

# Health Workers' perspectives on Vacuum Extraction in Mulago Hospital, Uganda

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## Research

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# Abstract

**Background:** The objective of this manuscript is to explore perceptions of health workers regarding the use of vacuum extraction, two years after the implementation of training programme, in Mulago Hospital, Uganda.

**Methods:** A cross-sectional survey among midwives, residents and consultant obstetricians, was performed. It was composed of questions pertaining to vacuum extraction, addressing reasons for low use, recommendations to increase use, preferred mode of birth, views about who is suited to perform the procedure and contraindications.

**Results:** Eighty-three of 134 (61.9%) participants returned the survey. The most frequent reasons for low use of vacuum extraction were lack of training (60/83, 72.3%) and equipment (59/83, 71.1%). Skills training and improved supply of equipment were recommended. Most participants (57/83, 68.8%) chose vacuum extraction over caesarean section as hypothetical mode of birth for themselves or a relative. There was a tendency to cite contraindications not identified as such in international guidelines (big baby, caput succedaneum, moulding). Midwives and doctors with appropriate training were generally all considered suited to perform vacuum extraction.

**Conclusion:** Health workers generally conveyed a positive attitude towards vacuum extraction, despite some perceived barriers, often unsupported by evidence. Organisation of skills training, supply of equipment and focus on knowledge of indications are essential to increase its use.

## Background

Vacuum extraction is a procedure assisting a woman to give birth vaginally when the second stage of labour is prolonged or needs to be shortened because of suspected fetal or maternal distress. (1) It can be life-saving and improve maternal and fetal outcomes. (2, 3) It also has significant advantages over caesarean section (CS), including the reduction of complications associated with surgery, reduced delay between decision for intervention and birth, faster recovery, lower health care costs and avoiding complications related to uterine scars in subsequent pregnancies – an important aspect, particularly in low resource areas with high fertility rates. (2, 4, 5)

Despite these advantages, vacuum extraction has been under-utilized in low-and-middle-income countries (LMIC) in recent years, as compared to many high-income countries. (6, 7) Furthermore, rising CS rates and increasing proportions of CS unsupported by medical indications are also present in LMIC. (7, 8) These unwarranted CS are part of the growing concern for excessive or inappropriate use of obstetric interventions. (9)

As one of the interventions to counteract this trend, a programme aiming to increase use of vacuum extraction in Mulago Hospital, Uganda, was introduced in November 2012. Part of this programme was to assess health workers' perspectives on the intervention.

Common reasons for low vacuum extraction use in LMIC in the literature are lack of appropriate equipment, lack of skilled staff and training, low detection rate of indications for vacuum extraction, and concerns held by health care providers as well as national health institutions regarding potential harm to the neonate and increases in mother-to-child transmission of HIV. (5, 7, 8, 10)

In this paper, we report outcomes of a survey distributed to health workers in the obstetric department of Mulago Hospital in Uganda. The aim was to obtain a better understanding of the underlying reasons for low use of vacuum extraction by assessing personal opinions, recommendations and preferences.

## **Methods**

### **Study design**

A cross-sectional study was conducted, using a semi-structured questionnaire filled by Mulago Hospital's maternity unit staff. This study was part of a larger implementation programme with the aim to re-introduce vacuum extraction, including audit of the impact of this programme on vacuum extraction use, clinical outcomes and women's experiences regarding vacuum extraction. Detailed methods and outcomes of these aspects of the programme were described elsewhere. (3, 11, 12, 13)

### **Setting and participants**

Mulago Hospital is the national referral hospital of Uganda and the university teaching hospital for Makerere University, situated in the capital city, Kampala. It is a government hospital with 2700 beds and more than 31,000 births annually. The programme aiming to re-introduce vacuum extraction started in November 2012 consisted of developing a local vacuum extraction guideline, supply of equipment and training of staff. (11) During the programme, all residents in training to become obstetricians (45) were trained in small groups and received on-the-job supervision. Several presentations about the vacuum extraction guideline were given to the entire department staff (consultant obstetricians, midwives, residents, interns) during morning report meetings. Use of vacuum extraction increased from 0.6–2.4% of births over the 15-month time frame between November 2012 and February 2014, when a survey was done to assess health workers' opinions about vacuum extraction, and their recommendations to achieve additional increases in the use of vacuum extraction.

