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Maternal Morbidity Following a Trial of Labor After Cesarean Section vs. Elective Repeat Cesarean Delivery at KIU Teaching Hospital

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ABSTRACT

This study aimed to determine maternal morbidity and predictors of successful vaginal birth control (VBAC) among women at KIU Teaching Hospital. A retrospective cohort study was used, with 384 files of women who delivered between 2014 and 2018 selected. Descriptive statistics were used to determine the incidence of maternal morbidities. Univariate analysis and bivariate logistic regression were performed using STATA version 14.0 to identify predictors of successful VBAC. The mean age of the study participants was 25.62 years, with 63.54% of them elective repeat caesarean sections (ERCD) and 36.46% trial of labor after caesarean sections (TOLAC). Morbidities included uterine rupture, thromboembolism, transfusion requirement, and endometritis. Risks of TOLAC versus ERCD included uterine rupture, thromboembolism, and blood transfusion requirement. BMI, birth weight, spontaneous onset of labor, previous safe vaginal birth, and non-diabetic status were found to be predictors of successful VBAC. Delivering women with previous cesarean sections is a complex process that involves the physician's knowledge, experience, and fear of litigation, as well as the previous maternal experience and knowledge. Any decision made will affect the present pregnancy's outcome, future obstetric performance, and fertility of the patient.

Keywords: Maternal Mortality Rate, Cesarean delivery, Women, pregnancy, Labour.

INTRODUCTION

Cesarean delivery is one of the most commonly performed surgical procedures, and elective repeat Cesarean delivery (ERCD) accounts for a large proportion of Cesarean deliveries [1]; [2]. A trial of labour (TOL) and subsequent vaginal birth after Cesarean delivery (VBAC) has been advocated as a method to reduce the rate of Cesarean deliveries and subsequent maternal morbidity [3]. WHO has defined maternal morbidity as any health condition which is related to or aggravated by pregnancy and delivery which causes a negative effect on a woman's wellbeing. These morbidities can lead to short-term and long-term effects on mother and baby [4]. The American College of Obstetricians and Gynecologists notes that women who desire several children are not good candidates for elective primary cesarean delivery on maternal request [3]. The International Federation of Gynecology and Obstetrics and the Society of Obstetricians and Gynaecologists of Canada, among others, state that cesarean delivery on maternal request cannot be justified and should not be offered [5]. A substantial proportion of women attempting a vaginal birth after cesarean delivery will require an emergency cesarean delivery [6]. Globally, a recent WHO publication reports that between 1990 and 2018 the global average CS rate increased from 12.4 to 18.6 % with rates ranging, depending on region, between 6 and 27.2 %, and rising at an average rate of 4.4 % per year [7]. The overall rate of caesarean section in sub-Saharan Africa (SSA) is still very low; however, it remains the most common operation performed in the region, and there is an upward trend

as more women gain access to this lifesaving procedure. Consequently, the proportion of women with scarred uteri as a result of caesarean section is inevitably on the rise. Considering the high birth rates, bigger family size, and low contraceptive coverage in this region, the chances of these women having subsequent pregnancies is very high [8]. A previous study in the UK demonstrated uterine rupture to be associated with VBAC. Uterine rupture is a rare and serious complication of VBAC, but when com- paring ERCS and VBAC it is important to consider other maternal complications [9]. A World Health Organization survey in Latin America identified that women with singleton cephalic pregnancy with a prior CS despite their smaller pool were the greatest contributors to the overall CS rate [6]. Between 1970 and 2016, the cesarean delivery rate in the United States increased from 5% to 31.9%. This dramatic increase was a result of several changes in the practice environment, including the introduction of electronic fetal monitoring and a decrease in operative vaginal deliveries and attempts at vaginal breech deliveries [10]. Rates of vaginal birth after cesarean delivery have begun to increase again in the US from a low of about 8.4% of all births in 2008 and 2009 to 11.3% in 2014. In British Columbia, Canada, the proportion of women with a previous cesarean delivery who were deemed eligible for vaginal birth after cesarean delivery increased from 75% in 2010 to 80% in 2014 [3]. There has been a wide range of success rates (23 - 85%) reported for those achieving vaginal birth following a planned VBAC [11]. In Uganda, especially in the western region, there is no recent study addressing the issue of maternal morbidity after a trial of labour following a previous caesarean section compared to maternal morbidity due to elective repeat caesarean delivery. It is on that background that this current study seeks to fill the knowledge gap by determining maternal morbidity following a trial of labour after a previous caesarean section versus elective repeat caesarean section among women who delivered from Kampala International University teaching hospital from the year 2014 up to 2018.

Uganda's Maternal Mortality Rate (MMR) has consistently been one of the highest in the world with 440 deaths per 100,000 live births, according to Unicef's latest data. In Uganda, one woman out of every 49 will die of a maternal complication related to pregnancy or delivery [12]. Planning mode of delivery for women with a previous cesarean delivery is challenging both for the patient and the care provider. An elective repeat cesarean delivery is associated with an increased risk of surgical complications, as well as an increased risk of abnormal placentation in subsequent pregnancies [6]. Rising rates of cesarean section is a matter of great concern and trial of labor in previous cesarean section women is an attractive alternative. Vaginal Birth After Caesarean (VBAC) may be one of the strategy developed to control the rising rate of cesarean deliveries in our country. Analyzing outcome of previous caesarean pregnancies will provide an insight for reducing the caesarean rates and formulating protocols and policies for trial of labor. The most important event because of which obstetricians still hesitate to attempt planned VBAC is the uterine scar integrity. There is a definite risk of uterine rupture in vaginal birth after caesarean delivery often leading to catastrophies which can be avoided by early diagnosis and prompt intervention. The current study aims to determine the morbidities of TOLAC versus VBAC, to describe the frequency as well as selected maternal and obstetric factors in women with the first attempted VBAC for their seconddelivery.

