group were only 2% which was way less than those who had forceps delivery (68%) with a p value of  $< 0.001$

##### **Conclusion:**

In this research, physician instrument choice is a significant predictor of results that should be taken into account. Use of vacuum for delivery seemed to be the choice of majority of obstetricians. Vacuum extractor rather than forceps for assisted delivery appears to reduce maternal morbidity, whereas the incidence of neonatal injuries was more common in newborns delivered by vacuum. The choice of instrument should be personalized based on the patient's condition and the obstetrician's experience and expertise.

**Keywords:** Assisted vaginal delivery, Vacuum, Forceps, Instrumental deliveries and Obstetricians.

UNDER PEER REVIEW



## INTRODUCTION:

Instrumental delivery may become obsolete in today's modern obstetric practice due to the risk-averse character of our profession, the medical-legal atmosphere, women's choices for caesarean birth, and limited possibilities for training in operational vaginal birth in general.

Vacuum and forceps are used in operative vaginal deliveries, but forceps skills have grown less popular in recent years and vacuum remains the mainstay due their ease of use and reduced maternal morbidity. <sup>(1)</sup>

As the number of practitioners with skill in operative delivery reduces and there by the ability to effectively train residents decrease, we must consider whether there is anything we can do to reverse this trend.

Data from the last 3 decades confirm that the vacuum is the instrument of choice in Western Europe, Southern Asia and the Middle East. Current trends show that the caesarean delivery rate has increased over the last decade (17.3% in the India in 2005 and 38.8 % in 2018), while the operative vaginal delivery rate has decreased overall, despite the fact that both rates vary greatly around the world. The number of forceps births has reduced while the percentage of vacuum deliveries has grown in these surgical vaginal deliveries. Concerns about newborn and maternal safety, as well as a shortage of professionals experienced in utilising forceps who can instruct residents, have been the major drivers of these changes. <sup>(2)</sup>

Simulation training, improving the availability of experienced teachers, and prioritizing forceps instruction over vacuum training are some of the current initiatives. Although simulation training has aided training efforts, the accuracy of these models is insufficient to instill confidence in real-world clinical practice <sup>(3)</sup> In an era where caesarean section rates are increasing, obstetricians are advised to explore all possible delivery techniques and personalise them to each patient in order to offer the most efficacious and safest delivery experience. <sup>(4)</sup>

The current study aimed to get the opinion of practicing obstetricians on their preference of instrument, whether vacuum or forceps, their reasons for choosing it and to look into the complications faced by the two groups and to draw inference from the observations as to suggest ways to improve vaginal delivery and indirectly to reduce Cesarean section.

## **METHODOLOGY:**

The present study was conducted at ACS Medical College and Hospital, Chennai. Around 520 obstetricians in Chennai were included in this study. The study was approved by the institutional review board.

**Study design:** Cross sectional study

### **Data collection tools:**

A set of five questions were entered into Google forms [Online], and data were gathered from the google form results.

### **Questions:**

1. My preference in assisted vaginal delivery is
  - a. Vacuum
  - b. Forceps
  
2. My reason for vacuum preference is
  - a. Easy to use
  - b. No need for anesthesia
  - c. Less space occupying
  - d. Can use in higher station
  - e. Lesser maternal morbidity
  - f. all of the above
  - g. none of the above
  
3. Complications that I encountered with Vacuum are:
  - a. Failed Vacuum-Slipping of Cup
  - b. Maternal injuries
  - c. Bladder or Bowel Injuries
  - d. Caput Succedaneum
  - e. Neonatal Jaundice
  - f. Others

- g. None of the above
- 4. My reason for force preference is
  - a. easy to use
  - b. lesser neonatal morbidity
  - c. shorter delivery time
  - d. can use in preterm
  - e. all of the above
  - f. none of the above
  - g. Other
- 5. Complications that I encountered with forceps are.
  - a. Failed Forceps
  - b. Maternal injuries
  - c. Neonatal Injuries
  - d. Bladder or Bowel Injuries
  - e. Others
  - f. None of the above

