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Stage of labor at admission among Ugandan women with a prior cesarean, and its impact on management and delivery outcomes

Adeline A Boatin^{1,*}, Elly Agaba², Baltazar Nyongozzi², and Blair J Wylie³

¹Department of Obstetrics and Gynecology, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA ²Department of Obstetrics and Gynaecology, Mbarara Regional Referral Hospital, Mbarara, Uganda ³Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

Abstract

Objective—To describe stage of labor at admission among women with a prior cesarean, and examine its impact on intrapartum management and delivery mode.

Methods—In a prospective cohort study, women admitted to Mbarara Regional Referral Hospital, Uganda, for delivery were enrolled between March and June 2015. Rates of vaginal delivery (VBAC) and in-hospital trial of labor (TOL) were compared between early (<4 cm dilation) and late (≥ 4 cm) presenters. Women were interviewed after delivery about decision making and labor preferences.

Results—Overall, 188 women comprised the study sample; 98 (52.1%) and 65 (34.6%) women presented at < 4 cm and ≥ 4 cm, respectively, and 18 (9.6%) were fully dilated. In-hospital TOL and VBAC rates were 25.5% (42/165) and 9.6% (18/188), respectively. Compared with early presenters, late presenters were significantly more likely to undergo TOL (28/88 [31.8%] vs 14/77 [18.2%]; odds ratio [OR] 2.3, 95% confidence interval [CI] 1.1–5.0), and achieve VBAC (16/98 [16.3%] vs 2/90 [2.2%]; OR 7.6, 95% CI 1.7–35.1).

Conclusion—Most women arrived in active labor, but most had a repeat cesarean. Work is needed to understand the clinical decision making and provider management driving low TOL and VBAC rates.

Keywords

Intrapartum decision making; Repeat cesarean delivery; Trial of labor after caesarean; Uganda; Vaginal birth after cesarean

*Correspondence: Adeline A Boatin, 55 Fruit Street, Founders 5, Boston, MA 02114, USA., adeline_boatin@mgh.harvard.edu.

Author contributions

AAB and BJW conceived the study. All authors contributed to study design. AAB, EA, and BN contributed to data collection. AAB and BJW performed data analyses. All authors contributed to data interpretation. AAB drafted the manuscript and all other authors provided critical insight and review. All authors read and approved the final version of the manuscript submitted for publication.

Conflicts of interest

The authors have no conflicts of interest.

1 INTRODUCTION

Women with a prior cesarean delivery have an increased risk of uterine rupture, particularly during labor, as compared with those without a uterine scar [1,2]. Close monitoring and swift surgical intervention are key elements of minimizing poor outcomes should uterine rupture occur; thus, early admission at onset of labor is recommended to allow close monitoring of this population of women [3–5].

Several studies from Sub-Saharan Africa document poor outcomes among women with a prior cesarean who present at health facilities in advanced labor [6–9]. To our knowledge, however, few studies from this region have examined how pervasive such presentation is among women with a prior cesarean delivery, and the reasons why women might present at that time. The impact of stage of labor on intrapartum management decisions and delivery outcomes has also not been investigated in this setting.

To address this knowledge gap, the primary aim of the present study was to describe the stages of labor at admission among women with a prior cesarean delivery and to examine the effect of labor stage on both the clinical decision to allow an in-hospital trial of labor (TOL) and the ability to achieve a vaginal birth. The hypothesis was that women presenting in more advanced labor would be more likely to undergo in-hospital TOL and have a higher rate of vaginal birth after cesarean (VBAC) than would women presenting earlier. A secondary aim was to understand women's perspectives and to identify factors influencing the timing of their presentation at the facility.

2 MATERIALS AND METHODS

The present prospective cohort study was conducted among women with at least one prior cesarean who were admitted for delivery between March 1 and June 30, 2015, at the Mbarara Regional Referral Hospital, Mbarara, Uganda—a tertiary care facility in southwestern Uganda with approximately 12 000 deliveries per year and a cesarean rate of 39%. The exclusion criteria were multiple pregnancy or admission for a prepartum indication remote from delivery. Charts for all eligible women were reviewed on a daily basis after enrollment. To understand the factors and behaviors influencing the women's timing of presentation, half the eligible women were approached to participate in a structured interview. Those with complete data for cervical status on admission who agreed to the interview formed the main study sample.

Ethical approval for the study was obtained from: the Partners Institution Review Board, Boston, MA, USA (2014P002595); Mbarara University of Science and Technology Ethics Review Committee, Mbarara, Uganda (No. 01/10-14); and Uganda Council of Science and Technology, Kampala, Uganda (HS 1738). Women provided informed consent for participation in the interviews, but consent was waived for chart abstraction.

