



DEPARTMENT OF OBSTETRICS AND GYNECOLOGY

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**PREVALENCE, RISK FACTORS AND OUTCOMES OF PERIPARTUM  
HYSTERECTOMY AT KIGALI UNIVERSITY TEACHING HOSPITAL: A  
retrospective study from 2017 to 2021**

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*Thesis submitted in partial fulfillment of the requirement for the Award of Master of Medicine in  
Obstetrics and gynecology at the College of Medicine and Health Sciences, University of Rwanda.*

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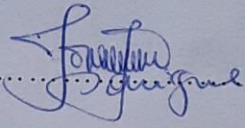
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September, 2022

## DECLARATION

I, Joseph SIBOMANA, hereby declare and certify that the work presented in this dissertation entitled **“PREVALENCE, RISK FACTORS AND OUTCOMES OF PERIPARTUM HYSTERECTOMY AT KIGALI UNIVERSITY TEACHING HOSPITAL: A retrospective study from 2017 to 2021”** is entirely my original work and it has never been presented or submitted in a whole or in part to any other university.

Joseph SIBOMANA, MD

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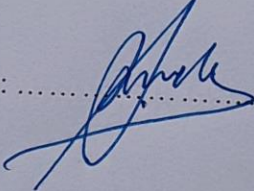
## Supervisors:

We, hereby declare that this dissertation has been submitted with our approval as supervisors.

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## DEDICATION

To God the Almighty

To my parents, brothers and sisters

To my senior Drs and supervisors

To my colleagues and classmates

To all friends and everyone who have contributed to  
this achievement

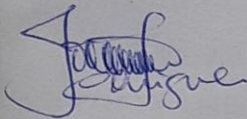
I dedicate this work

## ACKNOWLEDGEMENT

First of all, my gratitude goes to Dr. NTASUMBUMUYANGE Diomedee, Dr. DUSINGIZIMANA Vincent, and Dr. IRAKOZE Magnifique who accepted to supervise this work. Their patience, availability and meticulous analysis and corrections made to this achievement.

Many thanks to my colleagues for their encouragement and invaluable support which led to the completion of this dissertation.

For you all cited or forgotten, who contributed to my studies in Master of Medicine in Obstetrics and Gynecology, I say thank you.

A handwritten signature in blue ink, appearing to read 'Joseph Sibomana', with a stylized flourish at the end.

Joseph SIBOMANA

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## **List of acronyms**

**CHUK:** Centre Hospitalier Universitaire de Kigali (University Teaching Hospital of Kigali)

**CS:** Cesarean Section

**DH:** District Hospital

**EMR:** Electronic Medical Records

**GA:** Gestational Age

**ICU:** Intensive Care Unit

**ID:** Identification number

**MD:** Doctor of Medicine

**PPH:** Postpartum Hemorrhage

**STH:** Subtotal/ Supracervical hysterectomy

**TAH:** Total Abdominal Hysterectomy

## ABSTRACT

**Background:** Peripartum hysterectomy is defined as the removal of the uterus during cesarean section (cesarean hysterectomy) or shortly after vaginal delivery (postpartum hysterectomy). Peripartum hysterectomy, a life-saving surgical procedure for women with complicated obstetric hemorrhage, is associated with high maternal morbidity and mortality especially in low and middle income countries. There is scarcity of data on the prevalence, risk factors, and outcomes of peripartum hysterectomy in Rwanda

**Study design:** This study was designed as a retrospective cross-sectional study which evaluated the prevalence, risk factors and outcomes of 157 peripartum hysterectomies done among 30,134 women who presented at CHUK in the department of Obstetrics and gynecology for a five-year period from January 1, 2017 to December 31, 2021. Data were collected using a questionnaire and entered in epidata 3.1 then exported to Stata 13 for analysis.

The results were presented using frequencies in tables and charts and the continuous data were presented using mean values and their standard deviations. The statistical significance for associations was taken at the level  $p < 0.05$ .

**Results:** In our study, the rate of peripartum hysterectomy was found to be 5 in 1,000 deliveries; The median age for the participants was 33 years (range 16 to 48 years). Among risk factors of peripartum hysterectomy in our study, the most common was Cesarean delivery at 85.9%(135 of the participants) with history of previous C/S at 63.06%(99 of the participants); placenta previa/accrete followed at 29.3%(46 of the participants), uterine infection post C/S at 24%(39 of the participants), uterine atony at 17.83%(28 of the participants), uterine rupture at 16.56%(16 of the participants), placenta abruption at 6.37%(10 of the participants), and extending cervical tear/lacerations at 5.1%(8 of the participants). Among the patient who underwent peripartum hysterectomy in our study, 87.9% were transfused with a median number of 5 units of blood components (range 2 to 39 units), and 12.1% were admitted in ICU. The mortality rate was found to be 8.92% (14 of the participants). Sepsis and hemorrhagic shock were the two leading causes of death at a rate of 57.1% and 42.3% respectively.

**Conclusion:** In our settings, the rate of peripartum hysterectomy is 0.5% and it carries significant maternal morbidity and mortality. Cesarean section in current pregnancy and previous cesarean section history were independent strong risk factors. Abnormal placentation (placenta accreta and placenta previa) and uterine infection after c/section are the 2 leading causes of peripartum hysterectomy. Therefore, there is need for further enhancement of primary cesarean section prevention strategies and the promotion of safe cesarean section practice.