**Data processing and Statistical analysis:**

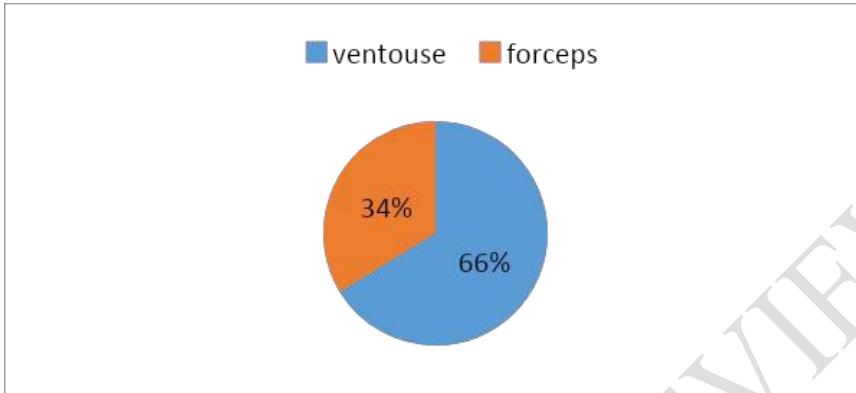
Statistical analysis included normal frequency percentage and odds ratio. Percentage distribution for the two groups was evaluated by mean values. Risk assessment was evaluated by Fisher exact test with odds ratio. This was used when the expected cell frequencies were equal to or less than 5 of p value. [ $P < 0.05$ ] was considered statistically significant. Statistical analyses were performed by using SPSS software.

**Results:**

Of 504 responders, 170 (34%) obstetricians preferred forceps and 334 (66%) obstetricians preferred vacuum. This is shown in figure – 1.

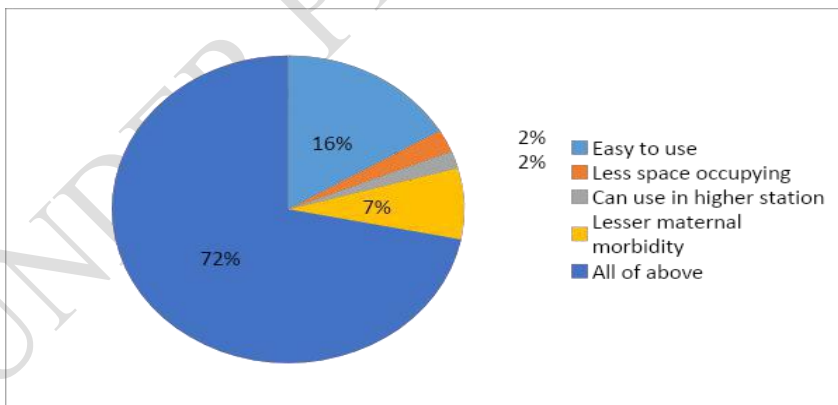
**Comment [MOU1]:** It should be mentioned here as to how 520 doctors became 504

**Figure:1 Preference distribution**



The two groups were compared in terms of indications, and maternal and neonatal results. Preference for ventouse group among obstetricians were very high because they felt that vacuum was easier to use, less space occupying, may be used at higher stations, has lower maternal morbidity, and majority 72% felt that many of the above reasons put together favoured vacuum usage over forceps.[Figure:2]

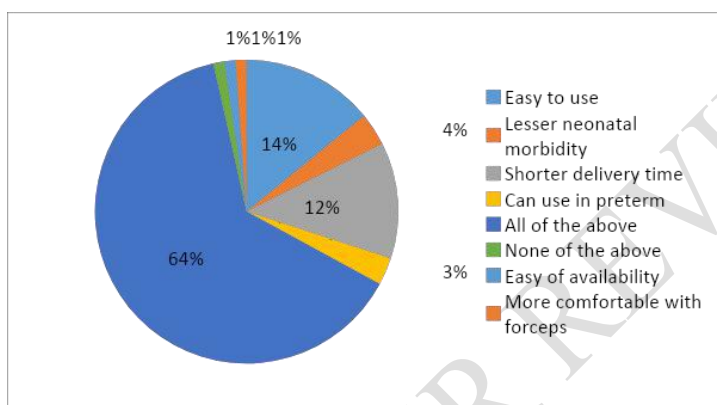
**Figure:2 Reason for vacuum preference**



Preference for forceps among obstetricians were moderately lower than ventouse. Among those who preferred forceps 14% felt that it easy to use and 12% felt that it had a shorter delivery

time. The other reasons that were opted were lesser neonatal morbidity, shorter delivery time, that it can be used in preterm infants where vacuum is contraindicated etc. Overall, 64% of obstetricians agreed to all the above advantages put together. [Figure: 3]

