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Research Article

Factors Associated with Caesarean Section Among Women Delivered at Kirehe District Hospital

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Abstract

The aim of this study is determine the prevalence and factors associated with caesarean section among women delivered at Kirehe District Hospital. A retrospective study was conducted among women delivered at Kirehe District Hospital from January 2018 to December 2019. The medical files of all women delivered at the hospital who meet the inclusion criteria were reviewed. Data were checked for completeness, cleaned, coded and entered into Excel sheet, and then exported to SPSS version 22.0 for further analysis. Descriptive statistics was used to estimate the prevalence and description of study participants. Multivariable logistic regression models were used to estimate risk for CS with 95% confidence intervals (CIs). The study was conducted in accordance with the research protocol Mount Kenya University Rwanda research ethical committee. The majority 806 (69.9%) of women who delivered at Kirehe district hospital from January 2018 to December 2019 were aged 22-35 years old. The prevalence of C-section at Kirehe District Hospital was 23.1%. Demographic and economic factors associated with Caesaren section in bivariate and multivariate analysis was respondent's type of health insurance where women who used private health insurance were 3 times more likely to deliver by C-section. The findings from multivariate analysis revealed that women who experienced eclampisa had 45% risk of C-Setion compared to those without Eclampsia. Women in rural area of Rwanda seem to have increased access to and use of CS. However, the significant increase in the rate of CS is of concern due to the potential of unnecessary CS.

Keywords:
Cesarean section; Delivery mode; Kirehe District Hospital; Prevalence; Eclampsia

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Introduction

Caesarean Section (CS) is a medical procedure which involves delivery of a baby through an incision made in the mother's abdomen and uterus [1]. The frequency of CS has been steadily increasing globally in the past several decades where one in five women give birth by CS [2]. The reasons that have been reported to contribute to CS increase include rise of pregnancy complications, emergence of pregnancies with multiple gestations, gestational obesity, twin pregnancy, previous CS, failure of progress in labor, breech presentation, increase in rate of labor induction and maternal request [3].

Globally, cesarean section (CS) rates increased from 12 % in 2000 to 15.5 % in 2012 [4]. In developed countries birth by CS has been doubled in the last 20 years, for example in United Kingdom (UK) CS rate was 23% in 2007, which was almost twice compared to 1990s estimate [5]. In the united state (USA), the CS rate reached a level of 32% in 2007 [6]. In China, the nationwide CS rate increased from 3.4% in 1988 to 39% in 2008, with a higher rate in urban areas [7]. Current studies revealed that CS rate is ranged from 50 to 60% in most parts of China [8], [9], [10].

The lowest rates of CS were observed in Africa with 7.3% and more specifically in Western Africa with only 3%. From 1990 to 2014, CS rates decreased in two countries: Guinea, from 3.3% to 2.4%; and Nigeria, from 2.9% to 2%. The highest rates of CS were reported in Latin American and the Caribbean (40.5%) and South America is the sub-region with the highest average CS rates in the world (42.9%) [11]. Results from a meta-analysis ranked the countries with the highest CS rates in each region. In Latin America and Caribbean, Brazil (55.6%) and Dominican Republic (56.4%) were on the top. In Africa, a Country with highest CS rates was Egypt (51.8%). Iran and Turkey in Asia (47.9% and 47.5%, respectively), Italy (38.1%) in Europe, United States (32.8%) in Northern America, and New Zealand (33.4%) in Oceania were the Countries with highest CS rates in their regions [11].

Since 1985, the international healthcare community has considered the ideal rate for CS to be between 10% and 15% [12]. Since then, cesarean sections have become increasingly common in both developed and developing countries [13]. Medically justified cesarean section can effectively prevent maternal and perinatal mortality and morbidity. Thus far, there is no evidence showing the tangible benefits of maternal request CS for women or infants [14]. In many settings, women are increasingly undergoing cesarean sections without any medical indication which may contribute to the global increase of cesarean sections [15], [16].

The results from Rwanda demographic health survey showed that 12% of women aged 15-49 years delivered their most recent birth by C-section (RDHS, 2015). Kigali city had the highest C-section delivery rates in both surveys (22% in 2014-15). The Eastern province region is composed by seven district hospitals whose average rate of CS was 23 % in the same period of five years. Despite this rate, Kirehe district is showing an increase CS in the past five years ranging from 24-35 %. The overuse of cesareans is substantially rising in Rwanda both in rural and urban areas and is now considered as a public health problem. This study aims to determine the current prevalence of CS in Kirehe and its associated factors.