In February 2014, medical staff consisted of 43 nurse-midwives, 46 obstetricians and 45 residents in training. A convenience sample was used, consisting of all staff working in the department of obstetrics at the time of the survey. The survey was developed by the second author, based on what was found in literature regarding reasons for low use of vacuum extraction, international guidelines and the Mulago Hospital vacuum extraction guideline. (1, 10, 14–16) After obtaining verbal consent, participants were asked to complete the survey anonymously. The questions from the survey are represented below. The answers to the questions were entered into Excel version 15.3 and analysed with SPSS version 24. The answers to the questions were translated into counts and percentages.

Survey questions
<p><i>What were the reasons for the low vacuum extraction rate in Mulago Hospital before the start of the programme?</i></p> <p><i>(multiple choice + "other reason, specify", more than one reason possible)</i></p>
<p><i>What are your recommendations to increase vacuum extraction use?</i></p> <p><i>(open question)</i></p>
<p><i>What would be your preferred mode of birth in case of prolonged second stage of labour? (or for your partner/sister in case of male health worker)</i></p> <p><i>(vacuum extraction or CS)</i></p>
<p><i>What would you consider (relative) contraindications for vacuum extraction?</i></p> <p><i>(multiple choice)</i></p>
<p><i>Who should be entitled to perform vacuum extraction after being trained</i></p> <p><i>(multiple choice)</i></p>

## Ethical clearance

Ethical permission to conduct this study was obtained from the Mulago Research and Ethics Committee (refnr: MREC 489).

## Results

In total, 83/134 (61.9%) participants returned the questionnaires, including 22/43 nurse-midwives, 32/45 residents in training and 29/46 consultant obstetricians.

### *Reasons for (previously) low vacuum extraction use*

The most frequently mentioned reasons for low vacuum extraction use before the start of the programme were lack of vacuum extraction skills amongst doctors and midwives (60/83, 72.3%), no vacuum extractor available (59/83, 71.1%), not enough opportunities for practice and training of staff (30/83, 36.1%), concerns of trauma to the neonate (29/83, 34.9%) and concerns related to mother to child transmission of HIV (27/83, 32.5%) (Table 1).

Table 1

Reason	N (%) of health workers who found this a reason for (previously) low vacuum extraction use
	All (83)
	N (%)
Lack of skilled staff	60 (72.3%)
No vacuum extractor available	59 (71.1%)
No training opportunities	30 (36.1%)
Concern trauma to baby	29 (34.9%)
Concern HIV transmission	27 (32.5%)
No VE if CS is possible	4 (4.8%)
CS safer for mother	3 (3.6%)
Should be done by specialist	3 (3.6%)
Obsolete	0 (0.0%)
Other	7 (8.4%)
	* <i>N = number</i>  <i>% = percentage of health workers</i>

Concerns regarding trauma to the neonate were more frequently reported by midwives (13/22, 59.1%) as compared to obstetricians (4/29, 13.8%). The majority of consultant obstetricians (15/29, 51.7%) reported concerns about HIV transmission, as compared to 8/32 (25.0%) of residents and 6/22 (27.3%) of midwives.

#### *Recommendations to increase vacuum extraction use*

The most frequently reported suggestions for increasing the use of vacuum extraction were organizing more skills training (61/83, 73.5%) and increase the availability of equipment (38/83, 45.9%) (Table 2). It was furthermore suggested by a few participants (3/83, 3.6%) to raise awareness about the procedure.

