Factors Associated with Women with Multiple Caesarean Deliveries Presenting in Labour and their Fetomaternal Outcomes in Mwanza Region, Tanzania.

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Abstract
Background: Emergency caesarean section (C-section) for women with two or more uterine scars is documented to be associated with poor fetomaternal outcomes. The World Health Organization recommends elective C-section for women with two or more previous scars. However, in Tanzania there is a paucity of data for women with two or more prior C-sections and how it contributes to increased maternal and perinatal morbidity and mortality when they come in active labour without a planned delivery. The purpose of the study was to determine factors associated with pregnant women with multiple C-section deliveries presenting in labour and their fetomaternal outcomes.
Methods: This was a cross-sectional, hospital-based study, involving 275 pregnant women who underwent C-section due to multiple uterine scars in the Mwanza region. Socio-demographic and clinical characteristics were collected serially until the sample size was reached using a structured questionnaire and patients' files. Data were analyzed using STATA version 13.0 software.
Results: All pregnant women with two or more previous uterine scars attended antenatal care (ANC) and the majority, 62.2%, had four or more visits. However, 61.9% were not told of the need for elective C-section. In addition, 26% were not counselled about the obstetric danger signs. Among the study participants, 66.6% presented with labour pain requiring emergency C-section, 13.1% had postpartum hemorrhage and 3.3% had ruptured uterus. There were 3.3% of peri-natal deaths and 10.9% required newborn resuscitation. The associated factors for women with two or more C-section scars presenting in active labour were: having the last ANC visit at primary healthcare (PHC) facility, unemployment, visiting ANC <4 visits or being attended by a non-physician health provider in her last ANC visit.
Conclusion: Parturient women with uterine scars, when attending primary health care facilities for their ANC visits, ought to be counselled and referred to high facilities with clinicians who can plan an elective c-section delivery.

Keywords: Uterine scars, repeat C-section

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Introduction
Caesarean section (C-section) is often performed when a vaginal delivery would put the fetus or mother at risk. Maternal morbidity and mortality have been associated proportionally with an increased number of previous uterine scars (*Silver, Landon et al. 2006*). By the year 2015, worldwide rates of C-sections were around 15.5%. In developed countries, middle-income countries and low-income countries rates of C-sections were 19.2%,16.9% and 5.2% respectively (*Ye, Zhang et al. 2016*). Studies have shown that countries with the highest rate of caesarean delivery have low maternal mortality compared with countries with the low rate of C-section (*Dubourg, De Brouwere et al. 2002, Blencowe, Cousens et al. 2012*).

The optimum rate of C-section with best fetomaternal outcomes was estimated to be 5% to 15% and those countries with high rate of C-section above 80% due to previous C-section scars. In a review of two countries, South Africa, Kenya and Tanzania, rates of C-section due to previous caesarean scar was 74%, 64% and 35% respectively (*Dumont 2001*). In South Africa, the rate of C-section in low socioeconomic status and people living in rural areas was 9.2% and 9.7% respectively compared to 19.9% and 32.8% for the people living in urban areas and high socioeconomic status respectively. In Tanzania, the caesarean deliveries rate is 0.44% and 1.7% for the low socio-economic status and people living in rural areas respectively while for high socioeconomic status and urban areas rate of C-section being 8.5% and 6.5% respectively (*Ronsmans, Holtz et al. 2006*).

Various outcomes of caesarean delivery in two or more previous C-section may be realized when you compare elective versus emergency C-section (*Islam, Ehsan et al. 2011*).In the multicenter study in California, U.S.A from January 1984 to 1985 and 1999 to 2002 respectively, there were higher chances of bladder injury, true uterine rupture, fetal death, prolonged hospital stay, low Apgar score and fetal death in emergency C-sections when compared to those who underwent elective C-section (*Flamm, Lim et al. 1988, Landon, Hauth et al. 2004*).

Same results were seen in southern California women hospital study where the incidence of uterine rupture in a patient with two and above previous C-sections was high, 2.3% and 2.8% respectively (*Al-Zirqi and Vangen 2010*). In a Cochrane review, the risk of infection was 30% and 7% in emergency and elective C-section respectively (*Olsen, Butler et al. 2010*).

