Maternal and Fetal Outcomes of Placenta Previa at A Rwandan Referral Hospital. Case of the University Teaching Hospital of Kigali

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Maternal and Fetal Outcomes of Placenta Previa at A Rwandan Referral Hospital. Case of the University Teaching Hospital of Kigali

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I, Etienne Tuyisenge, hereby declare that, this dissertation entitled **« Maternal and Fetal Outcomes of Placenta Previa at A Rwandan Referral Hospital. Case of the University Teaching Hospital of Kigali »** is my original work and has never been presented elsewhere for academic qualification.

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This research has been submitted with my approval as the supervisor of the University of Rwanda.

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For and on behalf of the University of Rwanda.

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ABSTRACT

Introduction: Placenta previa may be associated with significant adverse fetal and maternal outcomes including potential death. The aim of the study was to assess maternal and fetal outcomes associated with placenta previa at 1 Rwandan Referral Hospital: Kigali University Teaching Hospital, CHUK.

Methods: This was a retrospective cross-sectional study of which data were collected for a period of 11 years from January 2010 to December 2020. We examined all medical files of patients admitted with placenta previa at the University Teaching Hospital of Kigali (CHUK).

Results

A total number of 250 women out of 23353 deliveries at CHUK during the study period had Placenta previa. The prevalence of placenta previa was 1.07%. Maternal mortality due to placenta previa was 1.2%. Placenta accrete spectrum was prevalent among 38 (15.2%) of all women with placenta previa . The Prevalence of PAS at first cesarean delivery (i.e.: no prior delivery) was 4.8%, and 10.7%, 34,1%, 29.4%, 25% at second, third, fourth, fifth and more cesarean delivery.

The mean gestational age at delivery was 35.0±4.1 weeks. In the study, 16.0% of the neonates died while 84.0% survived, and 36.6% were admitted to NICU.

Women undergoing cesarean delivery under general anesthesia were significantly associated with higher neonatal death (21.9% vs 11.7%, OR:2.110, p=0.030), higher rates of NICU admission (51.0% vs 26,1%, OR:2.949, p<0.001), lower Apgar score below 7 at first minute (49.5% vs 26.5%, 0R: 2.721, p=0.001).An Other factor significantly associated with neonatal death was birthweight .

Conclusion

The incidence of placenta previa among patients managed at the University teaching Hospital of Kigali is higher than worldwide incidence and other countries in the region. We recommend that the healthcare personnel provide adequate health education to patients with placenta previa about its complications.

Keywords: Placenta previa, Placenta accrete syndrome, outcome, hysterectomy,ceasarean section

LIST OF SYMBOLS AND ACCRONYMS

WHO : World Health Organization

SPSS : Statistical Package for Social Sciences

PAS : Placenta Accreta Spectrum

NICU :Neonatal Intensive Care Unit

ICU : Intensive Care Unit

APGAR : Appearance, Pulse, Grimace, Activity, Respiration

IRB : Institutional Board Review

CHUK :Centre Hospitalier Universitaire de Kigali

CS : Caesarean Section

SVD : Spontaneous Vaginal delivery

PRBC : Packed Red Blood Cells

US : United States of America

TUTH : Tribhuvan University Teaching Hospital

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I. INTRODUCTION

1.1.Background

Placenta previa is defined as implantation of the placenta at the lower segment of the uterus over or near internal cervical os in a pregnancy of above 20 weeks of gestation(1) . The prevalence of placenta previa is around 0.3-0.6% of pregnancies worldwide and associated with increasing rate of cesarean deliveries(2). There are significant variations by regions where Asia has the highest prevalence of placenta previa while Sub Saharan Africa have the lowest according to studies(3). The exact etiology of placenta previa is unknown but some risk factors such as advanced maternal age, multiparity , previous miscarriages, previous cesarean sections and uterine surgeries have been identified,(4,5).

Placenta previa has been found to be associated with adverse maternal outcomes as well as adverse neonatal outcomes,(6,7). Painless per vaginal bleeding is the most common symptom associated with placenta previa although It can be asymptomatic and an incidental finding on ultrasound scan,(8–10). The bleeding can be so severe to the extent of leading to maternal and fetal adverse outcomes,(10,11). It can lead to life threatening bleeding, disseminated intravascular coagulation and death,(3,12). Potential Maternal complications of placenta previa include increased incidence of hemorrhage, shock, blood transfusion, acute renal failure, ICU admission, peripartum hysterectomy, and maternal death as the worst outcome(13).

Abnormal placentation such as placenta accreta syndrome is another common complication of placenta previa. It is characterized by a morbid adherence of the placenta to myometrium because of a partial and total absence of decidual basalis especially on previous uterine surgeries(7).

