Prevalence and predictors of obstetric outcomes among women with multiple Caesarean Sections at Iringa Regional Referral Hospital, Tanzania

Olimpia Bernard Tarimo[1], Deogratius Bintabara[2], Athanase Lilungulu[1], Maria Angelica Rweyemamu[1], Ipyana Mwampagatwa[1], Laisson Mwakalebela[3], John Lawi[3], Sr. Scholastica Malangalila[3] and Francis Kwetukia[3]

Author Affiliations:

1. Department of Obstetrics and Gynaecology, School of Medicine and Dentistry, University of Dodoma, Tanzania.
2. Department of Community Medicine, School of Medicine and Dentistry, University of Dodoma, Tanzania.
3. Department of Obstetrics and Gynaecology, Iringa Regional Referral Hospital, Iringa, Tanzania

Correspondence:
Athanase Lilungulu
athalilungulu@yahoo.com

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ABSTRACT

Introduction: Multiple Caesarean Sections (CS) are associated with an increased risk of adverse obstetric outcomes. Data on predictors are scarce. The objective of this study is to determine the prevalence and predictors of obstetric outcomes among women with multiple CS.

Method: This analytical cross-sectional study was conducted at Iringa Regional Referral Hospital and included 215 women with multiple CS. The purposeful sampling technique was used to recruit participants in the maternity ward. Data were collected using a structured questionnaire and analysed by SPSS version 26. Descriptive statistics were used to analyse categorical data using frequency and percentages, whereas continuous data were analysed using the median with an interquartile range. Chi squared tests and binary logistic regression, both univariate and multivariate, were used to access the association between variables, and a p value <0.05 was considered statistically significant.

Results: The median age was 32 with 6 years inter quartile range (IQR). The prevalence of adverse outcomes was 31.6% for maternal and 24.2% for foetal outcomes. Adverse maternal outcomes were: post-partum haemorrhage (PPH) 61 (28.4%), hysterectomy 20 (9.3%), and bladder injury 12 (5.6%), uterus rupture 5 (2,3%). Adverse foetal outcomes were: low Apgar score 49 (22.2%), prematurity 28 (13%) and neonatal death 7 (3.2%). Predictors of adverse maternal outcomes: lack of third trimester ultrasound [p value= 0.004, OR=4.66, 95% CI (1.66-13.14)], emergency CS [p value<0.001, OR=34.4, 95% CI (7.9-151.1)] and delay one (failure to recognise there is a problem requiring transfer to hospital) [p value<0.001, OR= 6.57, 95% CI (2.50-17.31)]. Foetal outcomes: preterm deliveries [p value<0.017, OR=3.63, 95% CI (1.26-10.48)], lack of ultrasound checkup [p value=0.002, OR=3.92, 95% CI (1.68-9.14)] and first delay [p value<0.001, OR=4.84, 95% CI (2.04-11.48)].

Conclusion: The prevalence of adverse outcomes among women with multiple CS deliveries is high in our setting. Third trimester ultrasound is important in detecting risks of adverse obstetric outcomes.

Keywords: multiple Caesarean Section, predictors, adverse outcomes, Iringa.

Introduction

Caesarean Section (CS) is a lifesaving procedure in which surgical intervention is performed to remove a baby through an incision made on the abdominal wall and uterus; however, it is usually done when vaginal birth is observed to pose a threat to good progress for both maternal and child health.[1] In Tanzania, the rate of pregnant women delivered by CS increased from 2% in 1996 to 6% in 2015-2016.[2] Furthermore, CS rates are projected to increase by 5.6% in Sub-Saharan Africa and 44.9% in Northern Africa.[3]

Traditionally, multiple CS is defined as repeated attempts at second and more deliveries by CS after the previous primary CS.[4] Multiple CS is associated with an increased risk of adverse obstetric outcomes, including placenta praevia, rupture of the uterus, difficult operation due to the adhesions leading to bowel and bladder injuries, and, on the other hand, increased foetal complications.[5]

There is limited data in low-resource countries on identifying predictors that could help reduce obstetric outcomes among women with multiple CS. However, one study in Ghana showed that the machine learning technique has a chance of identifying pregnant women who are at risk for caesarean section.[6]

Therefore, the objective of the study is to determine the prevalence and predictors of obstetric outcomes among women with multiple caesarean sections at Iringa Regional Referral Hospital in Tanzania.

