COMPLICATIONS AFTER CAESAREAN SECTION IN RWANDA

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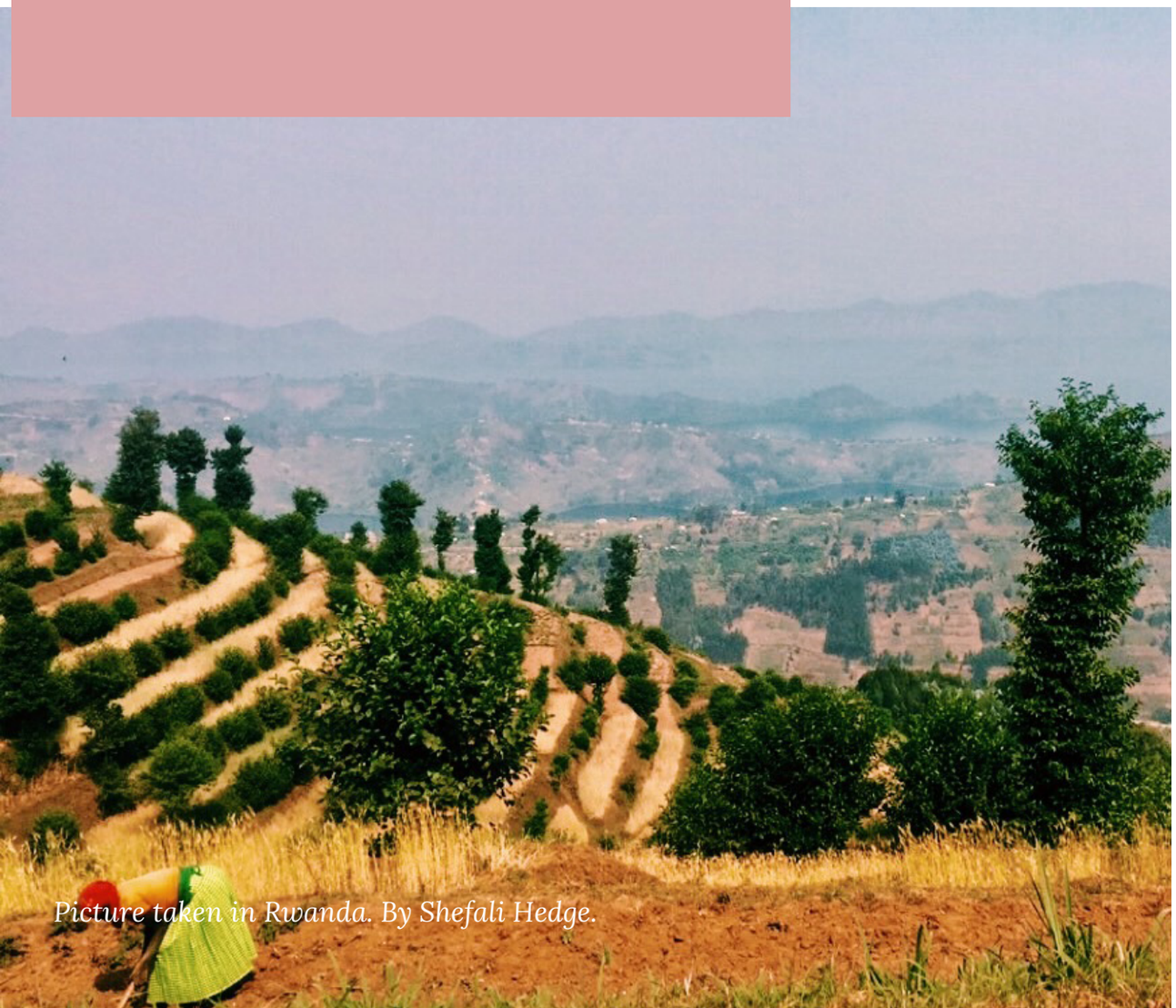

Picture taken in Rwanda. By Shefali Hedge.