Furthermore, Placenta previa may be associated with poor neonatal outcome including preterm delivery, low APGAR score, low birthweight NICU admission and neonatal death. Preterm delivery is the most common fetal complication of placenta previa(14). Diagnosis is made by clinical symptoms and signs of placenta previa and Transvaginal ultrasound to determine the location of the placenta and features of invasion into myometrium.

Management of placenta previa depends on clinical presentation, gestational age and presence of myometrial invasion,(14,15). Expectant management may be an option for the sake of the fetal condition whenever maternal life is not at risk(13). Early diagnosis and Timely intervention

are key in reducing placenta previa associated fetal and maternal morbidity and mortality,(16,17).

1.2.Problem statement

Placenta previa is an obstetrical emergency and a life threatening condition that may be associated with significant adverse maternal and fetal outcomes including potential death. Yet, the incidence and data regarding the burden of this condition in Rwanda are not well known. Since no previous study on placenta previa has been conducted in Rwanda.

The aim of this study is to assess maternal and fetal outcomes associated with placenta previa at 1 Rwandan Referral hospitals: Kigali University teaching Hospital (CHUK).

1.3. Research question

What are the maternal and fetal outcomes of Placenta previa in a Rwandan Referral hospital?

1.4. Objectives

1.4.1. General objectives

- To Assess Maternal and fetal outcome of placenta previa at the University Teaching Hospital of Kigali (CHUK) and identify determinants of maternal morbidity and mortality.

1.4.1.Specific objectives

- To Evaluate the incidence of placenta previa at CHUK
- To characterize women with placenta previa and placenta accreta spectrum (PAS)
- To evaluate predictors of maternal and immediate fetal outcomes of pregnancies complicated by placenta previa.

II. METHODOLOGY

2.1. Study design

This was a retrospective cross-sectional study of which data were collected for a period of 11 years from January 2010 to December 2020

2.2. Study setting

We examined all files of patients admitted with placenta previa at the University Teaching Hospital of Kigali (CHUK); the largest Rwandan public Referral and Teaching Hospital receiving the majority of complicated cases referred from District Hospitals including cases of placenta previa.

2.3. Inclusion and exclusion criteria

2.3.1. Inclusion criteria

- All patients who had been admitted for placenta previa at CHUK in a period of eleven years from January 2010 to December 2020

2.3.2. Exclusion criteria

- Patients admitted for placenta previa and later discharged for in utero transfer to other hospital.
- Patients whom the outcomes were unknown

2.4. Data collection and analysis

Data collectors were medical students in the final years and were trained about the purpose of the study and the confidentiality of the data. All patients at CHUK maternity department are diagnosed and registered at the emergency admission unit of the maternity department before hospitalization. Confirmation of placenta previa is done by a team of residents and a consultant before documenting the final diagnosis in the patient's file and in the admission registry. The registers were checked to identify women who had been admitted for placenta previa and their medical record numbers were recorded. The medical record number were then used to track the patient's archive code and all the identified patients from the registry were also identified from the hospital archive. Data were then recruited from the identified patient's file and filled on the data collection sheet.

Data were collected using a predesigned data collection sheet. Data were entered and analyzed using the IBM SPSS for windows version 25. Descriptive data are presented as follow: categorical data are presented using frequencies and percentages in tables and charts and continuous data are summarized by mean and median values depending on their distribution. Due to the low number of women with maternal outcome of interest in this study, the Fisher's exact test was used to predict maternal outcomes while Chi-square test was used to predict fetal outcomes. Independent student t-test for mean comparison and an association between variables was considered significant if the p-value was less than or equal to < 0.05.

2.5. Sampling method and sample size

Because there were no accessible data on previous studies that might have included placenta previa at CHUK and in Rwanda, we considered our study as generating the initial information about the condition and hence, all patients with placenta previa were recruited to participate in the study. A sample size of 250 women meeting the study criteria were then recruited in the analysis.

2.6. Ethical consideration

Ethical approval to conduct this study has been obtained from the University of Rwanda after presenting the research protocol at the IRB committee of the College of Medicine and Health Sciences of University of Rwanda. Thereafter, the protocol has been presented to CHUK Ethical Committee to be allowed to collect data in that institution. The information of our patients have been kept confidential.

III. RESULTS

3.1. Incidence of placenta previa

During the cross section period of our study, a total of 250 women with placenta previa were managed at CHUK and during the same period, a total of 23353 deliveries were conducted at CHUK. The prevalence of placenta previa was 1.07%.