Method

Between October 2023 and March 2024, we recruited all women presenting for delivery at Iringa Regional Referral Hospital who had two or more previous CS, excluding those who had experienced intrauterine foetal death at gestational age of less than 28 weeks.

Structured questionnaires were used to gather information. The data were analysed using SPSS version 26. Descriptive statistics were used to analyse categorical data using frequency and percentages, whereas continuous data were analysed using the median and inter-quartile range (IQR) and summarised into charts and tables. Chi-squared tests and binary logistic regression, both univariable and multivariable, were used to access the association between variables and a p-value <0.05 was considered statistically significant.

Ethical approval was granted by the University of Dodoma and written consent obtained from the women who participated in the study.

Table 1. Characteristics of study participants

Variable	n (%)
Age in years (Median 32, IQR 6)	
21-34	151 (70.2)
≥35	64 (29.8)
Residence	
Urban	98 (45.6)
Rural	117 (54.4)
Education level	
No formal education	16 (7.4)
Primary	100 (46.5)
Secondary	65 (30.2)
Higher education	34 (15.8)
Occupation	
Peasants	69 (32.1)
Self employed	75 (34.9)
Employed	71 (33.0)
Total	**215 (100)**

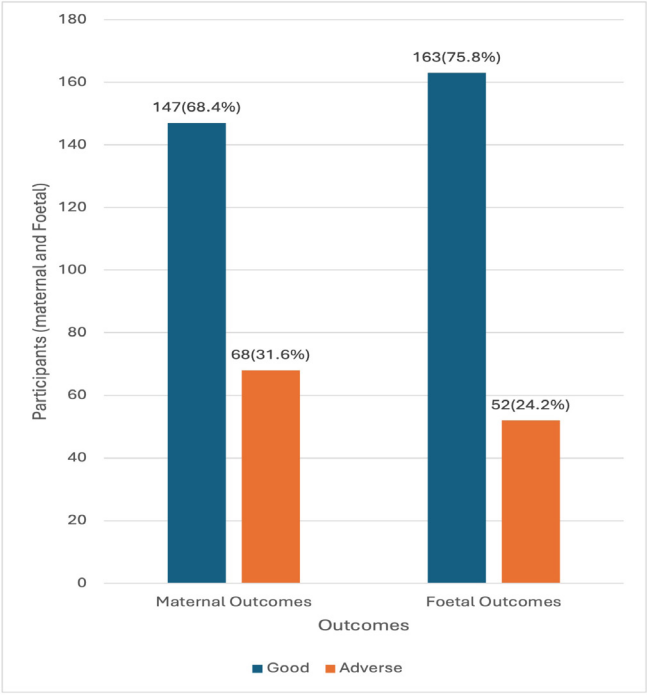

Figure 1. Prevalence of immediate adverse obstetric outcomes

Results

We recruited 215 women for the study. The median age of participants was 32 years and IQR 6 years. Most (70.2%) were aged between 21-34 years. Nearly half (46.5%) had a primary education (Table 1).

Obstetric outcomes were categorised as good or adverse, the latter including any complications post-delivery. The prevalence of adverse outcomes was 31.6% for maternal and 24.2% for foetal respectively (Figure 1).

Sixty-one (28.4%) women had post-partum haemorrhage (PPH) of which 12 (5.6%) had serious haemorrhage due to atonic uterus. Twenty (9.3%) women underwent Caesarean hysterectomy and 12 (5.6%) experienced bladder injury. In foetal outcomes, 49 (22.8%) had low Apgar score, 28 (13.0%) were premature, 32 (14.9%) had low birth weight and 7 (3.2%) foetal deaths (Table 2).

Tables 3 and 4 show the results of Chi-squared tests of potential predictors of maternal and foetal outcomes respectively.