METHODOLOGY

Area of Study

Area of study refers to that specific geographical location where the study is carried out (Enon, 2012). The study was conducted at KIU-TH which is in Ishaka Town, a major town in Bushenyi district, and located in the north of Bushenyi district, south west of Mbarara district and around 78km from Mbarara town which is the biggest city in Western Uganda. Bushenyi district is also located around 361km in the south west of Kampala (capital city) by road. Ishaka town's coordinates together with the municipality as all are believed to be 0o 32' 40.00''N, 30o 8' 16.00''E (Latitude: 0.544445, Longitude: 30.137778).

Study population.

Pregnant women who had a previous caesarean section. The comparison of interest was between elective repeat cesarean delivery and attempted vaginal birth after cesarean delivery.

Sampling Technique.

Sampling is used to select a portion of the population to represent the entire population. There is need for a researcher to select a sample from which he wishes to seek information, using appropriate sampling techniques. The techniques selected for the study was based on probability methods.

Systemic random Sampling

The main advantages of this method were that it gave results like those of simple random sampling, and it was easy to actually do. A list of women who women who had planned VBAC and those who had elective caesarean section after a previous caesarean section was prepared from the medical records and a number was assigned for each woman. The total number of women was divided by the sample size to give the sampling interval. Files were then picked systematically until the required number of participants was reached.

Sample size determination

The following formula was used for determining study sample.

$$n = \frac{Z^2\, p(1-p)}{d^2}$$

Where: n is the sample size

Z is the standard normal deviate or variant (at 5% type 1 error and p<0.05, Z is 1.96)

P is the expected proportion of characteristic being measured in the target population based on previous studies (For this study, it is estimated at 50% or 0.5) since no similar study was done in a local context.

d is the absolute error or level of statistical significance (For this study set at 0.05)

Thus by using this formula,

$$n = \frac{1.96^2\ 0.5(1-0.5)}{0.05^2}$$

$$n = 384$$

Therefore, 384 was considered as the required sample size.

Inclusion criteria

Files of all women who had a trial of labor after a previous caesarean section and files of all women who had election caesarean section were included in the study.

Exclusion criteria

- Files of women who had caesarean section for the first time.
- Files of women who had normal vaginal delivery for the first time.

Study procedure

The study proceeded after the procedures and purpose of the study was thoroughly explained to the head of Obstetrics department of head of records department. The principle investigator sought for permission to access the medical records from the persons incharge. Files of interest were withdrawn from amongst the other files by the research assistants and the required information was extracted from the files.

Data collection Instruments

Questionnaires were used in this study to obtain information from patient files. This provided a guide to the principle investigator to collect data that was used in answering the research questions.

Questionnaires

A questionnaire is a written form of questions that are systematically arranged to enable the researcher come up with clear findings that can answer the research questions. Research questionnaire was prepared following the available literature and was used in capturing data as required by specific objectives. A structured and pre-tested questionnaire was used for gathering quantitative data about the study population. For this study, the questionnaire had a section regarding demographic characteristics of the study participants, another section captured data about maternal morbidities in both TOLAC and ERCD then the last part of the questionnaire contained information about determinants of a successful VBAC.

Validity of instruments

Before the instruments were administered to research assistants to start collecting data, they were first scrutinized by the supervisor to ensure that the terms used in the questionnaire were precisely defined. Content Validity Index was calculated basing on judgment by at least two experts in the field. Since the result got was 0.8, the instrument was deemed valid for use.

Quality assurance and quality control

The accuracy of data was achieved through intensive training for data collectors. The data collectors were closely supervised by the principal investigators and supervisors. To ascertain whether the questions are properly filled and necessary correction were made on the spot, each completed questionnaire was checked by supervisors.

Proof and data analysis

All data collection sheets completed in a day were reviewed and entered on the same day. Data was entered using Epidata Version 3.1 and was analyzed using STATA 14.0. Before running for analysis, data was cleaned, composite indexes were computed and recoded after missing values and extreme values/outliers are identified and trimmed. Descriptive statistics of frequencies and percentages were calculated for categorical variables and presented in the form of figures, tables and narrations. The comparisons in maternal and infant outcomes between the groups of interest were quantified using rates, rate ratios (RRs) and 95% confidence intervals (CI), with women who had elective repeat cesarean deliveries as the reference group. Logistic models included maternal age, diabetes mellitus, hypertension and labour induction. Adjusted rate differences were calculated from the absolute outcome rates for the elective repeat cesarean delivery group. These analyses were repeated for all women who had a previous cesarean delivery (i.e., without restriction by parity). A post hoc sensitivity analyses was also conducted in women at 40 weeks gestation or more to address potential misclassification of elective repeat cesarean and attempted vaginal birth after cesarean delivery (because women planning an elective repeat cesarean delivery would have had this procedure before 40 wk). A 2-sided p value less than 0.05 was used to guide inference. In addition, I also tested whether the calculated rates in the exposure groups were significantly different from each other using $\chi 2$ test.

Ethical considerations.

The study was conducted in confirmation of national and international ethical guidelines for biomedical research involving human subjects. Ethical clearance was obtained from an ethical review committee of Kampala International University. Approval was sought from the executive director of Kampala International university teaching hospital, dean faculty of clinical medicine and dentistry. There was no need for informed consent since it was a retrospective cohort study using medical records. Anonymity of the data was maintained by reporting results in a way that did not reveal identity of the individuals whose medical records were used.