3.2. Sociodemographic characteristics

The social demographic characteristics are described in table 1. The mean age at presentation with placenta previa was 32+-5.2 years and nearly two thirds were young maternal age less than 35 years. The majority, 88.0%, were living with their husbands during the time of pregnancy course, 68.4% had primary education while 3.2 % did not have any formal education, 64.0% were living in rural areas and 94.0% had at least one antenatal care before admission for management of placenta previa. In relation to the women's past history, one in every four women (26.8%) had had at least one miscarriage, three of them had had a uterine myomectomy and one participant had history of prior placenta previa on prior pregnancy.

Table 1. Sociodemographic characteristics and clinical history

		N	%
Age (years)	<35 year	157	62.8
	≥ 35 years	93	37.2
	Mean		32.0 ± 5.2
Lives with partner	Yes	220	88.0
	No	30	12.0
Education	No formal education	8	3.2
	Primary	171	68.4
	Secondary	42	16.8
	Tertiary	29	11.6
Residence	Rural	160	64.0
	Urban	90	36.0
Insurance	Yes	238	95.2
	No	12	4.8
Antenatal care	Yes	235	94.0
	No	15	6.0
History of abortion	Yes	67	26.8
	No	183	73.2
Previous Myomectomy	Yes	3	1.2
	No	247	98.8
Previous placenta previa	Yes	1	0.4
	No	249	99.6

Clinical presentation and delivery and delivery

The clinical presentation and delivery details are presented in table 2. The mean gestational age at delivery was 35.0±4.1 weeks, 46.4% delivered before completing 34 weeks, 24.0% delivered at late preterm period (34 – 36 weeks) while 29.6% delivered at term (≥37 weeks). Our results show that, 8.0% of women with placenta previa had antepartum hemorrhage, 98.0% were singleton pregnancy while 2.0% were multiple pregnancy, 58.0% underwent cesarean delivery under spinal anesthesia while 42.0% had general anesthesia. The incidence of Placenta accrete spectrum was 38 (15.2%) of all women with placenta previa in this study. Placenta accreta was developed in 7.2%, placenta increta developed by 4.0% of the study population, similar to placenta percreta (4.0%). The mean hospital stay was 4 days.

Table 2. Clinical presentation and delivery

		N	%
Gestational age at delivery	<34 weeks	116	46.4
	34-36W6D	60	24.0
	≥37 weeks	74	29.6
	Mean		35.0 ± 4.1
Placenta accreta spectrum	Yes	38	15.2
	No	212	84.8
Placenta accrete	Yes	18	7.2
	No	232	92.8
Placenta increta	Yes	10	4.0
	No	240	96.0
Placenta percreta	Yes	10	4.0
	No	240	96.0
Antepartum bleeding	Yes	230	92.0
	No	20	8.0
Single or Multiple children	Singleton	245	98.0
	Multiple	5	2.0
Types of anesthesia	Spinal	145	58.0
	General	105	42.0
Hospital stay	Mean	4 days	

3.3. Placenta Accreta Spectrum

Figure 1 represent the distribution proportion and types of placenta accreta spectrum. Among 38 women with placenta previa combined with placenta accreta spectrum, nearly half (47.4%) were having placenta accreta, and the remaining proportion was equally distributed between placenta increta and placenta percreta (26.3% each)