**Figure:3 Reasons for forceps preference**



### PREFERENCES

Although the decision of which instrument to use is dependent in large part on the dilatation of cervix and the station of the fetal head, operators' level of comfort and experience with the specific instrument is important. [Table:1]. In general, vacuum extraction is safer than forceps for the mother while forceps is safer than vacuum extraction for the fetus. In the present study it was observed that most common instrument preferred in assisted vaginal delivery is vacuum. Preference of vacuum deliveries are statistically significant when compared to forceps deliveries.

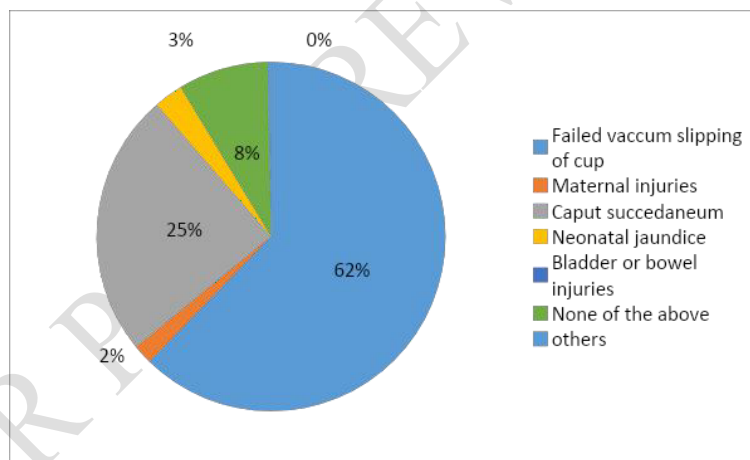
**Table:1 Preference of instrument**

	Vacuum	Forceps	P value
Preference of instrument	334 (66%)	170 (34%)	0.004

<b>Ease of Usage</b>	25 (7.4%)	24 (14%)	0.001
----------------------	-----------	----------	-------

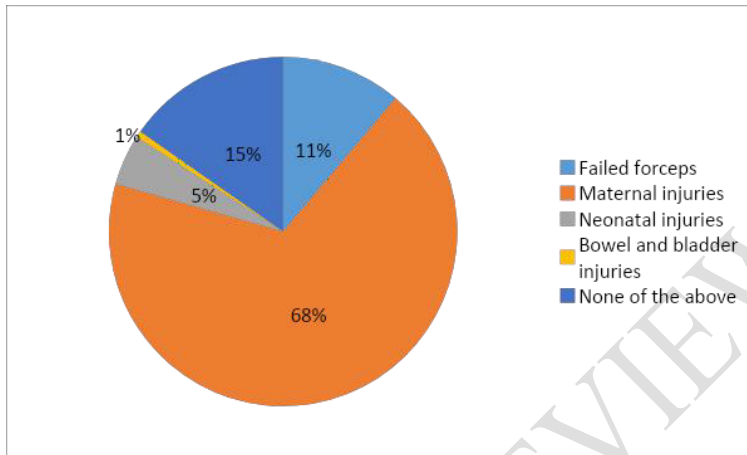
Vacuum has its share of complications. [Fig 4]. Failed vacuum due to slipping of cup was the most common complication faced- 62%, followed by caput succedaneum – 25% and then others like newborn jaundice and bladder or intestinal injuries. 8% of obstetricians did not have any complications with vacuum usage. The most significant finding was that maternal perineal and vaginal injuries were only 2% which was way less than those who had forceps delivery (68%)

**Figure:4 Complications encountered with vacuum**



Maternal injuries were the most common complication (68%) encountered by the obstetricians who preferred forceps. This was followed by 11% who had failed forceps followed by neonatal injuries, cervical tears, sphincter injuries, bowel and bladder injuries. 15% of obstetricians did not have any complications with forceps usage. [Figure: 5]