RESULTS

Socio- Demographic Characteristics of the Study Participants

A total of 384 women who delivered from Kampala International University Teaching Hospital starting and had ever had a previous caesarean section from 2014 to 2018 were sampled from records kept at maternity, the socio-demographic characteristics of study participants are presented in table 1 below. Majority of the study participants 40.89% (157/384) were in the age group of 16 – 23 Years whereas as the minority of participants 05.73% (22/384) were 38 years and above. Regarding the gestational age, majority of study participants 92.19% (354/384) had gestational age of 34 weeks and above while the minority 02.08% (08/384) of the study participants were had gestational age of less than 28 weeks. On the variable of parity, more than half of the study participants 51.04% (196/384) were having parity of less than 3 meanwhile 48.96% (188/384) had parity of 3 and above. The study was dominated by participants 72.14% (277/384) who had body mass index of <35kg/m^2 whereas minority of the study participants 27.86% (107/384) had body mass index of ≥35kg/m^2. Finally, majority of study participants 65.10% (250/384) delivered babies with birth weight of <3500g meanwhile 34.90% (134/384) delivered children who had birth weight of ≥3500g. Presented in table 2 are the summary statistics for the continuous variables of age of the study participants and birth weight of the babies. The mean age of the study participants was 25.62 years with a standard deviation of 5.99 years from the mean. The minimum age was 16 years meanwhile the maximum age was 40 years. The data on age of the study participants had a variance of 35.97 with a positive skewness of 0.58 and a platy kurtosis of 2.42. Regarding birth weight, the mean was 2,987g, Standard deviation of 965.43g, Minimum of 900g, Maximum of 5,000g. The data on birth weight has a variance of 932,056, skewness of 0.13 and kurtosis of 2.28.

Table 1; Frequency table of demographic characteristics of the study participants

Variables	Categories	Frequency(N)	Percentage (%)
Age of participants in years	16 – 23 Years	157	40.89
	24 – 30 Years	149	38.80
	31 – 37 Years	56	14.58
	38 Years and above	22	05.73
	Total	**384**	**100**
Gestation Age in weeks	<28 weeks	08	02.08
	28 – 31 weeks	08	02.08
	32 – 33 weeks	14	03.65
	34 weeks and above	354	92.19
	Total	**384**	**100**
Parity	<3	196	51.04
	≥3	188	48.96
	Total	**384**	**100**
Body Mass index (BMI) of mother	<35kg/m^2	277	72.14
	≥35kg/m^2	107	27.86
	Total	**384**	**100**
Birth Weight of the baby in grams	<3500g	250	65.10
	≥3500g	134	34.90
	Total	**384**	**100**

Table 2: Shows the summary statistics for selected continuous variables of participants

Variable	Mean	Std Dev	Minimum	Maximum	Variance	Skewness	Kurtosis
Age	25.62	5.99	16	40	35.97	0.58	2.42
Birth weight	2,987	965.43	900	5,000	932,056	0.13	2.28

Obstetric Characteristics of the Study Participants

Shown in table 3 below are the obstetric characteristics of the study participants. Results revealed that majority 73.70% (283/384) of the study participants did not undergo augmentation of labor. More than half of the study participants 63.28% (243/384) spent less or equal to 15 hours in the labor. There was spontaneous onset of labor among 34.38% (132/384) study participants meanwhile 65.63% (252/384) of the study participants never had spontaneous onset of labor. Results of the study further showed that more than half of the study participants 55.47% (213) never had a previous successful VBAC. Finally, 57.55% (221/384) of the study participants had a history of a previous safe vaginal birth.

Table 3: Shows Obstetric Characteristics of the Study Participants

Variables	Categories	Frequency (N)	Percentage (%)
Augmentation of labor	Yes	101	26.30
	No	283	73.70
	Total	**384**	**100**
Time spent in labor	≥15 hours	243	63.28
	>15 hours	141	36.72
	Total	**384**	**100**
Spontaneous onset of labor	Yes	132	34.38
	No	252	65.63
	Total	**384**	**100**
Previous successful VBAC	Yes	171	44.53
	No	213	55.47
	Total	**384**	**100**
Previous safe vaginal birth	Yes	221	57.55
	No	163	42.45
	Total	**384**	**100**

Medical Characteristics of the Study Participants

The medical characteristics of the study participants are shown in table 4 below. As observed from the table, majority 60.94% (234/384) of the study participants never had diabetes mellitus. Similarly, majority of study participants 73.44% (282/384) never had hypertension meanwhile 26.56% (102/384) had hypertension. Lastly, 15.71% (60/384) of the study participants were HIV positive meanwhile 84.29% (322/384) were HIV negative.

Table 4: Shows Medical Characteristics of the Study Participants

Variables	Categories	Frequency(N)	Percentage(%)
Diabetes Mellitus	Yes	150	39.06
	No	234	60.94
	Total	**384**	**100**
Hypertension	Yes	102	26.56
	No	282	73.44
	Total	**384**	**100**
HIV/AIDS	Positive	60	15.71
	Negative	322	84.29
	Total	**384**	**100**

Category of the study participants

Table 5 below shows the proportion of study participants based on the categories of Elective repeat caesarean section and Trial of labor after caesarean section. It can be observed that majority of the

study participants 63.54% (244/384) belonged to the category of elective repeat caesarean section (ERCD) meanwhile 36.46% (140/384) of the study participants belonged to the category of trial of labor after caesarean section (TOLAC).

Table 5: Proportion of the study participants based on category of ERCD and TOLAC

Category	Frequency	Percentage	95% CI
ERCD	244	63.54	58.71 – 68.38
TOLAC	140	36.46	31.62 – 41.29

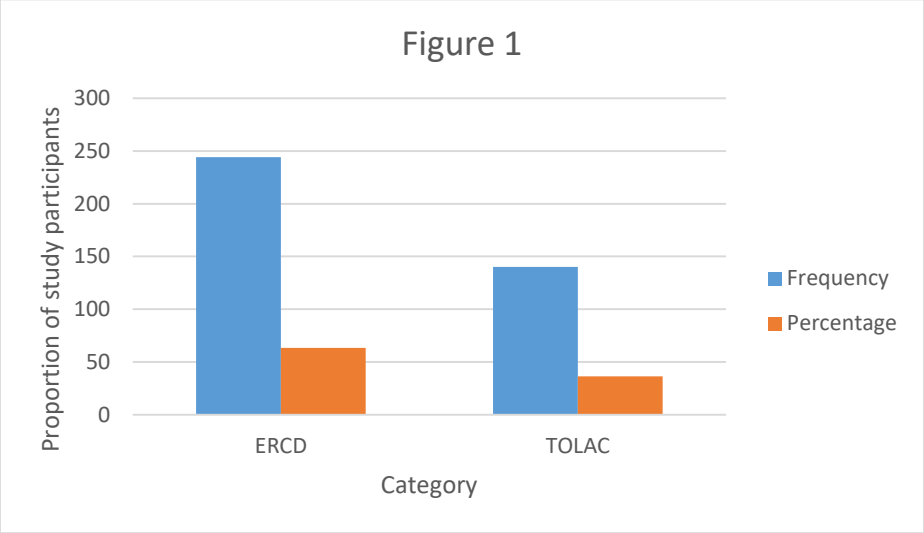

Figure 1: Column Graph showing Proportion of the study participants based on category of ERCD and TOLAC