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ABSTRACT

Background Women in sub-Saharan Africa face a disproportionate risk of severe injury or death in childbirth compared to Western countries. In 2016, Rwanda's maternal mortality rate (MMR) stood at 320 deaths per 100,000 live births. Government investment in education and health infrastructure has allowed for an astonishing decreasing trend in maternal death. However, high rates of Cesarean section (CS) place undue stress on the health system, expose patients to unnecessary surgical risks, and predispose women to subsequent delivery complications. **Methods** In an attempt to better understand the modifying effect of CS on immediate health outcomes, anesthesiologists at the Centre Hospitalier de Kigali (CHUK) designed a comprehensive project to measure CS complications. We analyzed a sample of 340 patient charts who were admitted in CHUK to identify the age, referral hospital, reason for cesarean section and other demographic factors relating to morbidity and mortality of mothers and infants. **Outcomes** We found peritonitis and sepsis to be the most common complications in mothers post-CS. We found no significant relationship between geographic distance from the hospital and mortality and between type of delivery and mortality. **Discussion** Inclusion criteria for our study excluded those who did not survive the travel from the district hospital and CHUK, which limited our results. Future research groups should collect data from a larger population set and explore the feasibility of data collection directly from the district hospitals. We obtained comprehensive information on CS rates from the main referral hospitals, which can be used to develop protocols to limit unnecessary CS, as well as to address the surprisingly high rates of peritonitis and sepsis.

KEYWORDS

Rwanda, Cesarean Section, Women's Health, Reproductive Health, Maternal Mortality

INTRODUCTION

There is a dearth of epidemiologic data available on the rates and indications for cesarean section (CS) in sub-Saharan Africa. The World Health Organization (WHO) recommends CS rates of 10-15% as optimal. In Rwanda, the CS rate has increased as the health system has expanded, and was estimated to be as high as 45% in 2011.[1] An executive summary on the topic concludes, "Every effort should be made to provide caesarean section to women in need, rather than striving to achieve a specific rate."

"[The risk from C-sections] is compounded in women with no access to continual and comprehensive obstetric care, which includes much of Rwanda's rural population."

Prior studies demonstrate that CS has little to no benefit for patients in which the procedure is not medically justified.[2] When not required, CS can contribute to increased mortality and morbidity that can continue for years after the procedure and affect the woman's future pregnancies. This risk is compounded in women with no access to continual and comprehensive obstetric care, which includes much of Rwanda's rural population.[3,4]

The majority of C-sections are performed in the country's 48 district hospitals. Women with severe obstetric complications are transferred to one of the four national tertiary-level hospitals for further management. The approximate time it takes to transport varies. The closest hospital, in Murambi, is within one hour. The farthest hospital, Cyangugu, is five and a half hours away.

Global health initiatives in sub-saharan Africa emphasize improving access to surgery and emergency care as a means to reduce obstetric complications.[5] However, no protocols exist in Rwanda to control or monitor the rates of CS use in the country's district hospitals.[6]

In the past decade, Rwanda's maternal mortality ratio (MMR) has decreased significantly to 320 deaths per 100,000 live births.[7] An effort to understand the complications and risks associated with Caesarean section is important to further reduce the MMR in low-income countries.

Our study has three primary aims:
1. Investigate the relative rates of complications and maternal and child mortality after Caesarean section.
2. Understand the risk factors predisposing women to death: age, rural/urban living, distance from referral hospital.
3. Understand the indications for CS. Compare relative rates in urban vs. rural district hospitals (DH).

METHODS

This retrospective study was a facility-based chart review of 340 cases of severe maternal morbidity and mortality that took place in the years 2016-2017 at Centre Hospitalier de Kigali (CHUK),

Figure 1. Location of Kigali, Rwanda (Source: British Journal of Surgery, 2012. Used with permission).

Rwanda. CHUK is the largest public hospital in Rwanda, located in the capital city of Kigali. It serves as a tertiary care referral center for providing advanced and specialized care.

Women admitted to the CHUK obstetrics service with severe morbidity following CS or vaginal delivery were included. Patients were identified through review of the surgical ward admissions log and through provider identification of eligible patients.Demographic characteristics and factors related to morbidity (near-miss) and mortality of mothers and infants were assessed using paper-based standardized health records stored at CHUK.