Table 2. Obstetric outcomes

Maternal	n (%)	Foetal	n (%)
Status of uterus		**Foetal status**	
Normal	178 (82.8)	Alive	208 (96.7)
Dehiscence	20 (9.3)	Dead	7 (3.2)
Atonic	12 (5.6)	**Apgar score**	
Ruptured	5 (2.3)	<7 (low)	49 (22.8)
PPH		≥7 (normal)	166 (77.2)
Yes	61 (28.4)	**Prematurity**	
No	154 (71.6)	Yes	28 (13.0)
Caesarean hysterectomy		No	187 (87.0)
Yes	20 (9.3)	**Low birth weight**	
No	195 (90.7)	Yes	32 (14.9)
Bladder injury		No	183 (85.1)
Yes	12 (5.6)	**Total**	**215 (100)**
No	203 (94.4)		
Total	**215 (100)**		

Table 3. Chi-squared tests of potential predictors of maternal outcomes

Variables	Maternal outcomes		p-value
	Good n (%)	Adverse n (%)	
Age			
21-34 years	102 (67.5)	49 (32.5)	0.690
35 years and above	45 (70.3)	19 (29.7)	
Residence			
Urban	72 (73.5)	26 (26.5)	0.141
Rural	75 (64.1)	42 (35.9)	
Residence			
Urban	72 (73.5)	26 (26.5)	0.141
Rural	75 (64.1)	42 (35.9)	
Employment status			
Unemployed	36 (52.2)	33 (47.8)	
Self-employed	52 (69.3)	23 (30.7)	<0.001
Employed	59 (83.1)	12 (16.9)	
Gestational age			
<37 weeks (preterm)	6 (21.4)	22 (78.6)	<0.001
37 weeks and above (term)	141 (75.4)	46 (24.6)	
Number of antenatal visits			
Less than 8 visits	75 (56.0)	59 (44.0)	<0.001
More than 8 visits	72 (88.9)	9 (11.1)	

Table 3. Continue

Staff who reviewed ANC visit			
Nurse	78 (59.1)	54 (40.9)	0.001
Clinical officer	5 (62.5)	3 (37.5)	
Doctor	31 (79.5)	8 (20.5)	
Specialist	33 (91.7)	3 (8.3)	
Health facility attended for ANC			
Dispensary	21 (47.7)	23 (52.3)	0.001
Health Centre	45 (63.4)	26 (36.6)	
District Hospital	24 (70.6)	10 (29.4)	
Regional Hospital	35 (87.5)	5 (12.5)	
Specialized clinic	22 (84.6)	4 (15.4)	
Antepartum haemorrhage			
Yes	19 (34.5)	36 (65.5)	<0.001
No	128 (80.0)	32 (20.0)	
Ultrasound performed after 28 weeks gestation			
Yes	100 (87.0)	15 (13.0)	<0.001
No	47 (47.0)	53 (53.0)	
Interval from last CS			
Short interval (<24months)	20 (37.7)	33 (62.3)	<0.001
Normal interval (24 months and above)	127 (78.4)	35 (21.6)	
Complication in previous CS			
Yes	18 (32.1)	38 (67.9)	<0.001
No	129 (81.1)	30 (18.9)	
Urgency of surgery			
Elective	101 (95.3)	5 (4.7)	<0.001
Emergence	46(42.2)	63 (57.8)	
Delay			
Delay to seek care	29 (40.8)	42 (59.2)	<0.001
Delay in transport	15 (62.5)	9 (37.5)	
Delay to receive care	32 (94.1)	2 (5.9)	
No delay	71 (82.6)	15 (17.4)	
Where last delivery was done			
Health centre	26 (74.3)	9 (25.7)	0.003
District Hospital	42 (53.2)	37 (46.8)	
Regional Hospital	57 (76.0)	18 (24.0)	
Zonal/ National Hospital	21 (84.0)	4 (16.0)	