Trained midwives screened all admitted patients, performed chart abstraction, and interviewed women. Data were obtained from charts for demographic data, obstetric history, referral history (women referred from another facility vs self-presented), pre-existing medical conditions (HIV, tuberculosis, asthma, diabetes, and cardiac or renal disease),

cervical examination at admission, initial intrapartum management plan (initial written plan for management made on admission to the hospital), and maternal and perinatal adverse events. Computer-generated random numbers were used to select which women would be approached to participate in the structured interview. The structured interviews were conducted with women after delivery and before discharge. Questions focused on socioeconomic status, education, prior deliveries, prenatal care, decision making and practices around the index pregnancy, preferences for delivery, and future reproductive goals.

The primary exposure of interest was cervical dilation on admission. Therefore, only women with complete information for this variable were included in the main study analysis. Participants were divided into two groups: those presenting with a cervical dilation of less than 4 cm (early presenters) and those presenting with a dilation of 4 cm or greater (late presenters). This cutoff was based on definitions of established labor in use in routine clinical practice in Uganda. A sensitivity analysis using a cervical dilation of 6 cm or more as the cutoff for late presentation was also performed.

The primary outcome of interest was VBAC; the secondary outcomes were rate of in-hospital TOL and rate of adverse events. The maternal adverse events assessed were uterine rupture (disruption of all layers of the uterine wall), hysterectomy, reoperation or laparotomy after delivery, surgical injury (i.e. injury to bowel, bladder, ovary, or fallopian tube during surgery), blood transfusion, and maternal death before discharge. The perinatal adverse events were stillbirth, 5-minute Apgar score less than 7, neonatal seizures, and neonatal death before discharge. Fetal monitoring was performed intermittently with the Pinnard stethoscope; continuous fetal monitoring was not available.

Prior work at the hospital indicated a VBAC rate of 18% (unpublished data). On the basis of studies demonstrating a 2–6-fold increase in the rate of VBAC for women presenting in more advanced labor [10], it was calculated that a sample size of 190 would allow the detection of a twofold difference in VBAC rate between early and late presenters, with 80% power and a two-tailed error of 5%.

All statistical calculations were performed with Stata version 13 (Statacorp, College Station, TX, USA). Demographic, obstetric, knowledge, and preference factors were tested for association with timing of presentation by χ^2 test. $P < 0.05$ was considered statistically significant.

Early or late presentation was tested for association with mode of delivery and initial intrapartum management plan on admission (i.e. in hospital TOL versus emergency cesarean) by a logistic regression model with results presented as odds ratios (ORs) and 95% confidence intervals (CIs). The model was adjusted for obstetric factors and demographics known to affect TOL and VBAC rates, including prior vaginal delivery and prior VBAC [11], in addition to obstetric variables found to be associated with timing of presentation in labor (early vs late presenters) at a significance level of 0.1 or less in the present study.

3 RESULTS

During the study period, 3081 women were admitted for delivery (Figure 1). Of these, 417 (13.5%) women had a prior cesarean and 402 (13.0%) met the inclusion criteria. Ultimately, 208 were invited to complete a structured interview: seven women refused consent, and 201 were interviewed. Of the 201 women who consented to the interview, 188 (93.5%) had complete information on cervical status on admission and comprised the study sample.

Most women (157/188 [83.5%]) had uterine contractions on admission. There were 90 (47.9%) early presenters and 98 (52.1%) late presenters. Over a third (65 [34.6%]) had a cervical dilation of 6 cm or greater, and 18 (9.6%) presented in the second stage of labor (Figure S1). Most women (134 [71.3%]) had only one prior cesarean; 47 (25.0%) had two prior cesareans and 7 (3.7%) had three or more. The frequency of presentation in advanced labor increased with the number of prior cesareans (Figure 2).

Referrals from another health facility were generally uncommon but were significantly more frequent among late presenters than among early presenters ($P=0.011$) (Table 1). Although there was no association between labor stage at admission and income or educational level, significantly more early presenters than late presenters owned a mobile phone ($P=0.013$) (Table 1).

Most of the women in the study cohort received counseling about delivery in the context of a history of cesarean delivery (Table 2). A roughly equal proportion of women received prenatal care at a basic health center and at a center capable of performing cesareans (Table 2). Most women reported some prenatal counseling in the index pregnancy (Table 2). There were no differences between early and late presenters in terms of prenatal care location, counseling received after the first cesarean, or counseling during the prenatal period of the index pregnancy (Table 2).