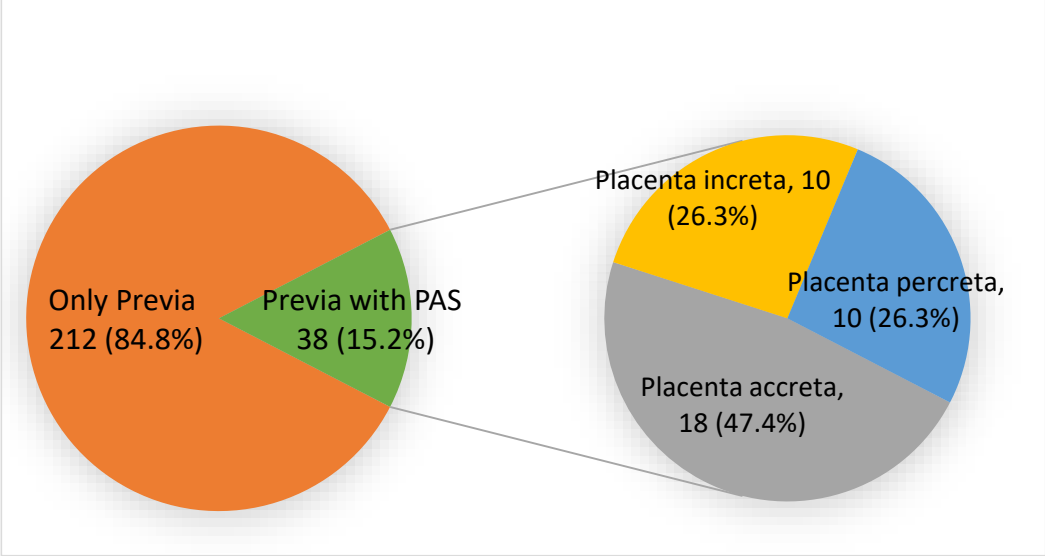

Figure 1. Incidence and types of Placenta Accreta Spectrum

3.4. Prevalence of PAS by obstetric history

The prevalence of placenta accreta spectrum according to women's prior obstetric history was investigated and is presented in table 3. The prevalence of PAS at 1st pregnancy was 2.9% and was 7.7% at second pregnancy, 20.5% at third pregnancy, and 43% at fourth and more pregnancy. In regard to prior the number of prior pregnancies delivered above 20 weeks of gestation (number of parity). The prevalence of PAS was 2.2%, 8.9%, 22.0%, 27.35 and 35.6% if the woman had had 0, 1, 2, 3, and ≥ 4 pregnancies respectively, that were delivered above 20 weeks of pregnancy. Similarly, the prevalence was 15.3%, 12.8%, 25.0%, 0.0% and 50% if the woman had had 0, 1, 2, 3, and ≥ 4 abortions respectively. The prevalence of PAS at first cesarean delivery (i.e.: no prior delivery) was 4.8%, and 10.7%, 34,1%, 29.4%, 25% at second, third, fourth, fifth and more cesarean delivery.

Table 3. Prevalence of PAS by obstetric history

		PAS by Gravidity		PAS by Parity		PAS by Abortion		PAS by Previous CS	
		n	(%)	n	(%)	n	(%)	n	(%)
Number of events	0	-	-	1	(2.2)	28	(15.3)	5	(4.8)
	1	1	(2.9)	5	(8.9)	6	(12.8)	6	(10.7)
	2	4	(7.7)	11	(22.0)	2	(25.0)	15	(34.1)
	3	8	(20.5)	12	(27.3)	0	(0.0)	10	(29.4)
	4 and more	15	(43.7)	9	(35.6)	2	(50.0)	2	(25.0)

3.5. Maternal and fetal outcomes

Maternal and fetal outcomes after delivery are presented in table 4. Among all the women in this study, 7.2% had postpartum hemorrhage, 18.9% underwent a lifesaving hysterectomy, 36.4% were transfused, 1.2% had iatrogenic internal organ injury (One bower injury and two bladder injuries), 2.0% were admitted to ICU, and 1.2% have died as maternal death. Regarding neonatal outcome, 16.0% neonates have died while 84.0% survived, and 36.6% were admitted to NICU

Table 4. Maternal and fetal outcomes

		N	%
Post-partum hemorrhage	Yes	18	7.2
	No	232	92.8
Hysterectomy	Yes	47	18.8
	No	203	81.2
Blood Transfusion	Yes	91	36.4
	No	159	63.6
Intra-operative organs injury	None	247	98.8
	Bladder	2	0.8
	Bowels	1	0.4
ICU admission	Yes	5	2.0
	No	245	98.0
Maternal death	Yes	3	1.2
	No	247	98.8
Neonatal survival	Alive	210	84.0
	Dead	40	16.0
Admission to NICU	Yes	87	36.6
	No	151	63.4
APGAR at 1st minute	<7	84	36.1
N=233	>=7	149	63.9
APGAR at 5th minute	<7	46	19.7
N=233	>=7	187	80.3
APGAR at 10 minute	<7	33	14.2
N=232	>=7	199	85.8
Birth weight (g)	Mean+-SD	2298	+-813.2

3.6. Factors associated with maternal outcomes

The factors hindering maternal outcomes are represented in table 5. Relative to women with no prior cesarean delivery, women with prior cesarean delivery were significantly more likely to have postpartum hemorrhage (10.3% vs 2.9%, 0R: 3.9, p=0.026), hysterectomy (29.0%, vs 4.8%, OR: 8.155, p<0.001) and more likely to have PAS (22.8% vs 4.8%, OR: 5.893, p<0.001). Multigravida women and multiparous women were significantly more likely to have hysterectomy (21.9% vs 0.0%, p=0.001 and 22.9% vs 0.0%, p<0.001 respectively), and more likely to have PAS (17.2% vs 2.9%, OR: 9.690, p=0.033, and 18.0% vs 2.2%, OR: 9.690,

p=0.005 respectively). Furthermore, relative to women with placenta previa only, women with placenta previa and PAS were significantly more likely to have PPH (21.1%, vs 4.7%, OR: 5.387, p=0.002), hysterectomy (71.1% vs 9.4%, OR: 23.564, p<0.001) and more likely to have ICU admission (10.5% vs 0.5%, OR: 24.824, p=0.002). On the other hand, factors such as maternal age, having had antenatal care, and prior history of abortion did not significantly predict maternal outcome variables of interest in this study.