Also other studies have shown that the risk of perinatal death and hysterectomy was high in women with two or more previous C-section scars attempting vaginal delivery (*Guise, McDonagh et al. 2004, Ozdemir and Yucel 2005*). In Sub Saharan Africa, a meta-analysis revealed the rate of uterine rupture in women with previous C-section scarwas2.1% (Boulvain and Wallast 1997) and in Tanzania was 22.4% (*Stein and Byengonzi 2008*). The risk for surgical site infection was 24% and the rate was higher in C-section done on emergency basis compared to elective (*Fehr, Hatz et al. 2006*). The study done at BMC between October 2012 and February 2013, showed that surgical site infection (SSI) was 11.8% for those who underwent emergency caesarean delivery compared to 0% for those who had elective C-section (*Mpogoro, Mshana et al. 2014*).

At Bugando Medical Centre (BMC) maternity wards, between 2016 and 2017, 224(65.7%) pregnant women with two or more uterine scars underwent elective C-section while 117(34.3%) underwent emergency C-section (*BMC 2017 Unpubl*). During the same period at SSRH, SDDH and NDH, an average of 82%,72% and 50% of pregnant women with two or more uterine scar underwent emergency C-section per month respectively. These women were supposed to be delivered by elective C-section in order to reduce morbidity and mortality commonly seen in low resource countries (*Zinberg 2001, ACOG 2010, Foureur and Homer 2010, Mpogoro, Mshana et al. 2014*).

Fetomaternal complications have been shown to be high in emergency C-sections among women with two or more C-sections compared to elective C-section deliveries (*Chazotte and Cohen 1990, Leung, Leung et al. 1993, Landon, Hauth et al. 2004, Silver, Landon et al. 2006, ACOG 2010, Guise, Eden et al. 2010*). Most of the guidelines, require women with two or more previous scars to undergo elective C-section delivery (*ACOG 2010, Bernstein and Rosenn 2012*).

However, unpublished data from Bugando Medical Centre, Sekou Toure Regional Referral Hospital, Nyamagana District Hospital and Sengerema Designated District Hospital show that the rate of emergency C-section due to two or more previous scars were 34.3%, 82%, 50% and 72% respectively. The proportion and the associated factors contributing to the emergency C-section among pregnant women with multiple C-section scars in Mwanza Region are poorly documented. Understanding of the associated factors will shed light to attending clinicians, midwives, and managers to devise appropriate strategies when providing care to pregnant women with two or more prior C-sections with the goal of reducing fetomaternal morbidity and mortality. Thus, the purpose of the study was to

determine factors associated with pregnant women with multiple c-section deliveries presenting in labour and their fetomaternal outcomes.

Methodology

Study Design
This was a cross sectional hospital-based study, from October 2017 to April 2018.

Study Area
The study was conducted in the maternity ward and post-natal ward of Sekou Toure Regional Referral Hospital (SRRH), Nyamagana District Hospital (NDH), Sengerema Designated District Hospital (SDDH) and Bugando Medical Centre (BMC).

Study population
All pregnant women with two or more previous C-sections admitted for delivery during the study period from 37 weeks were included in the study. The denominator was the pregnant women who had C-section due to two or more previous scars and numerator was those who came in active labour at time of admission.

Sampling Procedures
The study included 275 pregnant women with two or more previous C-section scars at the time of the study. Sample size was determined using formula for observational studies considering 95% confidence interval, 5% desired precision, and 19.3% estimated prevalence of pregnant women with two or more previous C-section in labour (*Wanyonyi, Sequeira et al. 2006*). Convenient sampling was used in this study.

Data collection
Direct structured pre-tested questionnaires were used to collect the participant's information and biodata. The questionnaires included socio-demographic characteristic (age, marital status, education level, occupation, economic status), obstetric information (number of deliveries from antenatal cards, number of previous caesarean scars, mode of delivery, month of pregnancy booked for initial antenatal care, the number of visits made and if she was informed of any risk or complication during antenatal care, if she was informed at what time to deliver and where, informed of danger signs of obstetric complication, number of vaginal examinations during labour, and history of previous caesarean (emergency or elective).