Most women preferred a vaginal delivery and believed that this mode was safer for mother and neonate (Table 2). Although delivery preference did not differ between early and late presenters, a higher proportion of women who presented early than late believed that cesarean was safer for the mother ($P=0.026$) (Table 2). A similar, but nonsignificant, trend was seen for women who believed that cesarean was safer for the neonate ($P=0.066$) (Table 2). Conversely, a higher proportion of women who desired future pregnancies presented late ($P=0.014$) (Table 2).

Women made the decision to seek care at a facility in half the cases (Table 2). The involvement of husbands in this decision was more common among early presenters than among late presenters ($P=0.022$) (Table 2). Once the decision had been made, most women arrived at the hospital within 6 hours.

Overall, 23 (12.2%) women had no documented intrapartum management plan on admission. The demographics, socioeconomic status, and obstetric characteristics of these women were compared with those of women with a plan (TOL or emergency cesarean), and no differences were found between the two groups (data not shown). Of the 165 women with a plan documented, only 42 (25.5%) were allowed an in-hospital TOL. The remaining 123

(74.5%) had a plan for emergency repeat cesarean. In an adjusted analysis, women presenting late were twice as likely to have TOL as those presenting early (Table 3).

Most women (170/188 [90.4%]) delivered by cesarean. Of the 42 women allowed in-hospital TOL, only 18 ultimately delivered vaginally (9.6% of total sample). Women presenting late were significantly more likely to deliver vaginally even after adjustment (Table 3). Only two women who presented early in labor delivered vaginally. Among both early and late presenters, the three most common indications for cesarean in the index pregnancy were cephalopelvic disproportion (32.4%), two or more prior cesareans (21.2%), and short interpregnancy interval (defined as <24 months; 17.7%) (Table S1). Other indications included scar tenderness, malpresentation, prior myomectomy, fetal indications, placental abnormality, macrosomia, uterine rupture, post-term, and poor obstetric history. None these indications differed between early and late presenters (Table S1).

There were 6 (3.2%) maternal adverse events and 10 (5.3%) perinatal adverse events. The maternal events included 2 (1.1%) uterine ruptures, 1 (0.5%) hysterectomy, 1 (0.5%) re-operation, 3 (1.6%) blood transfusions, and 3 (1.6%) prolonged stays in hospital. The perinatal events included 3 (1.6%) stillbirths, 5 (2.7%) neonates with a 5-minute Apgar score of less than 7, 5 (2.7%) neonatal referrals to the pediatric ward, and 1 (0.5%) early neonatal death.

In a sensitivity analysis for which 6-cm cervical dilation was used as a cutoff for early versus late presentation, the odds of VBAC and TOL were higher for women presenting late, similar to the findings based on 4 cm as a cutoff (data not shown). The associations observed between timing of presentation and obstetric factors, knowledge, and behavior at the 4-cm cutoff were also observed at the 6-cm cutoff (data not shown). No new associations emerged at the 6-cm cutoff (data not shown).

4 DISCUSSION

In the current study in a resource-limited setting, most women with a prior cesarean delivery presented in established labor. Additionally, more than one-third presented in advanced labor (cervical dilation >6 cm [12]) and one-tenth presented in the second stage. Despite most women presenting in spontaneous labor, and a strong preference for vaginal delivery among the women, the rate of in-hospital TOL permitted on admission was low (25%), and most women delivered by a repeat cesarean.

The combination of presentation in advanced labor and a high rate of repeat cesarean increases the risks of poor outcomes for women. In the short term, the risk of adverse maternal and perinatal adverse is higher for women undergoing intrapartum cesarean than for those with successful VBAC or unlabored repeat cesarean [2]. In the long term, the risk of placenta previa and abnormally adherent placenta, as well as more complex and challenging repeat cesareans, increases with each additional procedure [13,14]. This is particularly concerning in Uganda, with a total fertility rate of 6.2 [15].

It is possible that this conservative approach favoring repeat cesarean procedures has emerged owing to human and physical resource constraints that limit the ability either to

monitor both maternal and fetal well-being closely, or to facilitate an emergency surgical response should uterine rupture or fetal compromise occur. However, more research is needed to understand decision making among providers because the TOL rate in the present study was lower than that reported in other settings where resource constraints are likely to be similar [8,16–19].

