Comparison of Outcomes of Subsequent Delivery Among Previous Vacuum and Previous Second Stage Cesarean Section Delivery Mothers at Kawempe National Referral Hospital: A Retrospective Cohort Study

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Abstract

Introduction: The increasing trends in cesarean section (CS) with a decrease in operative vaginal deliveries is a major concern in health care system all over the world, particularly in low-resource settings. Studies show that a first delivery by CS is associated with an increased risk of repeat CS in the subsequent deliveries. In addition, CS compared to operative vaginal delivery (OVD), attracts higher health service costs yet resource-constrained countries have low rates of OVD compared to high-income countries. The aim of this study was to compare outcomes of the subsequent delivery among previous vacuum and previous second stage cesarean section delivery mothers at Kawempe National Referral Hospital.

Methods: This was a retrospective cohort study that involved physical or phone interviews of 81 mothers who had an operative delivery in their index pregnancy at Mulago hospital between November 2014 to July 2015. Maternal and neonatal outcomes in the subsequent delivery were compared among participants who had a previous vacuum extraction with those that previouslyhad a second stage cesarean section using Chi-2 square test and a Fisher's exact test with a 0.05 level of statistical significance. A multivariate logistic regression was performed to determine association between mode of index delivery and maternal and neonatal outcomes in the subsequent delivery.

Results: Higher rates of vaginal delivery were achieved among women who had a vacuum extraction (78.4%) compared to those that had a second stage cesarean section in their index delivery (38.6%), p-value =< 0.001. The risk of neonatal injuries was higher in the group of women with a previous second stage cesarean delivery compared to those with a previous vacuum extraction (11.4% compared to 0%, p value of 0.034).

Conclusions and recommendations: Vacuum extraction does not only provide a safe and effective way to prevent the increasing rates of primary cesarean section, but also reduces the risk of repeat cesarean section and the complications associated with it. Health workers need to continue to offer choice of vacuum extraction in the second stage of labor among prime gravidas that fulfill its indication. This will help curb the up-surging rates in cesarean section.

Introduction

The increasing trends in CS with a decrease in operative vaginal deliveries in current studies is a major concern in health care system all over the world but particularly in low-resource settings (1). The management of the first time mother with a singleton cephalic pregnancy at term seems to account for the increase in rates of cesarean section (2). Whereas a cesarean section (CS) can be a life-saving intervention when medically indicated, the procedure is a major determinant of mode of delivery in the subsequent pregnancies. High rates of spontaneous vaginal delivery can be achieved after a previous operative vaginal delivery (3). This is not the case after a previous CS because, in many settings, an index CS is the commonest predictor of a subsequent cesarean delivery (4). In Uganda where the fertility rate is

high at 5.4 children per woman (5), and with many women having a short inter-pregnancy interval, the call for a repeat CS is inevitable. Moreover, CS delivery has detrimental effects especially in our low-resource settings which still face resource restrictions, where access to care, especially access to theatre, in the subsequent pregnancy is not guaranteed (6).

Therefore, prevention of unnecessary second stage cesarean sections by use of evidence based interventions such as operative vaginal delivery especially in the index pregnancy could help mitigate the rising CS rates (7). A primary study by Dr. Barbara Nolens conducted between November 2014 and July 2015 at Mulago Hospital that compared short term delivery outcomes among vacuum delivery and second stage cesarean section mothers revealed that compared with cesarean section, vacuum extraction was associated with a lower risk of infection and hemorrhage, and a shorter decision to- birth interval and therefore lower rates of birth asphyxia, intrapartum stillbirths, and severe maternal morbidity. However, the perinatal mortality rate did not differ between the vacuum extraction and SSCD groups (8). Out of this this original cohort of women, we have surveyed those that we prime gravidas at that time, from both the vacuum delivery group and the second stage cesarean delivery group to compare outcomes in the subsequent delivery, with mode of delivery being the primary outcome of our study.

Methods

Our study was conducted between February and March 2020 from the out-patients' department at Kawempe National Referral Hospital (KNRH) – Kampala, Central Uganda.

It was a retrospective cohort study in which women who delivered by vacuum extraction and second stage cesarean section in their index pregnancy, five years ago, were recruited. The study was a secondary study that followed up mothers recruited into a primary study by Dr. Barbara Nolens between November 2014 and July 2015 at Mulago Hospital that sought to compare short term delivery outcomes among vacuum delivery and second stage cesarean section mothers. Their database was availed by the primary investigator from which their contacts were gotten. The mothers were consented for a follow up study by the primary investigator prior to their discharge from hospital. All the mothers had a term live singleton pregnancy in vertex presentation at the time of recruitment in the primary study. The primary investigator compared maternal and neonatal outcomes between mothers who delivered by vacuum extraction and those who delivered by SSCD. The comparisons were done both in the immediate post-partum period and then at six weeks' post-partum. We made an assumption that a significant number of these mothers had already had their subsequent delivery. We contacted the mothers using their telephone contacts from the database availed to us by the primary investigator. Consecutive sampling technique was employed. Data was collected using an interviewer administered structured questionnaire.