Data management
Data was double entered, verified, and cleaned using Microsoft Excel and analysis was done using STATA version 13. Continuous variables were summarized using median and interquartile range. Categorical data were described as frequencies and proportion (percent) and was compared using Pearson's Chi square test or Fisher's Exact test where appropriate. To determine factors associated with pregnant women with two or more prior C-section coming for delivery while in labour, a univariate logistic regression model followed by multivariate logistic regression model was used. Odds ratios with respective 95% confidence intervals were computed. In all analyses the significance level was set at a p-value of less than 0.05.

Ethics approval and consent to participate:
Ethical review and approval were obtained from a Joint CUHAS and BMC Research and Publication Committee with ethical clearance number CREC/269/2018. Permission was sought from officer in

charge of the corresponding hospitals. Written consent was obtained from the participants after explaining aims of the study. Strict confidentiality was maintained by the researchers. Protocols of the responsible hospitals were used to manage and/or treat those who required such treatments.

Results

Socio-demographic data of 275 pregnant women with two or more prior uterine scars
The distribution of socio-demographic data of pregnant women with two or more prior uterine scars is summarized below. Participants were enroll into the study from four selected hospitals. Their median age was 30 [IQR 25 – 33] years. Most of them, 124 (45.1%) were from Bugando Medical Centre followed by Sengerema Designated District Hospital, 82 (29.8%)The majority of them, 181 (65.8%) were from urban areas. About 183 (66.6%) women presented with labour pains and underwent emergency C-section whereas 92 (33.4%) presented with no labour pain delivered by elective C-section.

Table 1: Distribution of Socio-demographic data of pregnant women with two or more prior uterine scars.

Patient characteristics	Number (n)	Percent (%)
Health Facility		
Rugambwa Medical Centre	124	45.1
Sekou-Toure Regional Referral Hospital	32	11.6
Nyamagana District Hospital	37	13.5
Sangarama Designated District Hospital	82	29.8
Age group		
<35 years	226	82.2
≥35 years	49	17.8
Education level		
Never attended school	17	6.2
Primary school	158	57.5
Secondary school	85	30.9
Higher education	15	5.5
Marital status		
Married	256	93.1
Single mother	8	2.9
Divorced	7	2.5
Separated	2	0.7
Cohabiting	2	0.7
Occupation		
Peasant	77	28
House wife	36	13.1
Petty trader	91	33.1
Employed	58	20.4
Others	13	5.5
Residence		
Rural	94	34.2
Urban	181	65.8
Wealth index		
Poor	82	29.8
Middle	178	64.7
Rich	15	5.5

Health system factors for pregnant women with two or more previous uterine scars presenting in active labour

Antenatal care and the Clinical profile of patients are summarized in Table 2 below. Of the 275 study participants, 104(37.8%) attended their last ANC before delivery at the dispensary followed by 75(27.5%) who attended at health centres whereas 96(34.9%) attended their last visit at BMC, regional hospital, district hospital or a specialist clinic. Of note, all 275 (100.0%) pregnant women with two or more previous uterine scars attended ANC, 171 (62.2%) had four or more visits. Out of 275 pregnant women, 122 (44.4%) and 60 (21.8%) were seen at the last antenatal clinic visit by enrolled nurse and obstetrician specialist respectively and 18 (6.6%anymedicaledical attendant. Of the 275 women, 168 (61.1%) had two caesarean scars.

Table 2: Health system factors for pregnant women with two or more previous uterine scars presenting in labour

Patient characteristics	Number (n)	Percent (%)
Health facility attended for antenatal clinic visits		
Dispensary	104	37.8
Health Centre	75	27.3
District Hospital	35	12.7
Regional Hospital	8	2.9
Tertiary hospital	41	14.9
Specialist clinic	12	4.4
Birth order		
3	174	63.3
≥4	101	36.7
Number of previous C-section scars		
2	168	61.1
≥3	107	38.9
Number of antenatal care visits in this pregnancy		
≥ 4+ antenatal care visits	171	62.2
< 4 antenatal care visits	104	37.8
Health provider attending her during the last antenatal care visit		
Medical Attendant	18	6.6
Enrolled Nurse (EN)	122	44.4
Registered Nurse (RN)	54	19.6
Nursing Officer (NO)	4	1.5
Assistant Medical Officer (AMO)	2	0.7
Registered Doctor/Resident	15	5.5
Specialist	60	21.8
Planned for elective C-section		
Yes	96	34.9
No	179	65.1
Mode of cost-sharing she used during antenatal visits		
Non-insured	210	76.4
Insured	65	23.6
Cadre of who performed the operation		
Intern Doctors	23	8.4
Assisted Medical Doctors	32	11.6
Registered Doctor/Resident	177	64.4
Obstetrician Specialist	43	15.6

Associated factors for pregnant women with two or more prior caesarean scars presenting in labour and required emergency C-section.