To date, the real reasons for the increase CS rate remains unclear, only a few studies have reported the actual medical indications for the rise CS rate, especially in Rwanda. There is need to determine

the factors associated with this increase of C-section among the women delivered at Kirehe District Hospital located in rural area.

Methods

Research Design

A retrospective study was conducted to identify factors associated with caesarean section among mother delivered at Kirehe District Hospital. This is a retrospective study which use quantitative research approach though database of mHealth of Kirehe Hospital. It used data collected for the period of two years (2018-2019).

Kirehe is a district in Eastern Province, Rwanda. Its capital is Kirehe town (which is usually known as Rusumo, being the major settlement of the former Rusumo district. It has a district hospital that serves the whole district and some neighbouring sectors. Data was collected among the mother's delivered at Kirehe Hospital from January 2018 to December 2019.

Target Population

The study population were the women who delivered at Kirehe District Hospital in the period of two years which are 2018 and 2019. A total of 6024 deliveries performed at Kirehe DH annually.

Sampling Technique

A retrospective cohort study is designed using maternally-linked data from mhealth/HMIS-medical birth registry. The study targets all deliveries that took place at Kirehe Hospital during 2018 to 2019. Subjects with missing information on delivery mode were excluded since this attribute is serving as the main study outcome of interest.

Data Collection Instruments

The data for this study were obtained from mhealth and Health Management Information System (HMIS) of Kirehe District Hospital. The checklist that contain the variables by which help the researcher to achieve specific objectives were used to retrieve data from hospital dataset. Data on socio-demographic characteristics of women such as age, marital status, religion, level of education and occupation; mother's health history such as parity, age of gestation, height, weight, past health problems; indications registered as linked to c-section such as acute foetal distress, contracted pelvis, engagement failure, delivery on maternal request, cephalo-pelvic disproportion, previous c-section, malpresentation, breech presentation, macrosomia were obtained from mhealth/HMIS.

Data Analysis

Data were checked for completeness, cleaned, coded and entered into Excel sheet, and then exported to SPSS version 22.0 for further analysis. Mean and standard deviation (SD) was used to describe continuous variables. Comparison of proportions was performed by Pearson chi-square ($\chi 2$) for categorical variables to determine associations between selected covariates and delivery mode.

Multivariable log-binomial regression models was used to estimate Risk for CS with 95% confidence intervals (CIs). A p-value of less than 5% (2-tailed) was considered statistically significant for univariate and multivariable analyses of risk factors for CS delivery.

Ethical Consideration

The study was implemented in accordance with the research protocol approved by both the MKUR research ethical committee and Kirehe District hospital medical research ethical Permissions from them was also obtained.

Results

The overall objective of this study was to determine the prevalence and factors associated with caesarean deliveries among women delivered at Kirehe District Hospital. Records of 1158 women delivered at Kirehe Hospital from January 2018 to December 2019 were retrieved.

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Characteristics of Respondents

Table 1 presented the socio-demographic and economic characteristics of respondents of 1158 women delivered at Kirehe District Hospital.

Table 1. Socio-demographic and economic characteristics of respondents

Variables	Frequency	Percentage
Age group (years)		
Less than 18	31	2.7
18-21	168	14.5
22-35	806	69.6
>35	153	13.2
Marital Status		
Single	112	9.7
Living with a partner	537	46.3
Married	509	44.0
Education Level		
No formal education	112	9.7
Primary Education	766	66.1
Secondary education	280	24.2
Occupation		
Employed	40	3.5
Farmer	910	78.6
Housewife	115	9.9
Self employed	80	6.9
Students	13	1.1
Type of insurance		
Community based insurance	981	84.7
Private insurance	75	6.5
UNHCR	102	8.8
Household income (Rwf)		
0-10,000	699	60.4
10,000-20,000	188	16.2
20,000-30,000	156	13.5
30,000-40,000	29	2.5

Table 1 (continued)

Variables	Frequency	Percentage
>40,000	86	7.4
Maternal weight before pregnancy (Kg)		
<50	51	4.4
50-70	823	71.1
70-90	276	23.8
>90	8	0.7

The majority 806 (69.9%) of women who delivered at Kirehe district hospital from January 2018 to December 2019 were aged 22-35 years old, only 31 (2.7%) were aged less than 18 years. A total of 509 (44.0%) women were married while 537 (46.3%) were living with partners but without legally married. The majority of study respondents 766(66.1%) had primary education, 910(78.6%) were farmers, 981(84.7%) were using community based insurance, 699(60.4%) women are from a household with monthly income of less than ten thousands. The weight of women before pregnancy was recorded; the results show that 823(71.1%) women had weight of between 50-70 kg prior to conception; very few had weight of more than 90 kg.