3.7. Factors associated with fetal outcomes

Factors associated with neonatal outcomes were analyzed and presented in table 6. In comparison to spinal anesthesia, women undergoing cesarean delivery under general anesthesia were significantly associated with higher neonatal death (21.9% vs 11.7%, OR:2.110, p=0.030), higher rates of NICU admission (51.0% vs 26,1%, OR:2.949, p<0.001), lower Apgar score below 7 at first minute (49.5% vs 26.5%, 0R: 2.721, p=0.001), at fifth minute (29.9% vs 12.5% OR: 2.985, p=0.005) and at tenth minute (21.9% vs 8.8%, OR:1.688, p=0.005). The birth weight has significantly affected the neonatal outcomes with significant mean difference between neonates who survived and neonates who died (2315.4±738.8g vs 1383.3±823g, p<0.001). A significant mean difference have been also observed among neonates with lower Apgar score below 7 at 1, 5, and 10 minute with lower birth weights compared to neonates who had normal Apgar scores above 7 (p<0.001). Similarly, higher neonatal deaths and lower Apgar scores were among neonates delivered below 34 weeks of gestation (p<0.001). In this study, there was no significant association with occurrence of maternal deaths but higher odds of maternal deaths were observed among women with PAS (5.3% vs (0.5%, OR: 11.722, p=0.061) and women with prior abortion (3.0% vs 0.5%, OR:5.6, p=0.176)

Table 5. Factors associated with maternal outcomes

			Maternal death			PPH			Hysterectomy			ICU admission			PAS		
Factor		**Overall**	**N (%)**	**OR**	**P**	**N (%)**	**OR**	**P**	**N (%)**	**OR**	**P**	**N (%)**	**OR**	**P**	**N (%)**	**OR**	**P**
Age	**<35 year**	157(62.8)	2(1.3)	0.842	1.000	10(6.4)	1.384	0.614	25(15.9)	1.636	0.136	2(1.3)	2.583	0.364	25(15.9)	0.858	0.719
	≥35 years	93(37.2)	1(1.1)			8(8.6)			22(23.7)			3(3.2)			13(14.0)		
Antenatal care	**Yes**	235(94.0)	3(1.3)		1.000	18(7.7)		0.610	46(19.6)	3.407	0.316	5(2.1)	-	1.000	38(16.2)	-	0.137
	No	15(6.0)	0(0.0)			0(0.0)			1(6.7)			0(0.0)			0(0.0)		
Abortion	**Yes**	67(26.8)	2(3.0)	5.600	0.176	5(7.5)	1.055	1.000	12(17.9)	0.923	1.000	0(0.0)	-	0.328	10(14.9)	-	1.000
	No	183(73.2)	1(0.5)			13(7.1)			35(19.1)			5(2.7)			28(15.3)		
Previous CS	**Yes**	145(58.0)	1(0.7)	0.358	0.574	15(10.3)	3.923	**0.026**	42(29.0)	8.155	**<0.001**	2(1.4)	0.476	0.652	33(22.8)	5.893	**<0.001**
	No	105(42.0)	2(1.9)			3(2.9)			5(4.8)			3(2.9)			5(4.8)		
Gravidity	**Primigravida**	35(14.0)	0(0.0)	-	1.000	2(5.7)	1.327	1.000	0(0.0)	-	**0.001**	0(0.0)	-	1.000	1(2.9)	7.067	**0.023**
	Multigravida	215(86.0)	3(1.4)			16(7.4)			47(21.9)			5(2.3)			37(17.2)		
Parity	**Nulliparous**	45(18.0)	0(0.0)	-	1.000	2(4.4)	1.820	0.749	0(0.0)	-	**<0.001**	0(0.0)		0.589	1(2.2)	9.690	**0.005**
	Parous	205(82.0)	3(1.5)			16(7.8)			47(22.9)			5(2.4)			37(18.0)		
PAS	**Yes**	38(15.2)	2(5.3)	11.722	0.061	8(21.1)	5.387	**0.002**	27(71.1)	23.564	**<0.001**	4(10.5)	24.824	**0.002**			
	No	212(84.8)	1(0.5)			10(4.7)			20(9.4)			1(0.5)					
Antepartum bleeding	**Yes**	230(92.0)	3(1.3)	-	1.000	17(7.4)	1.516	1.000	42(18.3)	0.670	0.549	5(2.2)	-	1.000	35(15.2)	1.017	1.000
	No	20(8.0)	0(0.0)			1(5.0)			5(25.0)			0(0.0)			3(15.0)		
Types of anesthesia	**Spinal**	145(58.0)	1(0.7)	2.796	0.574	8(5.5)	1.803	0.321	20(13.8)	2.163	**0.022**	1(0.7)	5.703	0.165	15(10.3)	2.431	**0.019**
	General	105(42.0)	2(1.9)			10(9.5)			27(25.7)			4(3.8)			23(21.9)		

p: p-value by Fisher's exact test, OR: Odds Ration, PAS: Placenta Accreta Spectrum