Status in which the baby was delivered

Shown in table 6 is the status in which the study participants delivered their babies. Majority of the study participants 94.53% (363/384) delivered babies who were alive meanwhile 05.47% (21/384) delivered dead babies.

Table 6: Status in which the baby was delivered

Status	Frequency	Percentage	95% CI
Alive	363	94.53	92.25 – 96.82
Dead	21	05.47	03.18 – 07.75

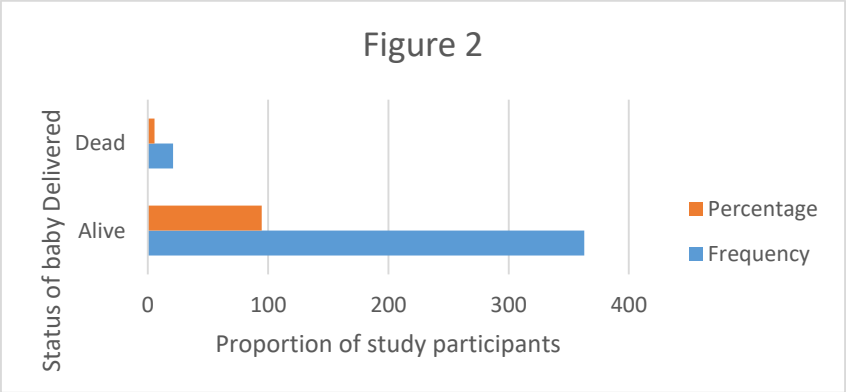

Figure 2: Bar Graph showing Status in which the baby was delivered

The Incidence of Maternal Morbidities Due TOLAC and Due to ERCD

Table 7 shows the incidence of maternal morbidities due to trial of labor after caesarean section and maternal morbidities due to elective repeat caesarean section. As observed in the table, 168 (68.85%) of the women who underwent TOLAC got uterine rupture meanwhile 59 (42.14%) of the women who underwent ERCD got uterine rupture, the difference was statistically significant at p value of 0.030. Uterine Dehiscence occurred in 52 (21.31%) of those in the category of TOLAC whereas only 26 (18.57%) of those in the category of ERCD got Uterine Dehiscence. Hysterectomy was done to 70 (28.69%) of TOLAC participants and 40 (28.57%) of ERCD participants, the difference was not statistically significant. Thromboembolism was a morbidity in 28 (11.48%) of those who underwent TOLAC whereas 77 (55.00%) of those who underwent ERCD developed thromboembolism, the difference was statistically significant at a p value of <0.001. Haemorrhage was experienced by 50 (20.49%) under TOLAC category and 26 (18.57%) under ERCD category. Blood transfusion was required by 66 (27.05%) of women in the TOLAC category and 66 (47.14%) of those in the ERCD category, the difference was statistically significant at a P value of <0.001. Viscus injury was experienced by 45 (18.44%) of those under TOLAC and 37 (26.43%) of those under ERCD whereas Endometritis was a morbidity among 64 (26.23%) of those under TOLAC and 55 (39.29%) of those under ERCD with the difference being significant at P value of 0.008. Then finally, pelvic floor trauma was experienced by 64 (26.23%) of those under TOLAC and 40 (28.57%) of ERCD.

Table 7: The Maternal Morbidities Due TOLAC and Maternal Morbidities Due ERCD

MORBIDITY		OVERALL n (%)	TOLAC n (%)	ERCD n (%)	P VALUE
Uterine Rupture	Yes	135 (35.16)	168 (68.85)	59 (42.14)	**0.030***
	No	249 (64.84)	76 (31.15)	81 (57.86)	
Uterine Dehiscence	Yes	78 (20.31)	52 (21.31)	26 (18.57)	0.521
	No	306 (79.69)	192 (78.69)	114 (81.43)	
Hysterectomy	Yes	110 (28.65)	70 (28.69)	40 (28.57)	0.981
	No	274 (71.35)	174 (71.31)	100 (71.43)	
Thromboembolism	Yes	105 (27.34)	28 (11.48)	77 (55.00)	**<0.001***
	No	279 (72.66)	216 (88.52)	63 (45.00)	
Haemorrhage	Yes	76 (19.79)	50 (20.49)	26 (18.57)	0.649
	No	308 (80.21)	194 (79.51)	114 (81.43)	
Transfusion requirement	Yes	132 (34.38)	66 (27.05)	66 (47.14)	**<0.001***
	No	252 (65.63)	178 (72.95)	74 (52.86)	
Viscus injury (bowel,	Yes	82 (21.35)	45 (18.44)	37 (26.43)	0.066

bladder, ureter)	No	302 (78.65)	199 (81.56)	103 (73.57)	
Endometritis	Yes	119 (30.99)	64 (26.23)	55 (39.29)	**0.008***
	No	265 (69.01)	180 (73.77)	85 (60.71)	
Pelvic floor trauma	Yes	100 (26.04)	60 (24.59)	40 (28.57)	0.392
	No	284 (73.96)	184 (75.41)	100 (28.56)	

The Risks of TOLAC versus ERCD among Women Delivering at Kampala International University Teaching Hospital.