The results presented in table 2 shows that anaemia (8.6%) and HIV (0.1%) were not common among the women delivered at Kirehe District Hospital from 2018 to 2019. A big number of women who delivered at Kirehe District Hospital experienced eclampsia 405(35.0%) and had multiple gestations 413(35.7%). A total of 127(11.0%) had previous CS, 199(17.2%) had uterine rupture, 31(2.7%) experienced prolonged labor while 11(0.9%) experienced fetal distress.

Prevalence of C-Section Among Women Delivered at Kirehe District Hospital

The prevalence of Caesarean section among women delivered at Kirehe District Hospital from January 2018 to December 2019 was estimated. (Figure 1)

The finding from this study revealed that 268 women out of 1158 women delivered at Kirehe District Hospital deliver their babies via Caesarean Section. Therefore, the prevalence of C-section at Kirehe District Hospital was 23.1%.

Demographic and Economic Factors Associated with Caesaren Section

Demographic and economic factors associated with Caesaren section were assessed. Both bivariate and multivariate analysis were performed, variables with a p-value less than 5% in bivariate were taken to multivariate analysis. (Table 3)

The results from bivariate analysis show that the majority of women who delivered by C-section were aged 22-35 years (65.3%), married/living with a partner, had primary education (63.1%) and had household income of less than 10 thousand (60.4%). However, women aged group, marital status, education level and household income were not statistically associated with caesarean delivery ($p>0.05$).

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Table 2. Clinical characteristics of respondents

Variables	Frequency	Percentage
Anemia		
Yes	100	8.6
No	1058	91.4
HIV status		
Positive	1	0.1
Negative	1157	99.9
Eclampsia		
Yes	405	35.0
No	753	65.0
Uterine rupture		
Yes	199	17.2
No	959	82.8
Previous CS		
Yes	127	11.0
No	1031	89.0
Fetal distress		
Yes	11	0.9
No	1147	99.1
Prolonged labor		
Yes	31	2.7
No	1127	97.3
Multiple gestation		
Yes	413	35.7
No	745	64.3