Table 6. Factors associated with neonatal outcomes

			Types of anesthesia				Birth Weight		Gestational age at delivery			
Outcome		**Overall**	**Spinal**	**General**	**OR**	**P***	**Mean +- SD**	**P****	**<34 weeks**	**34-36W6D**	**≥37 weeks**	**P***
Neonatal outcome N=250	Alive	210(84.0)	128(88.3)	82(78.1)	2.110	**0.030**	2315.4±738.8	**<0.001**	82(70.7)	59(98.3)	69(93.2)	**<0.001**
	Dead	40(16.0)	17(11.7)	23(21.9)			1383.3±823		34(29.3)	1(1.7)	5(6.8)	
Admission to NICU N=238	Yes	87(36.6)	36(26.1)	51(51.0)	2.949	**<0.001**	1651.4±628.4	**<0.001**	59(56.2)	20(33.3)	8(11.0)	**<0.001**
	No	151(63.4)	102(73.9)	49(49.0)			2560.4±686.8		46(43.8)	40(66.7)	65(89.0)	
APGAR at 1st minute N=233	<7	84(36.1)	36(26.5)	48(49.5)	2.721	**0.001**	1706.2±679	**<0.001**	58(56.9)	15(25.4)	11(15.3)	**<0.001**
	≥7	149(63.9)	100(73.5)	49(50.5)			2517.4±694.3		44(43.1)	44(74.6)	61(84.7)	
APGAR at 5th minute N=233	<7	46(19.7)	17(12.5)	29(29.9)	2.985	**0.005**	1481.6±708.9	**<0.001**	35(34.3)	8(13.6)	3(4.2)	**<0.001**
	≥7	187(80.3)	119(87.5)	68(70.1)			2410.5±700.3		67(65.7)	51(86.4)	69(95.8)	
APGAR at 10 minute N=232	<7	33(14.2)	12(8.8)	21(21.9)	1.688	**0.005**	1515±759.8	**<0.001**	22(21.8)	8(13.6)	3(4.2)	**0.005**
	≥7	199(85.8)	124(91.2)	75(78.1)			2359±724.8		79(78.2)	51(86.4)	69(95.8)	

**p: p-value by Chi-Square test, **: p-value from student t-test, OR: Odds Ratio.*

IV. DISCUSSION

The aim of this study was to evaluate the incidence of placenta previa at the University Teaching Hospital of Kigali and maternal and fetal outcomes of patients with pregnancy complicated by placenta previa and identify determinants of maternal morbidities and mortality. The results show high incidence rate of 1.07%, increased severe maternal morbidities including higher rates of postpartum hemorrhage (7.2%), hysterectomy (18.8%) blood transfusion (36.4%), admission to ICU (2.0%) and longer hospital stay. All the associated morbidities were even more definite in presence of placenta accreta spectrum. The fetal outcomes were hindered by the type of anesthesia, the birth weight and the gestational age at delivery. The maternal deaths associated with placenta previa was 1.2% (3 women) and was not influenced by other factors, but was predicted by the diagnosis of placenta previa alone. Lack of other significant predictors of maternal mortality may have been a consequence of few rate of occurrence (only 3 women) which was not sufficient for statistical power to analyze the associations.

The incidence of women presenting with placenta previa in our study was higher compared to the prevalence from a study conducted in Siriraj Hospital in Pakistan that showed a prevalence rate of 0.7% (18). In comparison with other studies conducted in East African Countries, our results were higher in relation to the results from Northern Tanzania showing a prevalence rate of 0.6% and by far higher compared to the results from Mulago Hospital in Uganda (0.16%), (2,10). The differences in incidence of placenta previa may be explained by the differences in study designs. The study conducted in Tanzania has excluded multiple pregnancies and pregnancies with placenta previa and subsequent placenta abruption, and the study from Uganda recruited only women living within 15 kilometers or less from the hospital. Our results however, are also higher compared with the general prevalence of placenta previa reported in a systematic review and meta-analysis on prevalence of placenta previa by world region showing a worldwide prevalence of 0.52% and 0.27% in sub-Saharan Africa,(19). It is important to note that, CHUK is the largest and main Referral hospital of the country,(20), and this attracts referral of high risk pregnancies such as placenta previa and hence, a higher incidence of a rare disease may rise due to lack of proportional attendance by low risk pregnancies because the later are managed at lower community hospitals.