**Figure:5 Complications with use of forceps**



**RISK ASSESMENT OF MATERNAL OUTCOMES:**

Either vacuum or forceps can be effective and safe if used appropriately, but there are still potential risks. More women in the vacuum-assisted group were free of maternal injury to the perineum or vagina than in the forceps group, and the difference was statistically significant. ( $p < 0.05$ ). There was no significant difference in occurrence of bowel and bladder injuries in the use of vacuum as compared to forceps.  $p > 0.05$ . Failed instrumental delivery was more common among vacuum assisted vaginal delivery as compared to forceps,  $p$  value  $< 0.001$ . [Table 2]

**Table:2 Maternal Outcomes**

Risks	Vacuum [n=334]	Forceps [n=170]	Odds ratio (CI=95%)	P-value
Maternal Injuries	7	116	0.009 (0,0.02)	$< 0.001$
Bowel and Bladder	0	1	0.00 (0.03,8.16)	$> 0.05$
Failed instrumental delivery	210	19	13.46 (7.95,22.78)	$< 0.001$

### RISK ASSESSMENT OF NEONATAL OUTCOMES:

Caput succedaneum was the most common neonatal complication which was more common among the vacuum assisted deliveries than forceps. The difference was statistically significant, p-value <0.001 [Table 3]

**Table:3 Neonatal outcome**

	Vacuum [n=334]	Forceps [n=170]	Odds_ratio CI=95%	P_value
Caput succedaneum / Neonatal injuries	83	8	6.7(3.16,14.2)	<0.001

### DISCUSSION:

In recent times, there has been a considerable increase in cesarean section, with rates more than 40% whereas the rate of instrumental deliveries is accounting for only 5.3 percent of all births in 2018<sup>(5)</sup>. Use of obstetric forceps or vacuum extractor requires that an obstetrician or other obstetric care provider be familiar with the proper use of the instruments and the risks involved.<sup>(6)</sup>

The goal of this study is to forecast the existing information on the advantages and disadvantages of both forms of instrumental vaginal delivery among the obstetricians.

A total of 504 obstetricians responded to the survey. One group of obstetricians [N = 334] preferred vacuum and the other group [N = 170] preferred forceps. The two groups had identical baseline characteristics.

In the last three decades, the use of forceps in assisted vaginal delivery has gone out of favor among obstetricians.<sup>(7)</sup> Vacuum extraction has also fallen in popularity, but it is still more common than forceps delivery; this might be because vacuum extraction is easier to use than forceps. Some think that this decreased tendency is due to a fear of lawsuit arising from frequent forceps delivery problems, such as an increased risk of perineal laceration and infant damage.<sup>(8)</sup> Others blame a lack of resident training for the decreasing use of forceps. When compared to the use of forceps, vacuum usage is less likely to result in a successful vaginal birth.

In our study, Obstetricians who favored ventose had a greater rate of aided vaginal births than those who preferred forceps. There are certain clinical situations where one instrument may be

preferred over another. For example, delivery of an occiput-posterior vertex with moulding is best effected using forceps, whereas a vacuum extraction would be the instrument of choice when performing an outlet procedure on an occiput-anterior vertex in a woman with minimal analgesia. <sup>(9)</sup> The decline in the use of obstetric forceps is multifactorial although many of the factors are inter-related. Litigation has grown over recent years in all areas. Issues of litigation and practice guidelines relate to widespread concerns over the training of obstetricians. Obstetric forceps are potentially dangerous in the hands of untrained or inexperienced obstetricians. Most residency training programs in India no longer expect proficiency in mid-cavity forceps delivery. <sup>(10)</sup>

It may be that vacuum extraction is an easier technique to learn than forceps, but there is indirect evidence that the ease of application may tempt misuse. Clearly, the technique can be misused, and therefore, good judgment and skill of the operator remain as important as they are in any operative procedure. There are some rare circumstances in which the unique properties of the vacuum confer advantages over forceps, but neither the indications nor the advantages are frequent or clear enough to recommend that every obstetric unit have the availability and capability of vacuum extraction instrumentation and expertise.

Similarly, six studies <sup>(11,12,13,14, 15,16)</sup> looked at the wider clinical skills/ assessment of clinical picture evaluation necessary for optimal AVD usage. In the first instance, Bailee et al., 2017 <sup>(15)</sup> recorded specific clinical practices (as opposed to decision-making skills) from obstetricians and midwives deemed experts, such as techniques they used to encourage a spontaneous vaginal birth in a situation where there was a chance that it could be done safely, but with the intention of quickly moving to instrumental birth if necessary.