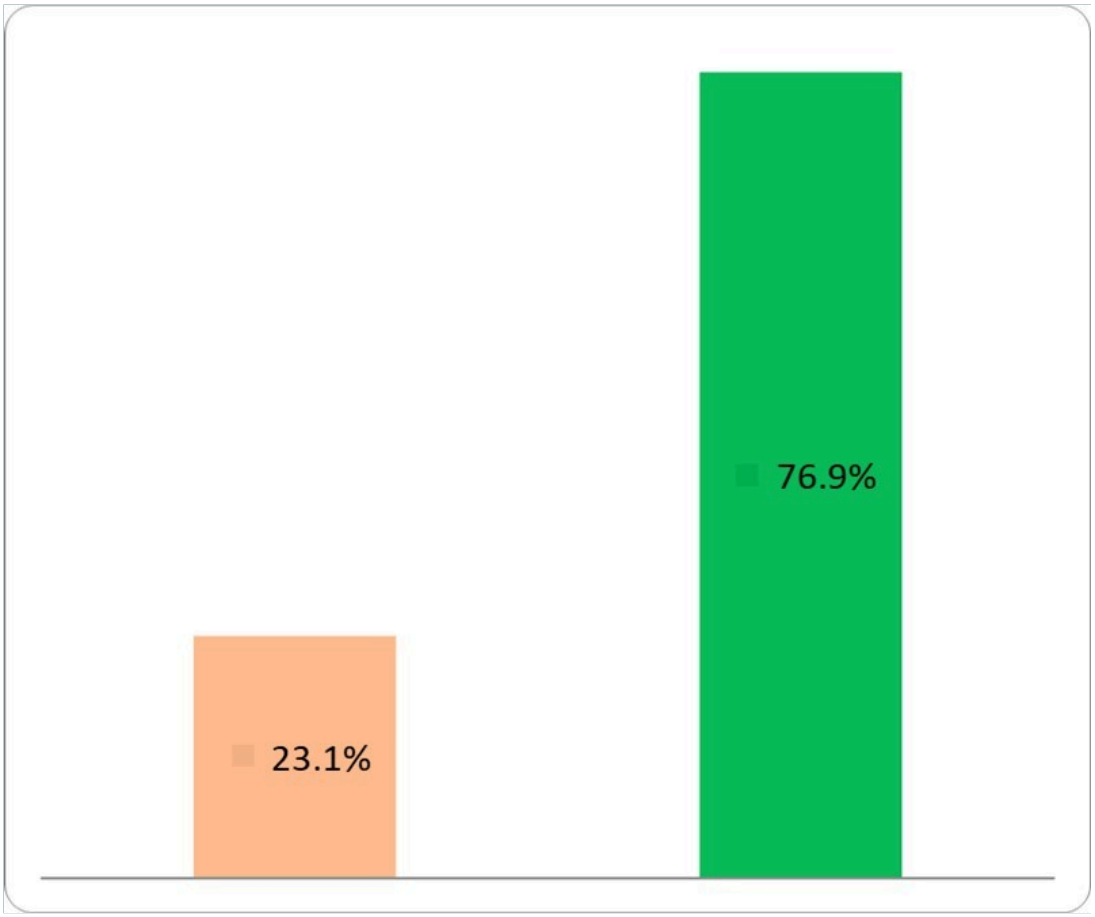

Figure 1. Prevalence of C-section among women delivered at Kirehe District Hospital

Respondents' occupation (P=0.027), type of health insurance used by the responded (P=0.001) and maternal weigh before pregnancy (P=0.009) were statistically associated with C-section. These variables were taken to logistic regression analysis to understand the strength of the association (Table 4).

Table 3. Bivariate analysis: Socio-demographic and economic characteristics associated with C-Section

Variables	C-section		Chi-square	P-value
	Yes n(%)	No n(%)		
Age group (years)			3.407	0.333
Less than 18	7(2.6)	24(2.7)		
18-21	44(16.4)	124(13.9)		
22-35	175(65.3)	631(70.9)		
>35	42(15.7)	111(12.5)		
Marital Status			2.083	0.353
Single	32(11.9)	80(9.0)		
Living with a partner	120(44.8)	417(46.9)		
Married	116(43.3)	393(44.2)		

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Table 3 (continued)

Variables	C-section		Chi-square	P-value
	Yes n(%)	No n(%)		
Education Level			2.455	0.293
No formal education	32(11.9)	80(9.0)		
Primary Education	169(63.1)	597(67.1)		
Secondary education	67(25.0)	213(23.9)		
Occupation			10.961	0.027
Employed	16(6.0)	24(2.7)		
Farmer	213(79.5)	697(78.3)		
Housewife	17(6.3)	98(11.0)		
Self employed	19(7.1)	61(6.9)		
Students	3(1.1)	10(1.1)		
Type of insurance			13.997	0.001
Community based insurance	220(82.1)	761(85.5)		
Private insurance	30(11.2)	45(5.1)		
UNHCR	18(6.7)	84(9.4)		
Household income (Rwf)			5.157	0.272
0-10,000	162(60.4)	537(60.3)		
10,000-20,000	45(16.8)	143(16.1)		
20,000-30,000	28(10.4)	128(14.4)		
30,000-40,000	10(3.7)	23(8.6)		
>40,000	23(8.6)	63(7.1)		
Maternal weight before pregnancy (Kg)			11.587	0.009
<50	10(3.7)	41(4.6)		
50-70	212(79.1)	611(68.7)		
70-90	44(16.4)	232(26.1)		
>90	2(0.7)	6(0.7)		

Results from logistic regression analysis revealed that women who are employed were two times more likely to deliver by C-section compared to students, however no statistical significance observed. Women who used private health insurance were 3 times more likely to deliver by C-section compared to women who were using insurance of UNHCR (AoR=3.11, 95%CI:1.564-6.187, P=0.001). Women who have 50-70 Kg weight before pregnancy had 42% risk of C-section compare to those with weight less than 50kg.