Table 2

Option	N (%) of health workers that recommended this option to increase the use of vacuum extraction (open question)
	All (83)
	N (%)
Vacuum extraction skills training	61 (73.5%)
Increase availability of equipment	38 (45.9%)
Supervision and feedback	7 (8.4%)
Present evidence	5 (6.0%)
Need for local protocol	4 (4.8%)
Raise awareness	3 (3.6%)
No recommendation	32 (16.9%)
	* <i>N = number</i>  %= <i>percentage of health workers</i>

*Preference of health worker for herself or his partner/sister*

In the event of a prolonged second-stage of labour, 57/83 (68.8%) would choose vacuum extraction as preferred mode of birth, compared to 21/83 (25.3%) who would choose CS (Table 3). Especially consultant obstetricians preferred vacuum extraction over CS (25/29, 86.2%). On the other hand, many midwives were in favour of CS (9/22, 40.9%).

Table 3

Option	N (%) of health workers that would choose this option for oneself or family member			
	Midwife (22)	Resident (32)	Obstetricians (29)	All (83)
	N (%)*	N (%)	N (%)	N (%)
Vacuum extraction	13 (59.1%)	19 (59.4%)	25 (86.2%)	57 (68.8%)
Caesarean section	9 (40.9%)	11 (34.4%)	1 (3.4%)	21 (25.3%)
No preference	0 (0.0%)	2 (6.3%)	3 (10.3%)	5 (6.0%)
	* N = number			
	% = percentage of this type of health professionals			

#### *Contra-indications for using vacuum extraction*

Face and brow presentations were perceived by the majority of the participants as absolute contra-indications (Table 4), also considered as such in international guidelines. (1)

Table 4

Indication	N (%) of health workers (midwives/ residents/ obstetricians) who considered this a relative or absolute contra-indication		
	N (%)*	N (%)	N (%)
	Absolute contra-indication	Relative contra-indication	Blanc
Face presentation	73 (87.9%)	4 (4.8%)	6 (7.2%)
Brow presentation	66 (79.5%)	10 (12.0%)	5 (6.0%)
Big baby	42 (50.6%)	33 (39.6%)	3 (3.6%)
Previous caesarean section	33 (39.8%)	40 (48.2%)	3 (3.6%)
HIV without medication	28 (33.7%)	39 (46.9%)	2 (2.4%)
HIV with HAART	7 (8.3%)	38 (45.8%)	6 (7.2%)
Caput succedaneum	25 (30.1%)	41 (49.4%)	7 (8.4%)
IUFD	22 (26.5%)	16 (19.3%)	5 (6.0%)
Occiput posterior	17 (20.5%)	38 (45.8%)	8 (9.6%)
Moulding	10 (12.1%)	45 (54.2%)	12 (14.5%)
	<p>* N = number</p> <p>% = percentage of health workers</p> <p>HIV = human immunodeficiency virus. IUFD = intra-uterine fetal death. HAART = highly active antiretroviral therapy.</p>		

Big baby, moulding and caput succedaneum were perceived as absolute contra-indications by 42/83 (50.6%), 25/83 (30.1%) and 10/83 (12.1%) of the health workers, respectively. Few participants (7/83, 8.3%) perceived a woman with HIV receiving antiretroviral therapy as an absolute contra-indication for vacuum extraction. When it concerned a woman not receiving antiretroviral therapy, 28/83 (33.7%) considered this an absolute contra-indication.

#### *Who should be allowed to perform vacuum extraction?*

When asked which type of health worker would be suited to perform vacuum extraction, obstetricians were unanimous (32/32, 100%) that obstetricians, residents and interns should be entitled to perform it. Overall, the majority found that obstetricians, residents, midwives and interns would be suited to perform vacuum extraction after having received appropriate training (Table 5).