Data management and statistical analysis

All the collected data was coded and double entered into EPIDATA to ensure validation. The data was then exported to STATA version 14.0 for analysis. Participants' baseline characteristics were presented in form of frequencies and percentages.

Subsequent delivery outcomes (maternal and neonatal) were compared among participants that had a previous vacuum extraction with those that had a second stage cesarean section using Chi-2 square test and a Fisher's exact test with a 0.05 level of statistical significance.

A multivariate logistic regression was performed to determine association between index mode of delivery and maternal and neonatal outcomes in the subsequent delivery.

Ethical consideration

We confirm that all the methods employed were carried out in accordance with the required guidelines and regulations;

Approval to conduct the study was obtained from School of Medicine Research and Ethics Committee (SOMREC). Permission to carry out the study at KNRH was obtained from KNRH administration and consent to use the participants' database was obtained from the primary investigator. Informed consent was sought from the participants and voluntary withdrawal from the study was emphasized.

Confidentiality was observed during and after data collection by excluding names of participants on the questionnaires and also allowing limited access to the research questionnaires. Participants were assured that participating in the study was voluntary and that it would never affect the care given to them by the care team at KNRH. They were informed of any likely risks and benefits before their involvement in the study.

Results

We were able to contact 142 (72%) out of the 198 prime gravidas enrolled in the primary study (8). Of these, 81(57%) had had a subsequent pregnancy and were all recruited in our study.

In table 1 (demographic characteristics), majority (80.2%) of the participants were less than 30 years of age with a mean age of 27.4 and 60.5% had attained secondary level of education. Nearly a half of the participants had informal employment. Majority (92.5%) of the participants lived within a distance of six kilometers from a public health facility

Table 2 (obstetric characteristics) shows that 44(54.3%) participants interviewed had had a second stage cesarean section in their index delivery. Nearly all (98.8%) of the children from the index delivery were alive and well. Nearly 60% of the participants had an inter-pregnancy interval of more than 24 months and majority (91.4%) of the mothers carried their pregnancy to term.

In table 3 (maternal outcomes in the subsequent pregnancy), more than half of the participants (46/81 (56.8%)) had a vaginal delivery, while 35/81 (43.2%) had a cesarean delivery. Majority (29/37 (78.4%)) of mothers that had previously delivered through vacuum extraction had a subsequent vaginal delivery while only 17/44 (38.6%) of those that had previously delivered by second stage cesarean section had a subsequent cesarean delivery. This difference was significant with a p value of <0.001.

Table 4 (neonatal outcomes in the subsequent pregnancy) shows that most (82.7%) of the participants delivered babies with birth weights > 2.5kgs. 12.3% of the neonates were admitted to special care units. Five neonates, all of whom their mothers had previously delivered by SSCD sustained neonatal birth injuries: three of the neonates had caput succedaneum, one had facial bruises from vaginal examinations and one neonate had a scalp laceration. This difference was significant with a p value of 0.034.

In table 5 (relationship between index mode of delivery and subsequent mode of delivery), women that had previously delivered by second stage cesarean section were seven times more likely to have a subsequent cesarean section compared to those that had delivered by vacuum extraction. This association was statistically significant with a p value=0.001. Mothers with an inter pregnancy interval of >24 months were 72% less likely to deliver by cesarean section in the subsequent pregnancy compared to those with an inter pregnancy interval of <24 months. This association was found to be statistically significant with a p value=0.028

Discussion

Comparison of subsequent mode of delivery after an operative delivery

Higher rates of vaginal delivery were achieved among women who had a vacuum extraction compared to those that had a second stage cesarean section in their index delivery. Women were seven times more likely to deliver by cesarean section in the subsequent pregnancy if they had had a previous second stage cesarean section compared to if they had had a previous vacuum extraction. Similar findings have been reported in a study done in Bristol, UK (3) and in another done in Cameroon (9)

Our study also found out that among mothers previously delivered by SSCD, those that had an inter pregnancy interval of >24 months were 72% less likely to deliver by cesarean section in the subsequent pregnancy compared to those with an inter pregnancy interval of <24 months. This can be explained by the fact that in our settings, an inter pregnancy interval of less than 24 months is an indication of CS due to the well documented risk of poor maternal and neonatal outcomes (uterine rupture, post-partum hemorrhage, blood transfusion, fetal death) in mothers with an inter pregnancy interval of <24 months who attempt vaginal birth after CS (10), (11).

Thus, the emphasis should be placed on achieving a vaginal delivery in the first pregnancy. Women who have had an operative vaginal delivery should be reassured by the very high likelihood of achieving a spontaneous vaginal delivery in the subsequent pregnancy

Comparison of immediate neonatal outcomes in the subsequent deliveries.