The age characteristic of women with placenta previa in our study (32.0±5.2 years) was similar to the results from a retrospective study in Guangzhou medical center for critical pregnant that reported a mean age of 32.17 ± 399 years and this study recruited data from 2009 to 2018, the

time period overlapping with our data collection period,(17). On the other hand, different from the study in Guangzhou characterizing college educated women as the highest majority of women with placenta previa (62.9%), women in our study mostly were mostly holding primary education (68.4%) level.

The rate of placenta accreta spectrum in our study increased with the increasing number of pregnancies, parities, and prior caesarean deliveries. This is similar to the results from a study conducted among nineteen medical centers that strongly emphasized the higher risks of PAS with increasing number of pregnancies and caesarean deliveries(21) and similar to the largest study that searched through the US national library of Medicine,(22). In the East African countries with similar population characteristics, Magaya et al. has reported higher occurrence of PAS as the number of prior pregnancies and prior cesarean deliveries increase among Tanzanians,(23). It is believed that, the increase in number of prior pregnancies and caesarean deliveries lead to degenerative changes in the endometrial vasculature which eventually leads to poor placenta perfusion on subsequent pregnancies and hence, a compensatory mechanism for the placenta to expand and invade more, beyond the endometrial thickness, to meet the perfusion needs of the fetus(24,25).

Severe maternal morbidities and mortality were highlighted in our study and more noticeable in the presence of prior uterine scars, and PAS which is similar to the results from TUTH hospital in Nepal,(26). Another study in Israel and a population-based study in Canada, have highlighted similar increased odds for PPH, hysterectomy, need for transfusion among women with placenta previa with higher increase in presence of PAS, (27,28). Given that placenta previa was more prevalent among women with prior uterine scars, the increased morbidities may have also been results from other existing risk factors resulting from prior caesarean delivery such as the presence of pelvic adhesions that require extra time and increase blood loss as described by Chiu et al,(29)(17).

The low birth weight exhibited by the infants born from mothers with placenta previa in this study was also a finding from the China and Tanzania, and Uganda, (2,10,17,18). As shown in our study, the low birth weight might have been resulted from the preterm delivery as a consequence of damage control for bleeding placenta previa before the fetus could have reached the term milestones of weight gaining. While a normal placenta weight is required to meet the intrauterine fetal needs, it is documented that, pregnancy complicated by placenta previa, there is a decrease in placenta weight compared to the pregnancies without placenta previa(17). This

can eventually lead to poor oxygen supply to the fetus and resulting poor fetal growth. Although it remains controversial whether the presence of placenta previa alone affects the fetal growth, a recent meta-analysis and systematic review has reported higher risk of fetal growth abnormalities in general and significantly higher rates of intrauterine growth restriction and small for gestational age among women with placenta previa,(30).

Our results have highlighted the association between general anesthesia offered to the mother during caesarean delivery and low Apgar scores at first, fifth and tenth minutes, NICU admission and neonatal death. This is consistent with other prior studies that reported lower Apgar scores, higher odds for intubation and neonatal death when general anesthesia is offered compared to spinal anesthesia,(26,31). This may be a result of diffusion of the sedative ingredients of the general anesthesia through the placenta with a resulting sedation to the fetus in addition to the longer operative duration that is typically taken to extract a fetus in presence of placenta previa.

V. CONCLUSION AND RECOMMENDATIONS

The incidence of placenta previa among patients managed at the University teaching Hospital of Kigali is higher compared to worldwide prevalence and other countries in the region. Women with placenta previa have mostly an advanced maternal age, multigravidity, multiparity and prior caesarean deliveries. The development of placenta accreta spectrum on top of placenta previa was more predicted among women with prior caesarean delivery and the odds increased with increasing number pregnancies and parities. Placenta previa has increased the rate of PPH, hysterectomy and ICU and these were significantly higher in presence of PAS associated with placenta previa. Maternal mortality was not increased compared to the mortality rate in the general population and this sheds light on the quality of obstetrical care offered at the Referral center, CHUK, but also, it calls for a continued plan of care. These factors can help healthcare providers design quality improvement protocols that raise awareness to the community and also sustain the advanced care required for high risk pregnancies and enhanced management of neonates with low birth weights. We recommend that the healthcare personnel conduct health education to patients with placenta previa about the complications involved, the need for antenatal follow-up.

Limitation of the study

The main limitation of our study rely in the retrospective design that reports results from a single Referral facility and hence may not reflect the prevalence of placenta previa or associated outcomes. Our study did not look at the long term maternal and neonatal outcomes and, hence, it leaves a gap on the neonatal survival rate and recurrence of placenta previa on subsequent pregnancies. The strength of this study was the extended period of data collection and the recruitment of all cases with placenta previa that were managed from 2010 to 2020.