Table 5

Type of health worker	N (%) of health workers that indicated a trained of a specific discipline with appropriate training as being entitled to perform a vacuum extraction
	All (83)
	N (%)*
Obstetrician	76 (91.6%)
Residents	81 (97.6%)
Interns	61 (73.5%)
Midwives	60 (72.3%)
Nurses	15 (18.1%)
Blanc	0 (0.0%)
	<i>* N = number</i>
	<i>% = percentage of health workers</i>

*Comments mentioned by participants:*

Category	Reasons for low use	Suggestions to increase use
Logistical organization	<i>"Vacuum extraction should be performed if CS is available in case of failed attempt"</i>	<i>"Decongest (operating) theatre, so that it is ready in case of failed vacuum"</i>
	<i>"Simply because donation of vacuum extractors was irregular"</i>	<i>"Provide vacuum sets and make them available for use and provide regular periodic training for all doctors in the department"</i>
	<i>"Satisfactory resuscitation of babies not guaranteed in labour ward"</i>	
Implementation	<i>"Low number of cases for vacuum extraction on the day of duty"</i>	<i>"Do hands-on training to increase confidence of health workers to do this procedure"</i>
	<i>"There are few indications for vacuum extraction"</i>	
Perception	<i>"Attitude towards vacuum extraction: people just don't want to do it!!!"</i>	<i>"Perform evidence-based studies on vacuum extraction in Uganda and present evidence of success"</i>
		<i>"Sensitize mothers about this procedure"</i>
		<i>"Increase knowledge, train medical workers and dispense myths about the risks for the babies"</i>

## Discussion

### Main findings

The most frequently reported reasons for previous low use of vacuum extraction are lack of skills among health workers, lack of available equipment and insufficient opportunities for training and practice. Concerns related to neonatal trauma and HIV transmission were also reported. Recommendations to increase use of vacuum extraction included providing additional training and guaranteed supply of equipment. Most participants chose vacuum extraction over CS when asked about their personal preferred mode of birth. The majority of health workers agreed that consultant obstetricians, residents and midwives should be entitled to perform vacuum extraction.

### Interpretation

Results from other studies, including the ones performed in the context of the implementation programme in Mulago Hospital, revealed that frequent periodic training sessions and supply of equipment can reverse the trend of low vacuum extraction use with improvement of neonatal and maternal outcomes. (2, 3, 12, 17, 18) As a matter of fact, before the start of the programme, trainings were limited and vacuum extractors scarce.

Despite a generally open attitude, a substantial part of participants expressed concerns regarding vacuum extraction as a mode of birth. Apparent concerns regarding trauma to the neonate were mentioned. However, outcomes of severe neonatal trauma and brain damage were investigated in the same hospital and revealed that neonatal trauma was infrequent and not more frequent after vacuum extraction compared to second-stage CS. (3) This is consistent with other studies from high-income and low-income countries that show reassuring outcomes after vacuum extraction, especially when compared to CS. (19–27)

Another concern was vertical HIV-transmission. A meta-analysis conducted in the era before antiretroviral treatment (ART) was introduced revealed that there is no significant difference in transmission risk between a second-stage CS and operative delivery. (28) A more recent study stated that vertical transmission risk was very low in women on ART with suppressed viral load. (29) Furthermore, it is unlikely that second-stage CS provides a better protection for HIV transmission compared to vacuum extraction, especially considering the delay between the decision to perform a CS and actual birth. (28, 29) Decision on mode of birth in HIV-positive women should be based on risks and benefits, depending on the underlying risks associated with disease stage, antiretroviral treatment and local capacity to manage potential complications. (30)

There were also suggestions to raise awareness about benefits of vacuum extraction through presenting local outcomes in order to sensitize not only health workers, but also women. Since September 2013, outcomes from studies performed in Mulago Hospital have been presented in the hospital itself as well as during various conferences. Studying interventions in a local context can indeed help health workers understand benefits and inform them about safety. In this way, beliefs about potential harm can be addressed, discussed and adjusted.