Table 4. Socio-demographic and economic characteristics associated with C-Section: Multivariate Analysis

	AoR	95% CI		P-value
Variables				
Occupation				
Employed	2.22	0.528	9.351	0.276
Farmer	1.01	0.278	3.735	0.978
Housewife	0.57	0.144	2.320	0.440
Self employed	1.03	0.259	4.165	0.958
Students	Ref.			
Type of insurance				
Community based insurance	1.34	0.794	2.294	0.269
Private insurance	3.11	1.564	6.187	0.001
UNHCR	Ref.			
Maternal weight before pregnancy (Kg)				
<50	Ref.			
50-70	1.42	0.700	2.890	0.330
70-90	0.77	0.363	1.667	0.518
>90	1.36	0.239	7.811	0.725

Clinical Factors Associated with Caesarean Section Among Women Delivered at Kirehe District Were Investigated

The results from bivariate analysis (Table 5) revealed that anaemia, HIV status, previous CS, fetal distress, prolonged labor and multiple gestations were not statistically associated with C-section. Therefore these variables were not taken to multivariate analysis.

Experiencing eclampsia (P=0.008), uterine rupture of membrane (0.017) were statistically associated with C-section. The results further show that the majority (41.8%) of women who delivered by CS had eclampsia, 22.0% women had C-section after rupture of membrane. (Table 6)

The findings from multivariate analysis revealed that women who experienced eclampisa had 45% risk of C-Setion compared to those without Eclampsia (AoR=1.45, 95%CI:1.095-1.921, P=0.009). Furthermore, rupture of membrane before delivery was associated with C-section (AoR=1.49, 95%CI:1.061-2.103, P=0.021).

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Table 5. Bivariate Analysis: Clinical characteristics associated with C-Section

Variables	C-section		Chi-square	P-value
	Yes n(%)	No n(%)		
Anemia			1.628	0.202
Yes	18(6.7)	82(9.2)		
No	250(93.3)	808(90.8)		
HIV status			3.324	0.068
Positive	1(0.4)	0		
Negative	267(99.6)	890(100)		
Eclampsia			7.125	0.008
Yes	112(41.8)	293(32.9)		
No	156(58.2)	597(67.1)		
Uterine rupture			5.716	0.017
Yes	59(22.0)	140(15.7)		
No	209(78.0)	750(84.3)		
Previous CS			2.878	0.090
Yes	37(13.8)	90(10.1)		
No	231(86.2)	800(89.9)		
Fetal distress			1.091	0.296
Yes	4(1.5)	7(0.8)		
No	264(98.5)	883(99.2)		
Prolonged labor			0.127	0.722
Yes	8(3.0)	23(2.6)		
No	260(97.0)	867(97.4)		
Multiple pregnancies			1.216	0.270
Yes	88(32.8)	325(36.5)		
No	180(67.2)	565(63.5)		

Table 6. Clinical characteristics associated with C-Section: Multivariate analysis

Variables	AoR	95%CI		P-value
Eclampsia				
Yes	1.45	1.095	1.921	0.009
No	Ref.			
Uterine rupture				
Yes	1.49	1.061	2.103	0.021
No	Ref.			

Discussion

Primary concerns in choosing a method for delivering a baby are the comfort of the mother and, specifically, the safety of both mother and baby. Recently, as safety has become more assured in most normal births in developed countries, health workers have focused on making the experience more pleasant and on meeting emotional needs by bringing the father and other family members into the process. Today, for a pregnancy without maternal complication, parents have the right to choose delivery mode for a new baby either vaginal or cesarean delivery. Normally, both cesarean and vaginal delivery is associated with well-known measurable short- and long-term maternal and neonatal complications and benefit [17].

Cesarean delivery is a surgical procedure to remove the baby from the uterus by cutting through the abdomen. Most cesarean births result in healthy babies and mothers. But CS is major surgery and carries risks. Healing also takes longer than with vaginal birth [18]. The operation is commonly performed when labor does not progress as quickly as it should, when the fetus seems to be in trouble, or when the mother is bleeding vaginally. Often a cesarean is needed when the fetus is in breech position (feet first) or in the transverse position (lying crosswire in the uterus), or when its head is too big to pass through the mother pelvis. Surgical deliveries are more likely when the birth involves a first baby, a large baby, an older mother (35 years old and above), or a mother who has had an earlier cesarean delivery [19].