Table 8 shows that there were only 3 statistically significant risks of TOLAC over ERCD namely; Uterine rapture, Thromboembolism and requirement for blood transfusion. Participants in the TOLAC category were 1.35 times at risk of getting a uterine rapture than participants who were in the ERCD category (cRR 1.35, 95%CI 1.03 – 1.77, P=0.028). Women who underwent TOLAC were 4.79 times more at risk of developing thromboembolism than their counterparts who underwent ERCD (cRR 4.79, 95%CI 3.28 – 7.00, P<0.001). Then lastly, those who were under the TOLAC category faced 1.50 times more risk of getting endometritis than those who were in the ERCD category (cRR 1.50, 95%CI 1.12 – 2.01, P<0.007).

Table 8: The Risks of TOLAC versus ERCD among Women Delivering At Kampala International University Teaching Hospital.

Morbidity		**Occurance**		**cRR**	**95% CI**	**P Value**
		NO	**YES**			
Uterine Rupture	ERCD	168 (68.85)	76 (31.15)	1.00	Reference	
	TOLAC	81 (57.86)	59 (42.14)	1.35	1.03 – 1.77	**0.028***
Uterine Dehiscence	ERCD	192 (78.69)	52 (21.31)	1.00	Reference	
	TOLAC	114 (81.43)	26 (18.57)	0.87	0.57 – 1.33	0.523
Hysterectomy	ERCD	174 (71.31)	70 (28.69)	1.00	Reference	
	TOLAC	100 (71.43)	40 (28.57)	0.99	0.72 – 1.38	0.981
Thromboembolism	ERCD	216 (88.52)	28 (11.48)	1.00	Reference	
	TOLAC	63 (45.00)	77 (55.00)	4.79	3.28 – 7.00	**<0.001***
Haemorrhage	ERCD	194 (79.51)	50 (20.49)	1.00	Reference	
	TOLAC	114 (81.43)	26 (18.57)	0.91	0.59 – 1.39	0.651
Transfusion requirement	ERCD	178 (72.95)	66 (27.05)	1.00	Reference	
	TOLAC	74 (52.86)	66 (47.14)	1.74	1.33 – 2.28	**<0.001***
Viscus injury	ERCD	199 (81.56)	45 (18.44)	1.00	Reference	
	TOLAC	103 (73.57)	37 (26.43)	1.43	0.98 – 2.10	0.065
Endometritis	ERCD	180 (73.77)	64 (26.23)	1.00	Reference	
	TOLAC	85 (60.71)	55 (39.29)	1.50	1.12 – 2.01	**0.007***
Pelvic floor trauma	ERCD	184 (75.41)	60 (24.59)	1.00	Reference	
	TOLAC	100 (71.43)	40 (28.57)	1.16	0.83 – 1.64	0.390

The outcomes among women who underwent Trial of Labor after Caesarean Section

Under this specific objective, data was considered for only women who underwent TOLAC which accounts for 36.46% (140/384) of the total number of participants in the study. From table 9 below, it can be observed that majority 64.57% (82/140) of the women who underwent TOLAC had a successful VBAC meanwhile 64.57% (82/140) of the women who underwent TOLAC had unsuccessful VBAC.

Table 9: The outcomes among women who underwent Trial of Labor after Caesarean Section

Outcome	Frequency	Percentage	95% CI
Unsuccessful VBAC	45	35.43	27.00 – 43.87
Successful VBAC	82	64.57	56.13 – 72.99

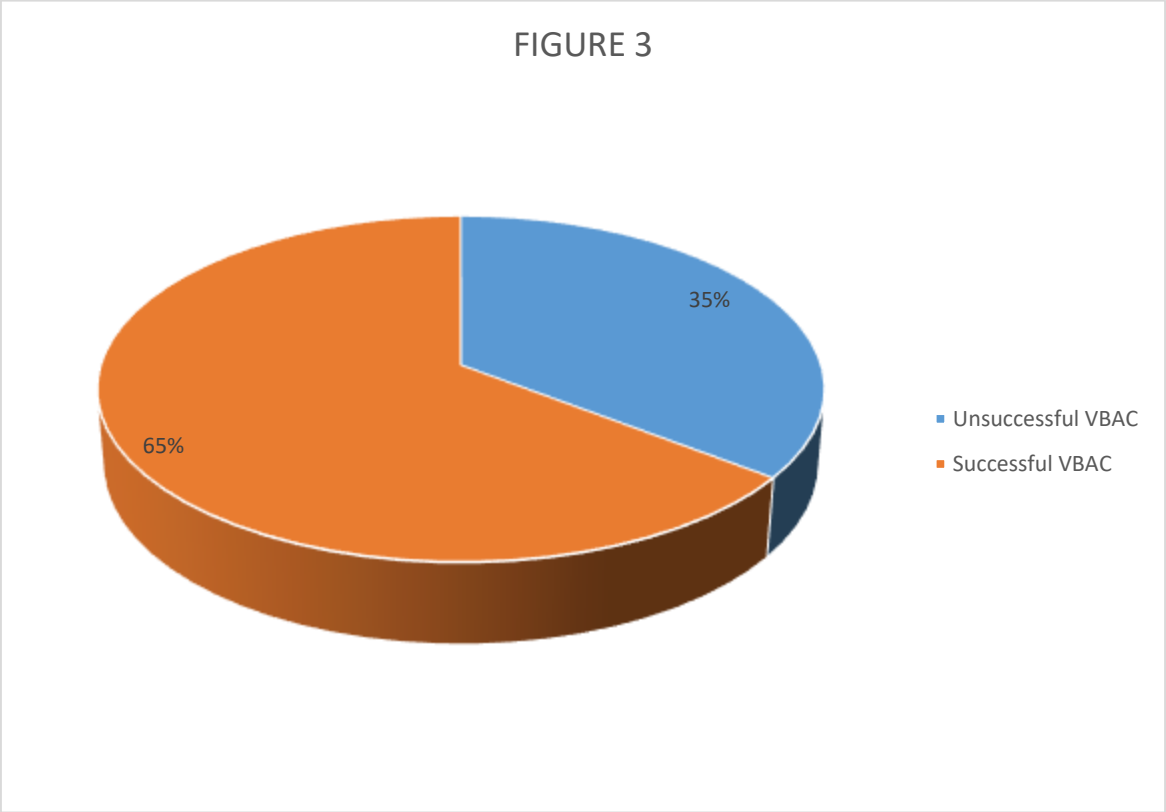

Figure 3: Pie Chart showing the outcomes among women who underwent Trial of Labor after Caesarean Section