In our study the usage of vacuum was preferred over the forceps. The difference was statistically significant with p value <0.005. This is similar to the study by Jennifer. Johnson et al who also showed that forceps were used more often than vacuum (P =.001). <sup>(16)</sup> The same study also showed a higher incidence of maternal third- and fourth-degree perineal (P <.001) and vaginal lacerations (P =.004) with the use of forceps, which was similar to our study which had a significant p value of < 0.001. Also Jennifer et al showed that the incidence of cephalohematomas were greater (P =.03) and caput and molding (P <.001) in the neonates delivered with vacuum, which is similar to our study which also had a significant increase of cephalhematoma in the vacuum group, p value < 0.001.

Multivariable logistic regression analysis showed that forceps use was associated with an increase in maternal injuries (odds ratio [OR] 0.009; 95% confidence interval [CI] 0,0.02; P <0.001),

Comment [MOU2]: Contradiction ???

whereas vacuum was associated with greater neonatal injuries (OR 6.7; 95% CI 3.16.14.2; P <.001) and the rate of vacuum failure was very high as compared to the forceps. (OR 13.46; 95% CI 7.95,22.78; P =.001)

The study by Hamza et al. <sup>(17)</sup> 635 obstetricians completed surveys. All obstetricians reported using forceps much less than vacuum births. Almost all obstetricians wish to do more deliveries, indicating a desire to learn both. Obstetricians felt more confidence using vacuum than forceps. Most obstetricians would choose to undertake a vacuum assisted birth in a comparable obstetrical setting. The vast majority of obstetricians desired further training in vaginal operative births.

Claire Feeley et al., 2021, <sup>(18)</sup> included 31 publications that reported on 27 investigations that were published between 1985 and 2020. Qualitative designs (3), mixed techniques (3), and quantitative surveys were all used in the research (21). With one exception, trust in the ten assertions of findings was generally poor (moderate confidence). According to his study, AVD competency is made up of interconnected skill sets that include non-technical abilities (such as behaviors), general clinical skills, and specific technical skills linked with specific instrument usage. They discovered that practitioners required and welcomed more specialized training, which included a variety of instructional approaches, to develop skills and confidence in this field.

#### **Conclusion:**

Our study shows that vacuum is preferred over forceps due to the ease of usage. While maternal morbidity is somewhat greater with forceps delivery, it is still modest in compared to the morbidity associated with caesarean section delivery. The majority of newborn outcomes were comparable in both types of instrumental births. The instrument's safety is mostly dependent on the operator's abilities and the proper selection of patients. Improved training for obstetricians in instrumental delivery may help to further reduce the current Cesarean Section rates.

#### **Recommendations:**

In future research, it may be helpful to question obstetricians explicitly why they do not feel competent, as there may be other concerns besides a lack of expertise. Obstetricians may have had a negative experience or witnessed a negative outcome with forceps births. More information should also be gathered on residents perceived ability to do various forceps deliveries (outlet, low, mid, rotational, etc).

#### **Limitations:**

We did not have data to analyse as determinants of self-perceived competence such as gender, race/ethnicity, institutional volume, or operational delivery rates. We were worried, though, about

**Comment [MOU3]:** Preference of the instrument of choice with regards to indication of application is also not elicited  
Age and experience of obstetrician is also a parameter which should be compared with regards to instrument of choice

retaining anonymity in order to promote participation.