The prevalence of Caesarean delivery was 23.1% in at Kirehe District Hospital, which is above WHO recommendation. Previous studies on cesarean delivery rate and maternal or neonatal mortality have yielded inconsistent results. Current evidence showed that national cesarean delivery rates of up to approximately 19 % live births were associated with lower maternal or neonatal mortality among WHO member state [20]. In contrast, other studies reported that a higher cesarean delivery rate is associated with higher infant mortality rate in high-income industrialized countries [21]. Similarly, Souza et al. observed that compared to spontaneous vaginal delivery, all other modes of delivery were associated with the increased risk of death, admission to intensive care unit (ICU), transfusion of blood and hysterectomy; this association was stronger in Africa, compared to Asia and Latin America [22]. The increasing CS rate in rural health facilities in Rwanda could indicate increased access to EmONC services and the high utilization of skilled delivery.

A recent study conducted in Rwanda found that the rate of CS in Rwanda significantly increased from 2.2% (95% CI 1.8–2.6) in 2000 to 15.6% (95% CI 13.9–16.5) in 2019–20. Despite increasing in all health facilities over time, the rate of CS was about four times higher in private (60.6%) compared to public health facilities (15.4%) in 2019–20. The same study revealed that overall, there were varied associations between CS and maternal age, occupation, wealth, ANC attendance, parity, sex and size of the child, and region of residence over the years. Across the surveys, women with multiple pregnancies, with ≥4 ANC visits, and from the richest households had higher odds of CS, while multiparous women and women with female babies had lower odds of CS. Women with female babies had 19–27% lower odds of CS compared to male babies between 2005 and 2019–20 while those with 5 or more children has 65–85% lower odds of CS compared to those with one child between 2010 and 2019–20. Women

with multiple pregnancies had 3.2 to 6.5 times higher odds of CS than singleton pregnancy between 2005 and 2019–20 [23].

Sayinzoga et al. further attributed improved maternal health services including access to CS use to established network of follow up for pregnant women, infrastructural development and proper leadership in health service delivery [24]. However, the overuse of caesareans beyond WHO recommendations is substantially rising in Rwanda and is now considered as a public health problem.

In this study, no association observed between multiple pregnancies and CS this contrast many other studies that reported an association between multiple pregnancies and CS [23], [25]. In 2014, the rate of CS among women with multiple pregnancies was three times the average rate of CS in Rwanda, having doubled within the preceding five years. However, in 2019–20, the rate of CS among women with multiple pregnancies reduced by 10 percentage points while that of singleton significantly increased to 23.3%. Hence, there is a need to review the indication for CS among women with multiple and singleton pregnancies to guide clinicians on women who are likely to benefit from the procedure and avoid unnecessary CS in this group.

In this study the associated between eclampsia and CS was reported. Previous study revealed that there is a lack of robust evidence from randomised controlled trials that can inform practice regarding planned caesarean section versus planned vaginal birth for women with severe pre-eclampsia. There is a need for high-quality randomised controlled trials to assess the short- and long-term effects of caesarean section and vaginal birth for these women and their babies [26].

Pre-eclampsia is a very frequent problem during pregnancy that affects up to one in 10 pregnant women. Pregnant women with pre-eclampsia have symptoms such as high blood pressure, headache, problems with vision and swelling of hands, legs, or feet. If untreated, serious pre-eclampsia may lead to poor health or even death both for pregnant women and for their babies. More women in low-income countries and in difficult economic circumstances suffer and die from pre-eclampsia. The only definitive treatment for this illness is the birth of the infant. It is therefore very common for doctors and pregnant women with serious pre-eclampsia to discuss delivering the baby after 34 or 37 weeks of pregnancy, with the timing dependent upon the health of the mother and the baby.

Conclusion

This study adds to the evidence on CS in Rwanda by examining the hospital-based trends and factors associated with CS in rural district of Rwanda in the period of one year. The prevalence of CS has very high compared to WHO recommended rates. The use of private health insurance, had eclampsia and rupture of membrane were factors associated with CS increase in Kirehe District.

Women in rural area of Rwanda seem to have increased access to and use of CS. However, the significant increase in the rate of CS is of concern due to the potential of unnecessary CS. Therefore, there is a need to examine the guidelines for CS use in Rwanda to ensure proper indications for use of CS are adopted for beneficial outcomes.

Health education for women is an essential component of antenatal care. The following educational interventions and support programmes are recommended to reduce caesarean births only with targeted monitoring and evaluation.

For the sole purpose of reducing unnecessary caesarean sections, financial strategies (i.e. insurance reforms equalizing physician fees for vaginal births and caesarean sections) for health-care professionals or health-care organizations are recommended. Incentives given to health care professional who successful perform caesarean sections should be cancelled and focus more on women counseling.

Competing Interests

The authors have declared that no competing interests exist.

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