The Potential socio-demographic Predictors of Successful VBAC

Overall, the study established that there were 5 predictors of successful VBAC. There were 2 socio-demographic predictors namely; BMI of the mother and birth weight the baby. Similarly, 2 obstetric factors were found to be predictors of successful VBAC namely; Spontaneous onset of labor and Previous safe vaginal birth. Lastly, under medical factors, only Diabetes mellitus was found to be a predictor of successful VBAC. Study participants who had BMI of <35kg/m^2 were 2.25 times more likely to have a successful VBAC than study participants who had BMI of ≥35kg/m^2 (cOR 2.25, 95%CI 1.07 – 4.75, P=0.033). Participants who gave birth to babies who had birth weight of <3500g were 2.93 times more likely to have successful VBAC than study participants who gave birth to babies having birth weight of ≥3500g (cOR 2.93, 95%CI 1.37 – 6.26, P=0.005). Those who did not have did not have spontaneous onset of labor were 88% less likely to have successful VBAC compared to those who had spontaneous onset of labor (cOR 0.12, 95%CI 0.05 – 0.30, P<0.001). Participants who had a negative history of previous safe vaginal birth were 70% less likely to have successful VBAC as opposed to their counterparts who had positive history of previous safe vaginal birth (cOR 0.30, 95%CI 0.14 – 0.66, P=0.003). Finally, findings from the study revealed that study participants who were not suffering from Diabetes Mellitus were

7.65 times more likely to have successful VBAC as compared to their counterparts who were suffering from Diabetes Mellitus (cOR 7.65, 95%CI 3.37 – 17.32, P<0.001).

Table 10: The Potential socio-demographic Predictors of Successful VBAC

Variable	Category	Successful VBAC		cOR	95% CI	P Value
		No (N=45)	Yes (N=82)			
Age of participants in years	16 – 23 Years	17 (36.96)	29 (63.04)	1.00	Reference	
	24 – 30 Years	17 (30.91)	38 (69.09)	1.31	0.57 – 2.99	0.522
	31 – 37 Years	05 (33.33)	10 (66.67)	1.17	0.34 – 4.00	0.800
	38 Years and above	06 (54.55)	05 (45.45)	0.49	0.13 – 1.85	0.291
Gestation Age in weeks	<28 weeks	02 (40.00)	03 (60.00)	1.00	Reference	
	28 – 31 weeks	01 (33.33)	02 (66.67)	1.33	0.07 – 26.62	0.851
	32 – 33 weeks	01 (25.00)	03 (75.00)	2.00	0.11 – 35.81	0.638
	34 weeks and above	41 (35.65)	74 (64.35)	1.20	0.19 – 7.50	0.843
Parity	<3	26 (39.39)	40 (60.61)	1.00	Reference	
	≥3	19 (31.15)	42 (68.85)	1.44	0.69 – 2.99	0.333
BMI of mother	≥35kg/m²	22 (28.21)	56 (71.79)	1.00	Reference	
	<35kg/m²	23 (46.94)	26 (53.06)	2.25	1.07 – 4.75	**0.033***
Birth Weight of in grams	≥3500g	21 (26.25)	59 (73.75)	1.00	Reference	
	<3500g	24 (51.06)	23 (48.94)	2.93	1.37 – 6.26	**0.005***
Augmentation of labor	Yes	08 (27.59)	21 (72.41)	1.00	Reference	
	No	37 (37.76)	61 (62.24)	0.63	0.25 – 1.56	0.317
Time spent in labor	≥15 hours	26 (32.50)	54 (67.50)	1.00	Reference	
	>15 hours	19 (40.43)	28 (59.57)	0.71	0.34 – 1.50	0.368
Spontaneous onset of labor	Yes	08 (13.33)	52 (86.67)	1.00	Reference	
	No	37 (55.22)	30 (44.78)	0.12	0.05 – 0.30	**<0.001***
Previous successful VBAC	Yes	21 (31.34)	46 (68.66)	1.00	Reference	
	No	24 (40.00)	36 (60.00)	0.68	0.34 – 1.42	0.309
Previous safe vaginal birth	Yes	24 (26.97)	65 (73.03)	1.00	Reference	
	No	21 (55.26)	17 (44.74)	0.30	0.14 – 0.66	**0.003***
Diabetes Mellitus	Yes	30 (63.83)	17 (36.17)	1.00	Reference	
	No	15 (18.75)	65 (81.25)	7.65	3.37 – 17.32	**<0.001***
Hypertension	Yes	12 (35.29)	22 (64.71)	1.00	Reference	
	No	33 (35.48)	60 (64.71)	0.99	0.44 – 2.26	0.984
HIV/AIDS	Positive	07 (43.75)	09 (56.25)	1.00	Reference	
	Negative	38 (34.55)	72 (65.45)	1.47	0.51 – 4.27	0.475

DISCUSSION

The Incidence of Maternal Morbidities Due TOLAC and Maternal Morbidities Due ERCD Among Women Delivering at Kampala International University Teaching Hospital