Table 4. Chi-squared tests of potential predictors of foetal outcomes

Variables	Foetal outcomes		p-value
	Good n (%)	Adverse n (%)	
Residence			
Urban	83(84.7)	15(15.3)	0.005
Rural	80(68.4)	37(31.6)	
Education level			
No education	5(31.3)	11(68.8)	<0.001
Primary	71(71.0)	29(29.0)	
Secondary	57(87.7)	8(12.3)	
Higher	30(88.2)	4(11.8)	
Employment status			
Unemployed	38(55.1)	31(44.9)	<0.001
Self-employed	62(82.7)	13(17.3)	
Employed	63(88.7)	8(11.3)	
Gestational age			
<37 weeks(preterm)	2(7.1)	26(92.9)	<0.001
37 weeks and above (term)	161(86.1)	26(13.9)	
Number of antenatal visits			
Less than 8 visit	86(64.2)	48(35.8)	<0.001
More than 8 visits	77(95.1)	4(4.9)	
Staff who reviewed last ANC visit			
Nurse	87(65.9)	45(34.1)	<0.001
Clinical officer	5(62.5)	3(37.5)	
Doctor	37(94.9)	2(5.1)	
Specialist	34(94.4)	2(5.6)	
Health facility attended for ANC			
Dispensary	25(56.8)	19(43.2)	<0.001
Health Centre	51(71.8)	20(28.2)	
District Hospital	25(73.5)	9(26.5)	
Regional Hospital	38(95.0)	2(5.0)	
Specialized clinic	24(92.3	2(7.7)	
Antepartum haemorrhage			
Yes	26(47.30	29(52.7)	<0.001
No	137(85.60	23(14.4)	
Ultrasound performed after 28 weeks gestation			
Yes	105(91.3)	10(8.7)	<0.001

Table 4. Continue

No	58(58.0)	42(42.0)	
Interval from last CS			
Short interval (<24 months)	27(50.9)	26(49.1)	<0.001
Normal interval (24 months and more)	136(84.0)	26(16.0)	
Complication in previous CS			
Yes	27(48.2)	29(51.8)	<0.001
No	136(85.5)	23(14.5)	
Urgency of surgery			
Elective	101(95.3)	5(4.7)	<0.001
Emergence	62(56.9)	47(43.1)	
Delay			
Delay to seek care	39(54.9)	32(45.1)	<0.001
Delay in transport	16(66.7)	8(33.3)	
Delay to receive care	32(94.1)	2(5.9)	
No delay	76(88.4)	10(11.6)	
Where last delivery was done			
Health Centre	29(82.9)	6(17.1)	0.012
District Hospital	50(63.3)	29(36.7)	
Regional Hospital	61(81.3)	14(18.7)	
Zonal/ National Hospital	22(88.0)	3(12.0)	

In multivariable analysis, the biggest predictor of adverse maternal outcome was the urgency of the previous CS (OR 34.4, 95% CI 7.9-151.1, p value<0.001). Also significant were complications such as delayed wound healing in the previous CS (OR 9.1, 95% CI 4.1-19.9, p value<0.001), delay to seek care (OR 6.57, 95% CI 2.50-17.31, p-value <0.001) and lack of third trimester ultrasound (OR 4.66, 95% CI 1.66-13.14, p-value 0.004) (Table 5).

Regarding foetal outcomes, in multivariable regression it was found that the biggest predictor of adverse outcomes was a delay to seek care (OR 4.84, CI 2.04-11.48, p-value <0.001). Other significant predictors were lack of third trimester ultrasound (OR 3.92, 95% CI 1.68-9.14, p-value 0.002) and preterm delivery (OR 3.63, 95% CI 1.26-10.48, p-value 0.017) (Table 6).

Discussion

Prevalence of adverse obstetric outcomes was 31.6% for maternal and 24.2% for foetal outcomes in this study. Significant predictors for adverse outcomes were a lack of third trimester ultrasound, first delay (delay to seek care), preterm delivery (for foetal outcome) and complications or urgency of the previous CS (for maternal outcome). More adverse outcomes were observed in this study than those in Kenya[7] and Turkey[8] because of lack of third trimester ultrasound to the placentation site.

The prevalences of adverse maternal and foetal outcomes were in line with a study done in Turkey, which reported an increased rate of adverse outcomes among women with multiple CS.[9]

The findings of increased adverse maternal and foetal outcomes concurred with several studies from Turkey,[8] Saudi Arabia[10] and China.[11] A study in Turkey showed an increase of adverse maternal outcomes with the number of CS.[9]

These risks escalate dramatically, particularly after the third procedure.[10] However, there is no significant trend in adverse foetal outcomes. Our findings were contrary to the study done in China, which reported that an increased number of multiple CS did not predict increased delivery complications.[11]

In this study, a significant number of mothers (28.4%) required blood transfusions due to PPH, which is in line with another study done in Iringa, which showed PPH at 26.4%.[12]