The study identified modifiable factors that can be targeted to promote earlier presentation of women to such facilities. First, at the individual level, a husband's involvement in decision making seemed to influence earlier presentation; therefore, strategies to involve husbands in counseling efforts during the prenatal period should be considered. Second, women's beliefs about the safety of cesarean, either for mother or neonate, seemed to motivate presentation. This finding could be in line with evidence from Sub-Saharan Africa suggesting that some women avoid deliveries in facilities owing to fear of undergoing a cesarean [20]. Quality improvement at the facility level that can increase TOL rates and the safety of cesarean might encourage women to present earlier if they feel that cesarean is not inevitable once there. For women who are not appropriate candidates for TOL, directed counseling that dispels myths of the impact or safety of cesarean and explains the need should be considered. Third, a short interpregnancy interval was a common indication for repeat cesarean; therefore, counseling about pregnancy spacing and improving access to contraception is important for this group of women. At a health system level, women referred from other facilities were more likely to present late. This is probably a result of the time taken for the first evaluation, followed by transport to the receiving institution. Further research is needed to determine the reasons for referral, their appropriateness, and changes to the referral system that might reduce either the need for referral or transfer time between facilities.

The present study expands information on delivery among women with a prior cesarean in resource-limited settings. The prospective design allowed collection of detailed information on cervical dilation, which has yet to be fully described in this population. Additionally, the study explored the women's perspective on labor, which to our knowledge has not been done in this population in Sub-Saharan Africa. However, the study also has some limitations. It was not possible to collect information such as the length of labor experienced before admission, which might have influenced the timing of presentation. Fetal presentation, position, and estimated fetal weight might also affect clinical decision making, but are not routinely recorded in the chart, and therefore it was not possible to assess their impact on TOL or VBAC rates. Last, the focus was to assess women's knowledge and behavior because this has not been addressed among women with a prior cesarean in the study setting. Provider knowledge, capacity, and motivations, in addition to institutional systems, might drive the clinical management demonstrated in the present study. This will be a focus of future work.

In conclusion, women with a prior cesarean commonly presented at a facility for childbirth in established spontaneous labor; although this increased the rate of TOL and VBAC at the facility, the overall rate of VBAC remained low. Modifiable factors were identified at the individual and health system level that might be targeted to encourage women with a prior

cesarean to present earlier in labor. Further work is needed to understand the clinical decision making and provider management driving low TOL and VBAC.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Synopsis

In a rural Ugandan setting, most women with a prior cesarean delivery presented in active labor, yet few achieved vaginal delivery.

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Figure 1.
Recruitment of the study population.

Figure 2.

Cervical dilation on admission by number of prior CDs. Abbreviation: CD, cesarean delivery.

Table 1 Characteristics of the study population.^a

Characteristic	All women (n=188)	Early presenters: <4 cm dilation (n=90)	Late presenters: 4 cm dilation (n=98)	P value ^b
Maternal age, y				0.656
18–34	175 (93.1)	83 (92.2)	92 (93.9)	
35	13 (6.9)	7 (7.8)	6 (6.1)	
Referral status				0.011
Self-referred	160 (85.1)	83 (92.2)	77 (78.6)	
Referred from other facility	28 (14.9)	7 (7.8)	21 (21.4)	
Prior vaginal birth (any)	48 (25.5)	19 (21.1)	29 (29.6)	0.385
Prior vaginal birth after cesarean	16 (8.5)	6 (6.7)	10 (10.2)	0.724
Number of prior cesareans				0.488
1	134 (71.3)	60 (66.7)	74 (75.5)	
2	54 (28.7)	30 (33.3)	24 (24.5)	
Maternal disease				0.840
None	157 (83.5)	75 (83.3)	82 (83.7)	
Present	31 (16.5)	15 (16.7)	16 (16.3)	
Fetal status at admission ^c				0.044
Live	168 (89.4)	85 (94.4)	83 (84.7)	
Intrauterine fetal demise	2 (1.1)	1 (1.1)	1 (1.0)	
District of origin ^d				0.292
Mbarara	118 (62.8)	53 (58.9)	65 (66.3)	
Outside Mbarara	69 (36.7)	36 (40.0)	33 (33.7)	
Educational level				0.168
None or primary	110 (58.5)	48 (53.3)	62 (63.3)	
Secondary or higher	78 (41.5)	42 (46.7)	36 (36.7)	
Income level, US\$ per mo ^e				0.121
0–30	124 (66.0)	55 (61.1)	69 (70.4)	
>30	63 (33.5)	34 (37.8)	29 (29.6)	
Mobile phone ownership				0.013*
No	20 (10.6)	4 (4.4)	16 (16.3)	
Yes	168 (89.4)	86 (95.6)	82 (83.7)	
Poor obstetric history ^f				0.744
No	113 (60.1)	53 (58.9)	60 (61.2)	
Yes	75 (39.9)	37 (41.1)	38 (38.8)	
Number of prenatal visits				0.251
<4	49 (26.1)	20 (22.2)	29 (29.6)	
4	139 (73.9)	70 (77.8)	69 (70.4)	

^aValues are given as number (percentage) unless indicated otherwise.