The study showed that the 4 morbidities were found to have statistical significance when the difference in their incidence was compared between women who underwent TOLAC and women who underwent ERCD. The morbidities include: Uterine Rapture 168 (68.85) for TOLAC versus 59 (42.14) for ERCD, p=0.030, Thromboembolism 28 (11.48) for TOLAC versus 77 (55.00) for ERCD, p<0.001, Transfusion requirement 66 (27.05) for TOLAC versus 66 (47.14) for ERCD, p<0.001 and Endometritis 64 (26.23) for TOLAC versus 55 (39.29) for ERCD, p=0.008. The results of the present study are in line with the results of a study done in Canada which found that

women who had an attempted vaginal birth after cesarean delivery had significantly higher rates of uterine rupture compared to women who had an elective repeat cesarean delivery [6]. Furthermore, the result of the present study is in line with the result of a Canadian retrospective cohort study [13]. The results of the present study are not in agreement with the results of a retrospective cohort study of 66,266 patients on mode of delivery in China which found that there were no significant differences between the cesarean deliveries on maternal request and planned vaginal delivery groups in the frequencies of maternal [13]. Much as the two studies had the same study designs, the discrepancy in the study findings could be due to the variation in the study participants and the difference in the geographical regions where the two studies were conducted from. Whereas the present study investigated the incidence of maternal morbidities among women undergoing TOLAC and women undergoing ERCD, a systematic review reported the prevalence of uterine rupture reported to be considerably lower for population-based than for facility-based studies and the prevalence tended to be lower for countries defined by the United Nations as developed than the less or least developed countries [4]. The results of the present study are not in line with a study conducted by [14] who found that there were no differences between the TOLAC and ERCD groups with respect to postpartum hemorrhage, thromboembolic disease, and endometritis 14]. The discrepancy in the results of the present study and the previous study might have risen probably because of the difference in the study designs particularly because the previous study was a systematic review and the present study is a retrospective cohort study. The findings of the present study deviate from the findings of a prospective cross sectional study at a Tertiary Care Center of Eastern Nepal which showed that there were three cases of bladder injury as well as wound infection which was more commonly 11(30.5%) found in failed VBAC cases and among them, six were having haemoglobin level <8 gm% requiring blood transfusion post operatively but none of the patient had significant blood loss intraoperarively [15]. Although both studies were carried out from tertiary care centers, the discrepancy in the study findings could be because of the different levels of expertise of health workers and variations in the availability of sophisticated obstetrics equipment in the two study centers. TOLAC is considered a reasonable means of delivery not only for mothers but also neonates. However, TOLAC is known to increase the risk of uterine rupture. As such, TOLAC is the preferred choice for women who do not have several risk factors based on professional consensus [16]. Furthermore, the availability onsite of an obstetrician and anesthetist must be pointed out to the patient. If the woman continues to prefer a repeat cesarean after adequate information and time to think about it, her preference should be honored [17]. Ultimately it comes down to the physician's ability to predict whether emergent cesarean will be required after TOLAC, as this is the real danger in attempted VBAC [18]. It follows that if women could be classified as either low-risk or high-risk for failure of attempted VBAC, the decision of whether to offer TOLAC would be much clearer [17].

The Risks of TOLAC versus ERCD among Women Delivering at Kampala International University Teaching Hospital

Results of the study showed that there were only 3 statistically significant risks of TOLAC over ERCD namely; Uterine rapture, Thromboembolism and requirement for blood transfusion. Uterine Rapture; Participants in the TOLAC category were 1.35 times at risk of getting a uterine rapture than participants who were in the ERCD category (cRR 1.35, 95%CI 1.03 – 1.77, P=0.028). The result of the present study is in agreement with the result of a study done in Canada which showed that the adjusted RR for composite severe maternal morbidity and mortality among women who had an

attempted vaginal birth after cesarean delivery was 1.96 (95% CI 1.76 to 2.19) and 6.41 (95% CI 4.84 to 8.50) for uterine rupture [6]. Furthermore, in a retrospective cohort study done Liu et al. (2007), the women in the planned cesarean group had increased postpartum risks venous thromboembolism (OR, 2.2; 95% CI, 1.5–3.2), and hemorrhage that required hysterectomy (OR, 2.1; 95% CI, 1.2–3.8) [13]. The result of the present study is not in agreement with the result of a prospective cross sectional study done from a tertiary care center of eastern Nepal on trial of vaginal birth after caesarean (VBAC) which showed that among 8 cases of scar tenderness none of the patients had rupture intra-operatively [15], which shows that scar tenderness may not be the reliable feature of impending or complete rupture of uterus. Though three women were suspected rupture uterus preoperatively, none of them had ruptured intraoperatively. Thromboembolism: Women who underwent TOLAC were 4.79 times more at risk of developing thromboembolism than their counterparts who underwent ERCD (cRR 4.79, 95%CI 3.28 – 7.00, P<0.001). The result of the present study is in line with the result of a retrospective cohort study done by [13] who found that the women in the planned cesarean group had increased postpartum risks of venous thromboembolism (OR, 2.2; 95% CI, 1.5–3.2) (OR, 2.1; 95% CI, 1.2–3.8) (Liu et al., 2007). Venous thromboembolism (VTE) is a problem during pregnancy, delivery and the puerperium. Thromboembolic events represent an important cause of maternal death, occurring both in women who undergo cesarean delivery and in those who undergo vaginal delivery [19]. The risk of thromboembolism after vaginal delivery is ~ 1 per 1,000, while this risk reaches 3 per 1,000 after elective cesarean section, and the mortality associated with VTE after cesarean section is increased 10-fold compared with women who undergo vaginal delivery [20]; [21]. The reasons for such a difference in outcome between the different delivery routes can be explained by several factors, among them, a greater immobility after cesarean section when compared with vaginal delivery. A study even showed that on the 7th day, postpartum women who underwent vaginal delivery were almost twice as mobile as those who had undergone cesarean section [22]. After acknowledging the increase in maternal deaths due to thromboembolism and a widespread failure of the clinicians to follow existing guidelines for prophylaxis based on identified risk factors, experts have advocated universal prophylaxis for all women undergoing cesarean section [23]. Endometritis: Study participants who were under the TOLAC category faced 1.50 times more risk of getting endometritis than those who were in the ERCD category (cRR 1.50, 95%CI 1.12 – 2.01, P<0.007). The result of the present study is not in agreement with the result of a systemic review done in China which revealed that the there was no significant difference in the risk of endometritis between successful TOL and ERCD (Peto OR = 0.769, 95% CI: 0.433 to 1.367, p = 0.371[14]. The possible reason for the discrepancy in the study findings could be because of the highly sophisticated and advanced medical equipment found in China which makes it easier for them to prevent complications such as endometritis. Similar to the findings of the present study, [24] found that there was a higher risk of endometritis in women who had TOLAC (0.8%–30%) than those who had ERCD (1.2%–18%). According to Hibbard et al. (2006), TOLAC is associated with more than twice the odds of endometritis than ERCD (aOR 2.4; 95% CI 1.7–3.5) [25]. Higher rate of maternal morbidity and endometritis have been shown to occur in women with an unsuccessful TOLAC compared to women with a successful TOLAC [13], and a similar trend was seen also in our study. Women in the Maternal-Fetal Medicine Units (MFMU) Network Cesarean Registry who underwent TOLAC were more likely to have endometritis compared to those undergoing an elective repeat cesarean (2.9% vs. 1.8%, aOR 1.6, 95% CI: 1.4-1.9) [13]. Therefore, health workers should be cautious so as to