Conflict of Interest

The author declares no competing interest in during this study

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ANNEX

Annex 1. Questionnaire

A.Sociodemographic characteristics

1. Age ……years
2. Marital status
    a. Married
    b. Unmarried
3. Education
    a. No formal education
    b. Primary
    c. Secondary
    d. Tertiary
4. Residence
    a. Rural
    b. Urban
5. Insurance
    a. Yes
    b. No
6. Antenatal care
    a. Yes
    b. No

B. Antenatal characteristics of participants

1. Obstetrical formula:

G……P……LC…..A…...D…….

2. Gestational age at delivery in weeks ……..weeks
3. Mode of delivery
    a. C/S
    b. SVD
4. Types of Anesthesia
    a. Spinal
    b. General

C. Previous obstetrical and gynecological history

1. Previous number of c/section ……..

2. Previous miscarriage

a. Yes

b. No

3. Previous myomectomy

a. Yes

b. No

4. Previous placenta previa

a. Yes

b. No

D. Maternal complications

1. Postpartum Hemorrhage

a. Yes

b. No

2. Morbidly adherent placenta

a. Yes

b. No

If yes, specify:

1.Placenta accreta 2.Placenta increta 3.Placenta percreta

3. Hysterectomy

a. Yes

b. No

4. Blood transfusion

None

……. Units of PRBC

…….....Units of platelets

……...units of Fresh frozen Plasma

…….units of other Blood products

5. Intra-operative organs injury

None

Bladder

Bowels

Other organs (specify…….)

6. Hospital stay in days ……das

7. Antepartum bleeding

a. Yes

b. No

8. ICU admission

a. Yes

b. No

9. Maternal death

a. Yes

b. No

E. Neonatal outcome and complications

1. Singleton or Twins
    a. Singleton
    b. More than 1 fetus(specify number…)

2. Neonatal outcome

a. Alive

b. Dead

3. APGAR score at 1st min ……..

at 5^{th} minute ……

at 10^{th} minute ……

4. Birth weight ……..grams

5. Admission to NICU

a. Yes

b. No

Annex 2. Ethical Approval

UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 22nd /June /2021

Dr. TUYISENGE Etienne

School of Medicine and Pharmacy, CMHS, UR

Approval Notice: No 219/CMHS IRB/2021

Your Project Title ***"Fetal and Maternal outcome of Two Rwandan Referral Hospitals"*** has been evaluated by CMHS Institutional Review Board.

		Involved in the decision		
		Yes	No (Reason)	
Name of Members	**Institute**		**Absent**	**Withdrawn from the proceeding**
Prof Kato J. Njunwa	UR-CMHS	X		
Dr Stefan Jansen	UR-CMHS	X		
Dr Brenda Asiimwe-Kateera	UR-CMHS	X		
Prof Ntaganira Joseph	UR-CMHS	X		
Dr Tumusiime K. David	UR-CMHS	X		
Dr Kayonga N. Egide	UR-CMHS	X		
Mr Kanyoni Maurice	UR-CMHS		X	
Prof Munyanshongore Cyprien	UR-CMHS	X		
Mrs Ruzindana Landrine	Kicukiro district		X	
Dr Gishoma Darius	UR-CMHS	X		
Dr Donatilla Mukamana	UR-CMHS	X		
Prof Kyamanywa Patrick	UR-CMHS		X	
Prof Condo Umutesi Jeannine	UR-CMHS		X	
Dr Nyirazinyoye Laetitia	UR-CMHS	X		
Dr Nkeramihigo Emmanuel	UR-CMHS		X	
Sr Maliboli Marie Josee	CHUK	X		
Dr Mudenge Charles	Centre Psycho-Social	X		

After reviewing your protocol during the IRB meeting of where quorum was met and revisions made on the advice of the CMHS IRB submitted on 18th June 2021, **Approval has been granted to your study.**

Please note that approval of the protocol and consent form is valid for **12 months**.

You are responsible for fulfilling the following requirements:

1. Changes, amendments, and addenda to the protocol or consent form must be submitted to the committee for review and approval, prior to activation of the changes.
2. Only approved consent forms are to be used in the enrolment of participants.
3. All consent forms signed by subjects should be retained on file. The IRB may conduct audits of all study records, and consent documentation may be part of such audits.
4. A continuing review application must be submitted to the IRB in a timely fashion and before expiry of this approval
5. Failure to submit a continuing review application will result in termination of the study
6. Notify the IRB committee once the study is finished

Sincerely,

Date of Approval: The 22nd June 2021

Expiration date: The 22nd June2022

Dr. Stefan Jansen
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate Studies, UR