Our study found that neonatal injuries were higher among women who had previously had a second stage cesarean section compared to those who had previously had a vacuum extraction. We did not

come across any similar studies. However, a study done by Melamed et al, compared the rate of neonatal birth injury among mothers who had had a previous operative vaginal delivery and a previous spontaneous vaginal delivery suggested that the rate of neonatal birth injury in the subsequent delivery was higher in the OVD group compared to the SVD group (1.5% compared to 0.6%) (12). This study may not compare with our study since it did not have SC group. Nonetheless, it shows that the rate of neonatal injuries after OVD is small.

In this regard, our findings imply that vacuum extraction in the index delivery may not present a major risk of injuries to the neonate in the subsequent deliveries. However, there is limited data regarding neonatal injuries in the subsequent delivery following vacuum extraction and cesarean section.

Strength of the study

This was a retrospective cohort study done five years after the primary study, which gave ample time for a subsequent pregnancy and hence delivery. We had 100% recruitment of eligible mothers since a we had a database where all the information regarding their index delivery was recorded.

The study establishes a high rate of vaginal delivery among mothers who previously had a vacuum extraction compared to those that had a previous cesarean section. These findings are in agreement with findings from other similar studies There was a high follow up rate of 72% after five years

Weakness of the study

Small sample size, a number of women had not yet had a subsequent pregnancy as we had assumed, and also a significant number had had abortions. Of the 142 prime gravidas from the primary study, 81 (57%) had had a subsequent delivery and all these were recruited into our study. Since this was a fixed cohort, we felt 57% was a representative of the rest of the mothers.

Recall bias especially for mothers that had more than one subsequent delivery. A well elaborate questionnaire was used and the questions carefully crafted to reduce recall bias.

Selection bias due to loss to follow up/retracing some mothers of original cohort who might have had different outcomes. Consecutive sampling was used given that the original cohort was small and not all women were reached.

Conclusion

Mothers that had had a previous vacuum extraction were more likely to have a subsequent vaginal delivery compared to those that had a previous second stage cesarean section. Vacuum extraction does not only provide a safe and effective way to prevent the overuse of cesarean section at incident pregnancy, but also reduces the risk of repeat cesarean section and the risks associated with it.

Neonatal injuries in the subsequent delivery were higher among the second stage cesarean section group compared to the vacuum delivery group

Recommendations

To Policy makers:

To support development of policies that will usher in clear guidelines on indications for vacuum extraction and cesarean section in the second stage of labor. Furthermore, studies should be done to determine whether it is the lack of training among obstetricians and medical officers on the use of vacuum extract that hinders use of OVD in Mulago and in Uganda at large. Then, policies that advocate for adequate training of health workers to use vacuum extraction would reduce the rampant cesarean sections in index pregnancies. Based on the current evidence, it is neither ethically nor economically justified to perform an emergency cesarean section when the patient is an appropriate candidate for vacuum extraction delivery.

To health care workers:

Health workers need to consider the overall reproductive outcome including mode of delivery of future pregnancies for an individual mother and not just the outcome of the index pregnancy in isolation. They should continue to offer choice of vacuum extraction in the second stage of labor since vacuum extraction reduces the risk of a cesarean section in the subsequent delivery and has low risk of neonatal injuries. Health care workers need to think twice before they execute a primary CS as it carries more risks in the subsequent delivery as observed from our study findings. VE is also a cheap and available option so should be well embraced in the low resource settings.

Further research is needed to explore the relationship between previous mode of delivery and the risk of neonatal birth injuries in the subsequent pregnancy since we did not come across studies about this topic.

Abbreviations

CS - Cesarean section

KNRH - Kawempe National Referral Hospital

SSCD - Second stage cesarean section

OPD – Out patient department

OVD - Operative vaginal delivery

SOMREC - School of Medicine Research and Ethics Committee

UDHS – Uganda Demographic Health Survey

VD - Vaginal delivery

VE - Vacuum extraction

Declarations

Ethical approval and consent to participate

We confirm that all the methods employed were carried out in accordance with the required guidelines and regulations;

Ethical approval was obtained from School of Medicine Research and Ethics Committee (SOMREC) with protocol number. Written and verbal informed consent were sought from the participants and voluntary withdrawal from the study was emphasized. Consent to use the participants' database was obtained from the primary investigator. Permission to carry out the study in the Outpatient department was obtained from the in-charge of OPD department. Confidentiality was observed during and after data collection by excluding names of participants on the questionnaires and also allowing limited access to the research questionnaires.

Consent for publication

Not applicable

Availability of data and materials

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

Competing interests

The authors declare that they have no competing interests

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Authors' contribution

AK, MM, HK, BN and JBK participated in the conception, study design, data analysis and dissertation and manuscript preparation. AK participated in data collection. All authors read and approved the final manuscript.

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Competing interest

The authors declare they have no competing interest.

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Tables

Tables 1 to 5 are available in the Supplementary Files section.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Table1to5.docx