OUTCOMES

After collecting 340 charts of severe maternal morbidity and mortality cases in the years 2016-2017, the cases were categorized as either cesarean section deliveries (n=271) or as vaginal deliveries (n=69). Analysis of each group was performed separately to identify delivery-specific risks.

To further analyze the CS deliveries, the study identified the primary indicators for CS as noted in the patient's chart (Figure 2). To fully analyze the deaths and near misses of mothers and infants, the primary causes of mortality and morbidity were recorded based on the presence of a death certificate and notes in the patient's chart (Table 2).

The researchers identified three risk factors to analyze for near-miss or fatal outcomes (Table 3): maternal age, the location of delivery and the type of delivery based on current knowledge of the risk factors for adverse maternal outcomes.[5] The age and type of delivery was taken from the patient's chart. The location of delivery was assumed to be the hospital from which the patient was transferred from, as noted in the hospital admission sheet. A tally of each outcome, categorized by the risk factors, is listed in Table 3.

Characteristic	Vaginal delivery (n=69)	Cesarean section (n=271)
Mean age (years)	28.85	29.11
Duration of hospital stay (days)	6.91	16.5
Delivery at home	9 (13.04%)	--
Referred from rural district	49 (71.01%)	194 (71.59%)
Referred from city of Kigali	20 (28.99%)	77 (28.41%)
Insured	61 (88.40%)	243 (89.67%)

Table 1. Demographic characteristics of the study population.

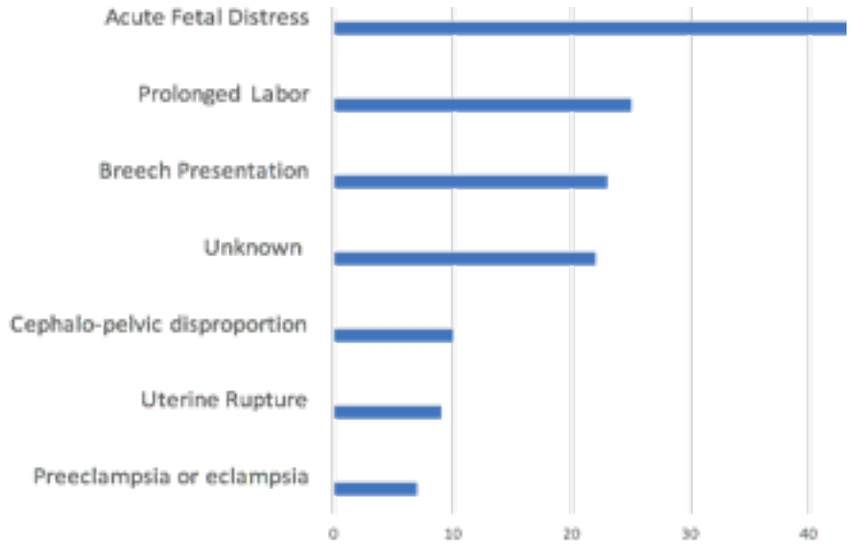

Figure 2. Count of primary indicators for cesarean section, per chart review.

DISCUSSION

This preliminary study aimed to report the major causes of maternal mortality and morbidity in Rwanda's largest referral hospital. Prior studies identify the most common post-delivery complication as postpartum hemorrhage (PPH). In contrast, our study found that the most common post-CS complication for the CHUK population was peritonitis (58.7%). This finding is consistent with recent studies of the entire CHUK obstetric population.[8,9] By contrast, the seven top causes (each contributing to 10-13% of deaths) for severe maternal outcome in the United States are hemorrhage, thrombotic pulmonary embolism, infection, hypertensive disorders of pregnancy, cardiomyopathy, cardiovascular conditions, and non-cardiovascular medical conditions.[13]

Picture taken in Rwanda by Shefali Hegde.

Condition	Prevalence (%) n=271	Maternal deaths (%) n=41	Adverse maternal cases with infant deaths (%) n=41
Peritonitis	162 (58.7)	25 (51.0)	28 (68.2)
Sepsis	18 (6.6)	9 (18.4)	1 (2.4)
Septic shock	12 (4.4)	14 (28.6)	2 (4.9)
Hemorrhage	76 (28.0)	17 (34.7)	11 (26.8)
Hemorrhagic shock	26 (9.6)	17 (34.7)	11 (26.8)
Cardiac arrest	8 (3.0)	8 (16.3)	1 (2.4)
Eclampsia	12 (4.4)	7 (14.3)	1 (2.4)
Disseminated intravascular coagulation	9 (3.3)	5 (10.2)	1 (2.4)

Table 2. Primary causes of severe maternal outcome and mortality post-cesarean section.