Big baby, moulding and caput succedaneum were perceived as relative and absolute contra-indications by an important number of participants, whilst in international guidelines these are not described as such. (1, 31) Non-recognition of indications or wrongly assumed contraindications may be an additional reason for low use of vacuum extraction. (7)

In Uganda, obstructed labour is not a rare event and is sometimes diagnosed at a late stage with severe caput succedaneum and moulding. (32) This might have contributed to the misconception that caput and moulding are pathological findings indicative of cephalo-pelvic disproportion and that CS is the only possible intervention in case these are present. Concerns about cephalo-pelvic disproportion is hence probably the reason that “Big baby” is seen as a contraindication. However, estimating fetal weight by abdominal palpation is unreliable. The best way to find out if vaginal birth is possible is trial of labour

with adequate contractions. When cephalo-pelvic disproportion is present, descent of the fetal head does not take place. In the event of prolonged labour or fetal distress in the second stage of labour, vacuum extraction could be tried, provided the bony part of the fetal head has engaged to the level of the ischial spines (station 0) and if per abdominal palpation not more than 1/5th of the fetal head is palpable above the pubic bone, irrespective whether caput succedaneum or moulding are present. When a difficult vacuum extraction is expected (severe caput succedaneum and/or moulding, fetal head not reaching beyond station 0), trial of vacuum extraction with the operation theatre available and ready could be considered.

Furthermore, scarred uterus, occipito-posterior position, an HIV-positive woman on antiretroviral therapy or intra-uterine fetal death are not considered contraindications for vacuum extraction in international guidelines, contrary to the opinion of a substantial part of the participants. (1, 31) The diverse answers to these questions reveal that there is a lack of clarity of guidelines and reluctance to use vacuum extraction. In May 2013, a local guideline on vacuum extraction was designed by Ugandan obstetricians and international members of the research group, based on the Royal College of Obstetricians and Gynaecologists guideline and adapted to the local context. This protocol was presented to the department (midwives, residents and consultant obstetricians) in May and July 2013 and approved by the department in July 2013. The guideline was distributed to all staff and posters were placed in the labour ward. The survey, however, revealed that not all participants agreed or were aware of the protocol. Together with reporting local outcomes, continuous training and supervision may help to improve adherence to the guideline. Finally, the majority of participants was of the opinion that a wide range of trained health workers can perform vacuum extraction, including interns and midwives. This reflects an open approach towards the expansion of skills among all health workers.

## **Strengths And Limitations**

In the dynamic process of re-introducing vacuum extraction, a survey obviously only represents a snapshot of opinions at a certain point in time. However, we believe that this survey provides a fair representation of the stance of health workers on vacuum extraction at the time, which is important in the context of implementing an intervention programme. Furthermore, to our knowledge, health workers' opinion on this obstetric intervention has not been studied before.

The response rate was relatively low and could indicate that there is a chance of selection bias, with participants more acquainted with the procedure being perhaps more likely to return the survey. Furthermore, there is a chance of recall bias considered that some of the questions referred to the period before the start of the re-introduction programme.

Nevertheless, the outcomes of this study complements outcomes of previous publications (7, 8, 10) on this topic and may encourage further implementation of training programmes on vacuum extraction in Mulago Hospital as well as other hospitals in LMIC.

## **Conclusion**

Health workers' perspectives on vacuum extraction demonstrate their willingness to learn more about maternal and neonatal outcomes of vacuum extraction and translate them into practice with the support of skills training, supervision and feedback.

Most participants would prefer the use of vacuum extraction over CS for themselves or family members. Outcomes suggest that there is room to expand the knowledge on medical indications which could promote use of vacuum extraction.

## Abbreviations

ART

Antiretroviral Treatment

CS

Caesarean Section

LMIC

Low and Middle Income Countries

## Declarations

- **Ethics approval and consent to participate**

Ethical permission to conduct this study was obtained from the Mulago Research and Ethics Committee (reference number: MREC 489).

Consent to fill in the surveys were obtained verbally by all participants. Surveys were filled in by their own initiative.

- **Consent for publication**

Not Applicable.

- **Availability of data and material**

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

- **Competing interests**

The authors declare to have no competing interests.

- **Funding**

There was no funding used to conduct this research.

- **Authors' contributions**

BN designed the surveys and collected the filled in surveys. MC interpreted the data and wrote this research paper, with the collaboration of BN. TA, JR, JL, JB all reviewed the paper and made editing suggestions. All approved on the final version of the paper.

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Authors' information (optional)

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