## REFERENCES:

1. Biringer A, Abells D, Boro J, Permaul JA, Sinha S, Graves L. Enhanced skills training in family medicine maternity care: Cross-sectional study of graduates' experiences. *Canadian Family Physician*. 2019 Dec 1; 65(12): e531-7.
2. Al Wattar BH, Mahmud A, Janjua A, Parry-Smith W, Ismail KM. Training on Kielland's forceps: A survey of trainees' opinions. *Journal of Obstetrics and Gynaecology*. 2017 Apr 3; 37(3):280-3.
3. Crosby DA, Sarangapani A, Simpson A, Windrim R, Satkunaratnam A, Higgins MF. An international assessment of trainee experience, confidence, and comfort in operative vaginal delivery. *Irish Journal of Medical Science (1971-)*. 2017 Aug; 186(3):715-21.
4. Hamza A, Lavin JP, Radosa JC, Abou-Dakn M, et al. Vaginal operative delivery in Germany: a national survey about experience and self-reported competency. *J Mater Fetal Neonatal Med* 2020, 0(0):1-7.
5. Anozie OB, Osaheni LL, Onu FA, Onoh RC, Ogah EO, Eze JN, Mamah JE, Asiegbu OG, Anozie RO. Declining rate of operative vaginal deliveries in Nigeria. *Open Journal of Obstetrics and Gynecology*. 2018 Mar 13;8(03):175. <http://www.scirp.org/journal/ojog>
6. Murphy, DJ, Strachan, BK, Bahl, R, on behalf of the Royal College of Obstetricians Gynaecologists. Assisted Vaginal Birth. *BJOG* 2020; 127: e70– e112.
7. Hotton EJ, Renwick S, Barnard K, Lenguerrand E, Wade J, Draycott T, Crofts JF, Blencowe NS. Exploring standardisation, monitoring and training of medical devices in assisted vaginal birth studies: protocol for a systematic review. *BMJ open*. 2019 Apr 1;9(4):e028300.
8. Goordyal D, Anderson J, Alazmani A, Culmer P. An engineering perspective of vacuum assisted delivery devices in obstetrics: A review. *Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine*. 2021; 235 (1): 3-16. doi:10.1177/0954411920956467
9. Hobson, S., Cassell, K., Windrim, R., & Cargill, Y. (2019). Assisted Vaginal Birth. *Journal of Obstetrics and Gynaecology Canada*, 41(6), 870–882. doi:10.1016/j.jogc.2018.10.020

10. Emily J. Hotton, Erik Lenguerrand, Mary Alvarez, Stephen O'Brien, et al., Outcomes of the novel Odon Device in indicated operative vaginal birth. *American Journal of Obstetrics and Gynecology*, Volume 224, Issue 6. 2021, Pages 607.e1-607.e17. <https://doi.org/10.1016/j.ajog.2020.12.017>.
11. Matsumoto N, Takenaka T, Ikeda N, Yazaki S, Sato Y. Naegele forceps delivery and association between morbidity and the number of forceps traction applications: a retrospective study. *Journal of pregnancy*. 2015 Sep 3;2015.
12. Feeley C, Crossland N, Betran AP, Weeks A, Downe S, Kingdon C. Training and expertise in undertaking assisted vaginal delivery (AVD): a mixed methods systematic review of practitioners views and experiences. *Reproductive health*. 2021 Dec; 18(1):1-22. <https://doi.org/10.1186/s12978-021-01146-3>
13. Barros JG, Afonso M, Martins AT, Carita AI, Clode N, Ayres-de-Campos D, Graça LM. Transabdominal and transperineal ultrasound vs routine care before instrumental vaginal delivery—A randomized controlled trial. *Acta Obstetrica et Gynecologica Scandinavica*. 2021; 100(6):1075-81. <https://doi.org/10.1111/aogs.14065>
14. Bailey PE, van Roosmalen J, Mola G, Evans C, de Bernis L, Dao B. Assisted vaginal delivery in low and middle income countries: an overview. *BJOG*. 2017; 124(9):1335–44.
15. Feeley C, Crossland N, Betran AP, Weeks A, Downe S, Kingdon C. Training and expertise in undertaking assisted vaginal delivery (AVD): a mixed methods systematic review of practitioners views and experiences. *Reproductive health*. 2021 Dec; 18(1):1-22.
16. Johnson JH, Figueroa R, Garry D, Elimian A, Maulik D. Immediate maternal and neonatal effects of forceps and vacuum-assisted deliveries. *Obstetrics & Gynecology*. 2004 Mar 1; 103(3):513-8.
17. Hamza A, Lavin JP, Radosa JC, Abou-Dakn M, Peitz I, Gerlinger C, Meyberg-Solomayer G, Ströder R, Juhasz-Böss I, Solomayer EF, Takacs FZ. Vaginal operative delivery in Germany: a national survey about experience and self-reported competency. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2020 Apr 20:1-7.
18. Feeley C, Crossland N, Betran AP, Weeks A, Downe S, Kingdon C. Training and expertise in undertaking assisted vaginal delivery (AVD): a mixed methods systematic review of practitioners views and experiences. *Reproductive health*. 2021 Dec;18(1):1-22. <https://doi.org/10.1186/s12978-021-01146-3>