Characteristics	Near-miss (%) n=278	Maternal death (%) n=62
Mean age	29.34	27.92
Referred		
Kigali district hospital	81 (29.14)	16 (25.81)
Rual district hospital	197 (70.86)	46 (74.19)
Type of delivery		
Cesarean section	222 (79.9)	49 (79.0)
Vaginal delivery	56 (20.1)	13 (21.0)

Table 3. Factors related to near-miss or death outcome.

Risk factor	Fisher's extract test odds ratio (95% CI)	p-value
Mortality of rural vs. city district hospital referral	1.26 (0.658, 2.53)	0.541
Mortality of Cesarean section vs. vaginal delivery	0.813 (0.396, 1.763)	0.586

Table 4. Fisher's test for mortality by delivery characteristics.

Peritonitis is associated with 51% of maternal deaths in 2016-2017. This is a highly concerning finding that is consistent with previous studies done at CHUK on a population of women who primarily had vaginal births.[14] Prior research on this population identified the need to look specifically at women who have had CS, as their observed mortality rate was higher among this population.

The level of infection-related deaths further underscores the need to implement rigorous aseptic procedures in the wards where surgeries are taking place. It also shows the growing concern for antibiotic-resistant organisms in Rwanda. A recent study showed the increasingly high prevalence of hospital-associated bacteria that are resistant to third-generation cephalosporins, which remain the most commonly used antibiotics in Rwanda.[15] Increased access to aseptic materials and training programs on sterile techniques for all health personnel, especially within the district hospitals, is vital to achieving lower rates of peritonitis. Resources are limited in this setting, but select use of bacterial cultures and antibiotic sensitivity screening for high-risk patients could save many lives.

The most likely complication to progress to maternal death is PPH, which resulted in 17 of 76 deaths. The number of total PPH cases in our population was lower than expected. This could be explained by the exclusion from our study those patients who died of complications before they could be transferred to CHUK. Patients with rapidly progressive complications such as PPH are more likely to be excluded from the study population. Many of these deaths occur due to missed or delayed diagnosis, lack of uterotonic agents in the district hospitals, or a lack of trained personnel to manage PPH.[10] Because women who had non-elective CS deliveries are at higher risk of PPH, such cases should be closely monitored for potential PPH and prior preparation can be made to quickly employ the necessary resources in case of emergency.[11,12]

When comparing the mortality rate among CS and vaginal delivery groups, we found no statistically significant difference (p=0.541). We also concluded there is no statistically significant relationship between mortality and the place of referral. Similarly, the p-value for the Fisher's exact test for type of delivery and mortality does not suggest a statistically significant relationship between type of delivery and mortality (p=0.586).

The statistically insignificant relationship between district hospital location and mortality may be similarly affected by the inclusion criteria, which excluded those who did not survive to be admitted into the referral hospital, limiting our results. Those criteria could have screened out the most urgent cases. The statistically insignificant relationship between vaginal delivery and cesarean delivery could also be due to the inclusion criteria, as the only vaginal deliveries counted were those that ended in a complication. However, the sample size was too small to continue to do analysis.

Future research groups should collect data from a larger population set and explore the feasibility of data collection directly from the district hospitals. We obtained comprehensive information on CS rates from the main referral hospitals, which can be used to develop protocols to limit unnecessary CS, as well as

to address the surprisingly high rates of peritonitis and sepsis.

CONCLUSION

The study found an 18% mortality rate in women who experienced post-CS complications. Peritonitis was the leading cause of post-CS morbidity in Rwanda. Hemorrhage was the most fatal complication. The study did not find a significant difference in mortality between those referred from rural hospitals and urban hospitals. Our results highlight the importance of creating protocols to (a) reduce the number of C-Sections performed, particularly in rural areas; and (b) work to create protocols to reduce incidence of hemorrhage and sepsis.

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