Adverse foetal and maternal outcomes are higher in mothers with multiple CS, even after adjusting for other risk factors.[13] A study done in the United Arab Emirates observed that multiple CS was associated with more maternal complications specifically increased dense adhesions.[14,15]

Foetal outcomes were significantly worsened by preterm delivery and low birth weight.[17,18] This study, with others, suggests that reducing complications from CS would reduce the prevalence of adverse maternal outcomes. Also, special care needs to be taken with preterm and low birth weight babies. Both individual and health system factors need to be considered to reduce delays in seeking care and uptake of third trimester ultrasounds.[19,20]

Predictors of adverse outcomes among women with multiple CS

In this study, lack of an ultrasound examination in the third trimester could have led to missed detection of critical complications such as placenta praevia, placental

Table 5. Univariable and multivariable logistic regression of potential predictors of adverse maternal outcomes

Variable	Maternal outcomes		Univariable regression		Multivariable regression	
	Good n (%)	Adverse n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Ultrasound check-up						
Yes	100(87.0)	15(13.0)	Ref			
No	47(47.0)	53(53.0)	7.52(3.85-14.69)	<0.001	4.66(1.66-13.14)	0.004
Complication in previous CS						
No	129(81.1)	30(18.9)	Ref			
Yes	18(32.1)	38(67.9)	9.1(4.6-18.1)	<0.001	9.1(4.1-19.9)	<0.001
Urgency of previous CS						
Elective	101(95.3)	5(4.7)	Ref			
Emergency	46(42.2)	63(57.8)	27.7(10.4-73.4)	<0.001	34.4(7.9-151.1)	<0.001
Delay						
No delay	72(82.8)	15(17.2)	Ref			
Delay to seek care	29(40.8)	42(59.2)	42.4(12.3-146.8)	<0.001	6.57(2.50-17.31)	<0.001
Delay in transport	14(60.9)	9(39.1)	14.2(3.4- 58.8)	<0.001	3.40(0.93-12.39)	0.064
Delay to receive care	32(94.1)	2(5.9)	2.96(0.63-13.99)	0.171	0.25(0.04-1.46)	0.124
Total	147(68.4)	68(31.6)				

Table 6. Univariable and multivariable logistic regression of potential predictors of adverse foetal outcomes

Variable	Foetal outcomes		Univariable regression		Multivariable regression	
	Good n (%)	Adverse n (%)	COR (95% CI)	p-value	AOR (95% CI)	p-value
Gestation age						
Term	158(81.8)	34(18.2)		Ref		
Preterm	10(35.7)	18(64.3)	7.24(2.99-17.51)	<0.001	3.63(1.26-10.48)	0.017
Ultrasound check						
Yes	105(91.3)	10(8.7)		Ref		
No	58(58.0)	42(42.0)	7.60(3.55-16.27)	<0.001	3.92(1.68-9.14)	0.002
Delay						
No delay	73(83.9)	14(16.1)		Ref		
Delay to seek care	41(57.7)	30(42.3)	6.95(3.35-14.43)	<0.001	4.84(2.04-11.48)	<0.001
Delay in transport	16(69.6)	7(30.4)	3.09(1.13-8.43)	0.028	2.85(0.89-9.10)	0.077
Delay to receive care	33(97.1)	1(2.9)	0.30(0.07-1.39)	0.124	0.33(0.06-1.68)	0.181`
Total	163(75.8)	52(24.2)				

abruption, and foetal growth restrictions, which are more common in women with multiple CS.[14,15,16]

Another predictor of adverse obstetric outcomes was complications in previous CS. The complexity during surgery not only increases the immediate risks during the CS but also leads to severe postoperative complications and prolonged recovery times.[16] Scarring of the uterus from complicated previous surgery can compromise its integrity, leading to complications like dehiscence, which may lead to preterm birth and low Apgar scores.[18]

Also, this study has found that women who underwent emergency CS had about 34 times greater odds of adverse outcomes compared to elective CS, findings similar to those in sub-Saharan Africa.[19,20,21]

When women with multiple CS experience delay seeking medical care, this leads to more complex emergencies. [22,23,24]

Conclusion

This study has found that the prevalence of adverse outcomes among women with multiple CS deliveries is high in our setting. Third trimester ultrasound is important in detecting risks of adverse obstetric outcomes.

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