Reasons that influenced pregnant women with two or more c-section scars to come in labour are summarized in Table 3 below. Of all pregnant women with two or more previous caesarean scars who came in labour and required an emergency C-section, the main reason was they were not informed in the last antenatal clinic visit where and when to deliver by planned C-section 61.9% (112/181) and were not counseled that it is not allowed to do trial of vaginal delivery with multiple caesarean scars 26% (47/181) respectively.

Table 3: Patient reasons for presenting while in labour among pregnant women with two or more previous section scars

Reasons	Number (n)	Percent (%)
Desire to experience vaginal delivery	16	8.8
Fear of her death by close friends during caesarean/surgery	2	1.1
Not informed /counseled in the last ANC visit where and when to deliver by C-section	112	61.9
Social pressure from the family after the previous C-section	3	1.7
Religious beliefs	1	0.6
Not counseled/informed of obstetric danger signs with two or more prior uterine scars at ANC visit	47	26.0

Perinatal outcome and maternal outcome

Perinatal and maternal outcomes are summarized in Table 4 below. Out of 275 pregnant women whose deliveries were by C-section, there were 9(3.3%) perinatal deaths, 30(10.9%) newborns required resuscitation and 236(85.8%) had no complications after birth (figure2). There were 228(82.8%) pregnant women who delivered with no maternal complications whereas 36(13.1%) had postpartum hemorrhage, 9(3.3%) ruptured uterus, and 2 (0.7%) bladder injuries. There were no maternal deaths (figure 3).

Table 4: Distribution of perinatal and maternal outcomes of 275 deliveries

Perinatal and Maternal Outcome	Number (n)	Percent (%)
Fetal outcome		
Baby required resuscitation	30	10.9
Death of newborn before seven days	9	3.3
No fetal complication after birth	236	85.8
Maternal complication		
Postpartum hemorrhage	36	13.1
Ruptured uterus/dehiscence	9	3.3
Bladder injury	2	0.7
Ureteric injury	0	0
No complication	228	82.9
Hospital stay after C-section more than three days due to maternal reason		
Yes	103	37.5
No	172	62.6
Condition of the mother at the time of discharge		
Alive	275	100
Dead	0	0

Associated factors for pregnant women with two or more prior C-sections presenting for delivery while in labour

Factors associated with pregnancy with two or more C-osection scars presenting in labour are summarized in Table 5 below. Univariate logistic regression was performed on associated factors in women with two or more previous C-section scars who presented in labour. Among the factors entered in univariate logistic regression: age group below 35 years, informal-primary education, attending last antenatal clinic visit in lower health facility, unemployed, residence in rural areas, low/middle incomes, facility level of the last ANC visit, less than 4 ANC visits, cadre of health provider attending her in the last visit and being uninsured were the attributes (p<0.05) for presenting in labour.

In multivariate logistic regression, four factors were associated with women with two or more previous caesarean scars presenting in labour. These factors were: attending last ANC visit in dispensary and/or health centre (OR 5.0[95% CI 1.0 – 24.5], p-value=0.046), unemployed (OR 13.2[95% CI 2.4 – 71.9], p-value <0.001), attending less than 4 ANC visits (OR 5.5[1.9 – 16.1], p-value=0.002) and being attended by a non-physician healthcare provider in her last ANC visit (OR 18.8[5.3 – 66.7], p-value <0.001).