prevent occurrence of any possible endometritis during TOLAC.

The Potential Predictors of Successful VBAC among Women Delivering At Kampala International University Teaching Hospital.

Results of the present study showed that there were 5 predictors of successful VBAC namely: BMI of the mother, birth weight the baby, Spontaneous onset of labor, previous safe vaginal birth and absence of Diabetes mellitus. BMI of the mother: This study showed that a BMI of <35kg/m^2 was a predictor of successful VBAC. This finding is in agreement with the results of another study which showed that BMI greater than 30 Kg/m^2 was a factor that reduced the success rate [26]. The finding of the present study is not in line with the result of a retrospective cohort analysis using data from the UK Obstetric Surveillance System which revealed that the exposure groups, ERCS and planned VBAC, for each of the outcomes were not significantly different in terms of body mass index [27]. The discrepancy in the findings could be because of the difference in the sample sizes in that the previous study had a very large sample size compared to the present study. Increasing BMI consistently has been shown to have an inverse association with the likelihood of achieving VBAC [3]. Nevertheless, a high BMI alone should not be con-sidered an absolute contraindication to TOLAC because this is just one factor in determining the chance of VBAC and obstetric morbidity in the setting of TOLAC. Birth Weight of the Baby; This study showed that a birth weight of <3500g was a predictor for a successful VBAC. This finding is in line with the results of a previous study which reported statistical association between successful VBAC and birth weight of less tha 3,500g [25]. Contrary to the finding of the present study, the result of a systemic review found no statistical association between birth weight and successful VBAC among the participants who were study [28]. The disagreement in the study finigs can be explained by the difference in the study designs in that the previous study was a systematic review whereas the present study is a cohort study using retrospective data. Spontaneous onset of labor; Women with one previous CS who undergo trial of labor had lower success rates of vaginal delivery compared to those who presented in spontaneous labor. In a study conducted by [29], just about a half of women in the induced group achieved a vaginal delivery compared to up to two-third in the women with spontaneous onset of labor. These results are similar to a study done in the King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia. The study showed that women, with one previous CS who undergo IOL, have lower success rates of vaginal delivery compared to those who presented in spontaneous labor. The incidence of successful VBAC in spontaneous labor was 72%; however, when induced, the incidence of successful VBAC was 63.5% [30]. Studies have shown that women with one previous CS who undergo IOL have lower success rates of vaginal delivery compared with those who presented in spontaneous labor [31]. Women who had a previous successful VBAC have the best chance to deliver vaginally with success rate of 85%–90% [13]. Previous safe vaginal birth; The finding of the present study is in agreement with the result of a large NICHD study which examined factors associated with successful VBAC for the 14,529 women who underwent a trial of labor and found vaginal birth prior to the cesarean section to be a factor associated with an increased chance of successful VBAC [13]. In a study done in the UK, 7065 of women undergoing VBAC had a history of previous vaginal delivery. These women achieved a high rate of VBAC success (86.6%) compared with only 60.9% in women without a history of previous vaginal delivery [31]. In a study done in Women's Hospital, Hamad General Hospital, Qatar, between April 2004 and April 2005, the result of the study was different from our study. The study included 702 women with a history of one CS and 62.4% also had a history of vaginal delivery. After a trial of labor, vaginal delivery occurred more often among

women with no history of vaginal delivery; the results of the study showed that trial of labor resulted in a vaginal delivery more often in women who were delivered only once and by CS (87.7%) than in women who also had a history of vaginal delivery (79.2%). The study was dealing with nonselected and retrospective data, so it is difficult to consider the accuracy of data from these studies [32]. Diabetes Melitus; The finding of the present study is in line with the result of a study done by [33] who found that absence of diabetes mellitus was significantly associated with successful VBAC among the study participants. Similarly, the results of another study showed that VBAC success rates appeared to be lower for diabetic women as compared to those for non-diabetic women [29]. The result of the present study is in agreement with the result of a study done by [34] who found that the relative risk for vaginal birth after cesarean delivery success in women with gestational diabetes mellitus compared with women without gestational diabetes mellitus was 0.94 (95% CI, 0.87-1.00). After an adjustment was made for confounding, the odds ratio for success with gestational diabetes mellitus was 0.87 (95% CI, 0.68-1.10) [34]-[37].

CONCLUSION

Decision to deliver women with previous CS is a complicated process that involves the physician's knowledge of the available evidence, experience, and fear of litigation as well as the previous maternal experience and knowledge. Any decision made will affect the outcome of the present pregnancy as well as the future obstetric performance and fertility of the patient.

Recommendations

The appropriate use and safety of cesarean and VBAC are of concern not only at the individual patient and clinician level but they also have far-reaching public health and policy implications at the national level. Although TOLAC/VBAC is a reasonable and safe option for most women with prior cesarean delivery, careful consideration of risks/benefits and assessment of individual factors is vital in this decision-making process. Risk factors should be assessed early enough during Antenatal care so that more attention can be given to the women who are at risk of having unsuccessful VBAC.

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