^bComparison between early and late presenters.

^cData on fetal status at admission were missing for 18 (9.6%) cases; 4 (4.4%) early presenters and 14 (14.3%) late presenters

^dData on district of origin missing for 1 (0.5%) case; 1 (1.1%) early presenter

^eData on income missing for 1 (0.5%) case; 1 (1.1%) early presenter

^fPoor obstetric history includes prior spontaneous abortion (31 [16%]), stillbirth (12 [13%]) and neonatal demise (39 [21%]).

Table 2 Knowledge, preferences, and behaviors of the study population.^a

Variable	All women (n=188)	Early presenters: <4 cm dilation (n=90)	Late presenters: 4 cm dilation (n=98)	P value ^b
Received counseling after first cesarean on where subsequent delivery should occur				0.402
No or don't know	43 (22.9)	23 (25.6)	20 (20.4)	
Yes	145 (77.1)	67 (74.4)	78 (79.6)	
Counseling after first cesarean on how subsequent delivery should occur				0.698
No or don't know	42 (22.3)	19 (21.1)	23 (23.5)	
Yes	146 (77.7)	71 (78.9)	75 (76.5)	
Prenatal counseling during index pregnancy about risks during delivery				0.210
No	13 (6.9)	4 (4.4)	9 (9.2)	
Yes	175 (93.1)	86 (95.6)	89 (90.8)	
Prenatal care location ^c				0.354
Health center (level II or III)	97 (51.6)	43 (47.8)	54 (55.1)	
Health center (level IV) or hospital	90 (47.9)	46 (51.1)	44 (44.9)	
Decision-maker regarding seeking of facility care				0.022
Self	94 (50.0)	37 (41.1)	57 (58.2)	
Husband	81 (43.1)	46 (51.1)	35 (35.7)	
Other ^d	13 (6.9)	7 (7.8)	6 (6.1)	
Time to get to hospital, h				0.877
<6	177 (94.1)	88 (97.8)	89 (90.8)	
6	11 (5.9)	2 (2.2)	9 (9.2)	
Preference for mode of delivery				0.121
Vaginal	166 (88.3)	76 (84.4)	90 (91.8)	
Cesarean	22 (11.7)	14 (15.6)	8 (8.2)	
Belief about which mode of delivery is safer for the mother				0.026
Vaginal	145 (77.1)	63 (70.0)	82 (83.7)	
Cesarean	41 (21.8)	26 (28.9)	15 (15.3)	
Don't know	2 (1.1)	1 (1.1)	1 (1.0)	
Belief about which mode of delivery is safer for baby				0.066
Vaginal	142 (75.5)	63 (70.0)	79 (80.6)	
Cesarean	43 (22.9)	26 (28.9)	17 (17.3)	
Unsure	3 (1.6)	1 (1.1)	2 (2.0)	
Desire for future pregnancies ^e				0.014
No	53 (28.2)	33 (36.7)	20 (20.4)	
Yes	133 (70.7)	56 (62.2)	77 (78.6)	

^a Values are given as number (percentage) unless indicated otherwise.

^b Comparison between early and late presenters.

^c Data on prenatal care location missing for 1 (0.5%) case; 1 (1.1%) early presenter

^d Includes brother/sister, in-laws, or other relative.

^e Data on desire for future pregnancies missing for 2 (1.1%) cases; 1 (1.1%) early presenter, 1 (1.0%) late presenter

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Table 3

Management decisions on admission and delivery outcomes, by labor status at admission.^a

Presentation	Intrapartum management decision on admission ^b			Mode of delivery		
	Trial of labor	Emergency cesarean	Adjusted OR (95% CI) ^c	Vaginal	Cesarean	Adjusted OR (95% CI) ^c
Early: <4 cm dilation (n=90)	14 (18.2)	63 (81.8)	Ref.	2 (2.2)	88 (97.8)	Ref.
Late: ≥4 cm dilation (n=98)	28 (31.8)	60 (68.2)	2.3 (1.1–5.0)	16 (16.3)	82 (83.7)	7.6 (1.7–35.1)

Abbreviations: OR, odds ratio; CI, confidence interval.

^a Values are given as number (percentage) unless indicated otherwise.

^b Plan of management was not available for 23 (12.3%) women (13 early presenters and 10 late presenters).

^c Adjusted for prior vaginal delivery, prior vaginal birth after cesarean, referral status, and fetal status at admission.