Table 5: Logistic Regression analysis on associated factors for pregnant women with two or more caesarean scars presenting in labour

Factor	Presented in labour:		Univariate		Multivariate	
	Yes	No				
	n (%)	n (%)	OR [95% CI]	p-value	OR [95% CI]	p-value
Age group						
≥35 years	24 (49.0)	25 (51.0)	1.0			
<35 years	159 (70.3)	67 (29.7)	2.5[1.3 – 4.6]	0.005	0.8[0.3 – 2.6]	0.772
No. of previous C-section scars						
2	109 (64.9)	59(35.1)	1.0			
≥3	74 (69.2)	33(30.8)	1.2[0.7 – 2.0]	0.464	-	-
Education						
Secondary Education-college	4 (42)	58 (58.0)	1.0			
Informal-primary Education	141(80.6)	34(19.4)	5.7[3.3 – 9.8]	<0.001	0.6[0.2 – 1.9]	0.350
Marital status						
Married	165 (64.4)	91(35.6)	1.0			
Not married	18(94.7)	1(5.3)	9.9 [1.3 – 75.6]	0.027	-	-
Occupation						
Employed	14 (25.0)	42(75.0)	1.0			
Petty trader	72(67.9)	34(32.1)	6.4 [3.1 – 13.2]	<0.001	1.8[0.6 – 5.4]	0.326
Peasant	66(85.7)	11(14.3)	18 [7.5-43.4]	<0.001	1.2[0.2 – 5.7]	0.840
Unemployed	31(86.1)	5(13.9)	18.6 [6.1 – 57.1]	<0.001	13.2[2.4 – 71.9]	<0.001
Residence						
Urban	108(59.7)	73(40.3)	1.0			
Rural	75(79.8)	19(20.2)	2.6 [1.5 – 4.8]	0.001	2.3[0.7 – 7.7]	0.189
Wealth index						
High	4(26.7)	11(73.3)	1.0			
Low	179(68.9)	81(31.1)	6.1[1.9 – 19.7]	0.003	-	-
ANC Health facility						
Specialized clinic[1]	5(9.4)	48(90.6)	1.0			
Non-specialized clinic[2]	19(44.2)	24(55.8)	7.6[2.5 – 22.8]	<0.001	0.9[0.2 – 4.3]	0.854

Lower[3]	159(88.8)	20(11.2)	76.3[27.2–214.2]	<0.001	5.0[1.0 – 24.5]	0.046	
Antenatal care visit							
≥4+	86(50.3)	85(49.7)	1.0				
<4	97(93.3)	7(6.7)	13.7 [6.0 – 31.2]	<0.001	5.5[1.9 – 16.1]	0.002	
Healthcare provider attending her during the last ANC visit							
Physician[4]	8(4.4)	69(75.0)	1.0				
Non physician[5]	175(95.6)	23(25.0)	65.6 [28 – 153.8]	<0.001	18.8[5.3 – 66.7]	<0.001	
Parity							
3	114 (65.5)	60 (34.5)	1.0				
≥4	69 (68.3)	32(31.7)	1.1[0.7-1.9]	0.635	-	-	
Mode of payment							
Insured	18(27.7)	47(72.3)	1.0				
Uninsured	165(78.6)	45(21.4)	0.1[0.1 – 0.2]	<0.001	-	-	

1.Specialized clinic (Tertiary Hospital+ specialist clinic) 2. Non-specialized clinic (Regional+ District Hospital) 3. Lower (Dispensary +Health Centre). 4. (Assistant Medical Officer, Registered Doctor/Resident, Obstetrician Specialist) 5. (Enrolled Nurse, Registered Nurse, Nursing Officer+ Medical Attendant).

Maternal and perinatal outcomes of pregnant women with two or more prior C-sections
Fetomaternal outcomes in pregnant women with two or more previous caesarean scars are summarized in Table 6 below. Emergency caesarean in pregnant women with two or more previous scars was associated with poor fetal and maternal outcomes as well as along hospital stay compared to those who underwent elective C-section (p<0.001).

Table 6: Maternal and perinatal outcomes of pregnant women with two or more prior C-sections

Outcome	Pregnant women came for delivery		Total	p-value
	In labour n (%)	Not in labour n (%)		
Fetal outcome				
No fetal complication within seven days	144 (78.7)	92 (100.0)	236	
Baby require resuscitation	30 (10.9)	0 (0.0)	30	<0.001
Low score	18 (6.6)	0 (0.0)	18	
Death of newborn within seven days	9 (3.3)	0 (0.0)	9	
Maternal outcome				
No complication arises during delivery	140 (76.5)	88 (95.6)	228	
Postpartum hemorrhage	32 (17.4)	4 (4.4)	36	<0.001
Ruptured uterus	9 (3.3)	0 (0.0)	9	
Bladder injury	2 (1.1)	0 (0.0)	2	
Hospital stay				
>3 days	96 (52.5)	7 (7.6)	103	<0.001
=< 3days	87(47.5)	85(92.4)	172	

Discussion
It is documented that emergency C-section for women with two or more previous caesarean scars is associated with poor fetomaternal outcomes (*Islam, Ehsan et al. 2011, Ye, Zhang et al. 2016*). The World

Health organization (WHO) recommends elective caesarean delivery for women with two or more previous caesarean scars (*WHO 2015*). The proportion of pregnant women with multiple uterine scars who presented in labour in this study was 66.6% (BMC 26.2%,SDDH 24.4%,SRRH 8.4% &NDH 7.6%).The high proportion at BMC and SDDH seen in this study, is slightly less than that of Muhimbili National Hospital (MNH) which was 30.2% (*Mdegela, Muganyizi et al. 2012*). A slightly higher proportion in MNH could be attributed the differences in settings and social economic status where most of the patients at MNH were possibly employed and health insured. These differences could have improved accessibility of elective C-section services. Also, the Muhimbili study involved a mix of pregnant women with previous caesarean scars i.e., one previous C-section and two or more previous C-section scars altogether different to our study population which involved only pregnant women with two or more prior C-section scars. On the other hand, the difference in proportion between Muhimbili National Hospital and the present study may be contributed to the type of study; MNH study was retrospective which could most likely miss several information related to its participants while the current study was prospective.

In this study only one third of pregnant women with two or more uterine scars underwent elective caesarean delivery compared to the optimum rate of 80% for the best fetomaternal outcomes as estimated by the WHO in Sub-Saharan Countries *(Dumont 2001, WHO 2015)*. However, those who underwent elective C-section with two or more prior caesareans, were higher in the Mwanza Region, Tanzania compared to the study done in Aga Khan University Hospital, in Kenya in which the proportion was only 19.3% *(Wanyonyi, Sequeira et al. 2006)*. The difference in proportion in the current study could partly be explained by our study design which was prospective and enrolled participants with only two or more prior C-sections and took place in facilities owned by faith-based organizations hospitals and the government which have a lower cost compared to private hospitals. This means that higher number of pregnant women could have access to elective C-section in faith-based and government hospitals compared to private health facilities*(Binyaruka and Mori 2021)*.

We found that attending ANC visits in the lower healthy facilities (Dispensary and Health centre), being attended by a non-physician healthcare provider in her last ANC visit, unemployed pregnant women and attending ANC less than four visits were the factors mainly associated with pregnant women with two or more C-sections presenting for delivery while in labour. Unemployed pregnant women were more likely to be uninsured and lack social and protection support, therefore more likely to seek health services in lower health facilities and hence be attended by less skilled healthcare providers*(Binyaruka and Mori 2021)*.

On the other hand, employed women who live in urban areas and attend ANC mostly in highly specialized clinics (Tertiary, Regional and District Hospitals), being attended by physician healthcare providers, were more likely to have planned elective caesarean delivery because they can afford the cost and majority were insured. This finding is similar to other studies done in Burkina Faso, Uganda, Tanzania, Nigeria, Ghana, Kenya, Malawi, Turkey, North India, Mali and Ethiopia *(Adamu and Salihu 2002, Mekonnen and Mekonnen 2003, Overbosch 2004, Ciceklioglu, Soyer et al. 2005, Gage 2007, Conrad, Schmid et al. 2012, Pell, Meñaca et al. 2013)*.

In this study, having attended ANC visits less than four times was also significantly associated with pregnant women with two or more prior C-section scars presenting in labour. This could be attributed to the delay in starting ANC visits early in first trimester, however despite attending ANC, they may not have been informed of the importance of attending ANC regularly and based on her number of uterine scars they were again not informed and counselled where, when and mode of delivery. This finding was consistent with several other studies done in Kenya, Ghana, Malawi, Uganda and Muhimbili National Hospital, Tanzania (*Magadi, Madise et al. 2000, Overbosch 2004, Urassa and Pembe 2012, Kisuule, Kaye et al. 2013, Pell, Meñaca et al. 2013)* in which participants were mostly pregnant women with socioeconomic status.

Furthermore, being attended by a non-physician health care provider at the last ANC visit before delivery and attending antenatal care visits in primary health care facilities were the positive predictors of presenting in labour. Pregnant women attended by non-physician healthcare providers were mostly to attend ANC in dispensaries and health centres, and were attended by non-physician healthcare providers at their last ANC visit before delivery. Women attended by non-physician healthcare providers and those attending primary health care facilities were significantly more likely to present in labour compared to those attended by a physician, who were mostly found in tertiary hospitals. This could be explained by the fact that pregnant women attended by physicians had a higher likelihood of being planned for elective C-section delivery and being informed or counselled for obstetric danger signs specifically related to number of uterine scars compared to those attended by non-physicians found mostly in the primary health care facilities. All of these associated factors seen in our study are similar to those seen in studies done in rural areas of Uganda and Tanzania (*Kyomuhendo 2003, Sahn, Younger et al. 2003, Mpembeni, Killewo et al. 2007*).

There is a need for regular in-service training for non-physician health care providers attending pregnant women with two or more prior C-section to know the importance of identifying obstetric danger signs. A study done in the Coastal Region of Tanzania had shown that non-physician healthcare providers, if given proper training on counselling about obstetric danger signs related to multiple uterine scars, could influence pregnant women to deliver at a suitable healthcare facility, at an appropriate gestational age before the onset of labour (*Pembe, Urassa et al. 2009*).

In this study, C-section refusal rate was low compared to the study done in Nigeria (*Chigbu and Iloabachie 2007*) where there were two fifths of refusal rate. The main reason for low refusal rate in our study was largely attributed by over two thirds of pregnant women attending more than four ANC visits compared to Nigeria in which antenatal utilization was low. Attendance to ANC has been shown to enhance understanding of obstetric danger signs in increased number of pregnant women and improve on birth preparedness (*Pembe, Urassa et al. 2009*).

No maternal death occurred in our study however, postpartum haemorrhage, ruptured uterus and bladder injuries were common in pregnant women with two or more prior C-sections presenting in labour. These findings were comparable to other studies done in a Cochrane review and Bugando Medical Centres, Tanzania (*Guise, McDonagh et al. 2004, Mpogoro, Mshana et al. 2014*). The absence of maternal mortality could have been attributed to improved early detection by skilled healthcare providers in the select tertiary health facilities and easy availability of blood products in cases needing such services.

Furthermore, one third of new-borns required resuscitation in this study and 3.3% of perinatal deaths occurred in this study. Perinatal deaths due to ruptured uterus were slightly lower compared to studies done in Netherlands and France which reported a prevalence of 8.7% and 13.6% respectively (*Zwart, Richters et al. 2009, Guiliano, Closset et al. 2014*). The lower perinatal deaths in our study were because our study involved only scarred uterus while the previous studies involved both scarred and an unscarred ruptured uterus. The unscarred uterine rupture has been associated with poor foetal prognosis compared to scarred uterus (*Zwart, Richters et al. 2009*).

The adverse fetomaternal outcomes observed in this study were consistent to studies done in Kigoma, BMC and Muhimbili National Hospital-Tanzania, USA, Nigeria and Kenya (*Chauhan, Martin et al. 2003, Wanyonyi, Sequeira et al. 2006, Chigbu and Iloabachie 2007, Pembe and Othman 2010, Bernstein and Rosenn 2012, KiThe needneedo, Mwampagatwa et al. 2012, Mpogoro, Mshana et al. 2014, Pembe, Paulo et al. 2014*). Need for elective c-section delivery for pregnant women with two or more uterine scars should be emphasized to health providers during ANC risk identification to minimize complications and improve on fetomaternal outcomes (*Islam, Ehsan et al. 2011*).

The limitation of this study is worth mentioning. Recall bias is affecting the results since participants had to remember to be counselled for obstetric danger signs and need for elective c-

section delivery. Lack of field intertemporal observations due to absence of researchers during the participant's ANC visits, one may not confirm the denial by pregnant women of having received health education and counselling at the health facility.

Conclusion
Proper counselling is required during ANC visits on the need for, where and when to deliver by C-section. All clinics and dispensaries providing antenatal care should refer pregnant women with uterine scars to tertiary hospitals for elective caesarean deliveries. Risk identification and decision to refer should be emphasized among health care workers in antenatal clinics.

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