## **I. INTRODUCTION**

### **1.1. Background**

Peripartum hysterectomy is defined as the removal of the uterus during cesarean section (cesarean hysterectomy) or shortly after vaginal delivery (postpartum hysterectomy) (1). Peripartum hysterectomy is usually performed in response to an emergency which might arise during cesarean section or after vaginal delivery (within 6 weeks) (1,2) and it carries a high risk of maternal morbidity and mortality (3).

Previous studies have reported a rate of peripartum hysterectomy ranging from 0.4 to 5.09 per 1000 deliveries (2–23) where the lowest rate was reported in Ireland by Karen et al at 0.4 per 1000 deliveries (14) and the highest rate was reported in Turkey by Sahin et al. at 5.09 per 1000 deliveries (17). A world-wide systematic review and meta-analysis by Sumaya et al. reported the prevalence of the peripartum hysterectomy at 5% among women with postpartum hemorrhage and placenta previa/accreta was the most common indication of hysterectomy (24). Abnormal placentation, uterine rupture and uterine atony were the common indications for emergency peripartum hysterectomy in a study performed by Furkan et al (11), Zeba et al (25), Umezurike et al. from Nigeria (26), Nwobodo and Nnadi from Nigeria (27) and the same findings were reported by from other studies (9,13,21,22,28–30). The following studies also reported the same findings (2,4,5,14,15,18,20,23,31,32). Uterine infections post C/S were reported to be the indication of hysterectomy in the study done by Wandabwa et al in South Africa in 27% of their study participants (33). A study done by Habek et al. from Croatia reported that among the 17 emergency peripartum hysterectomy procedures, 29.4% were done after vaginal deliveries and 70.6% of them were done after cesarean section (30). Similar findings were seen in a study by Mesbah et al. from Egypt which reported that 86.2% of the peripartum hysterectomies had a history of previous cesarean delivery (29). The study done by Manjula et al. from Bangalore reported previous C/S for abnormal placentation and placenta abruption and peripartum hemorrhage as the risk factors for emergency peripartum hysterectomy (21). Some studies report that mothers with multiple births were more likely to have high risk of emergency peripartum hysterectomy compared to those with singleton births (6). Uterine rupture, placenta praevia, postpartum hemorrhage, cervical tears,

second trimester bleeding, cesarean delivery, grand Multiparity and placenta accreta were identified as the independent risk factors of peripartum hysterectomy by Orbach et al. from Israel (34). Thomas et al. reported cesarean delivery in the current pregnancy, previous cesarean delivery, advanced maternal age and high parity as the risk factors of peripartum hysterectomy (35). Cesarean delivery is described as a significant risk factor of peripartum and postpartum hysterectomy (36) as also found by Heitkamp et al. from South Africa who reported that 86% of the patients who underwent hysterectomy gave birth by cesarean section (26). Peripartum hysterectomies are morbid procedures often causing blood loss and anemia. Blood transfusion is common with several studies demonstrating transfusion rates of 79 to 100% and high rates of ICU admission. (18, 20, 26) When evaluating the indications of emergency peripartum hysterectomy, Tarik reported that 53% of the patients developed disseminated intravascular coagulopathy (5). Bladder injury was another common complication reported from different studies (34).

The mean percentage of maternal deaths was at 3.0% among mothers who underwent emergency peripartum hysterectomy from a systematic review by Cara et al. (19) while the study by Andrea reported case fatality of 10.3% where the perinatal mortality was 7.7 per 1000 deliveries (20). The study by Manjula et al. reported 1 death in 13 peripartum hysterectomies performed (21). A study by Monday et al. reported the case mortality rate of 14.3% and the perinatal mortality rate was 64.3% (10). A study by Mesbah reported that 13.8% (4 patients among 29) of patients who underwent emergency hysterectomy died (29) and almost the same finding was reported by Okogbenin et al. from Nigeria who reported the mortality rate of 12.5% (2). A systematic review and meta-analysis by Thomas et al. revealed that the mortality among women who undergo emergency peripartum hysterectomy is higher in resource limited settings (35).

## **1.2. Problem statement**

Peripartum hysterectomy, a life-saving surgical procedure for women with complicated obstetric hemorrhage, is associated with high maternal morbidity and mortality especially in low and middle income countries (35,37). There is scarcity of data on the prevalence, risk factors, indications and outcomes of peripartum hysterectomy in Rwanda. Hence this study will inform the community and specifically the health providers about the prevalence and risk factors to help them manage the cases and improve outcomes.

### **1.3. Research question**

What is the prevalence, risk factors and outcomes of peripartum hysterectomy at CHUK?

### **1.4. Research objectives**

#### **1.4.1. General objective**

To evaluate the prevalence, risk factors and outcomes of peripartum hysterectomy at CHUK.

#### **1.4.2. Specific objectives**

To assess the prevalence of peripartum hysterectomy at CHUK

To identify the risk factors of peripartum hysterectomy at CHUK

To evaluate maternal morbidity and mortality associated with peripartum hysterectomy

## **II. METHODOLOGY**

### **2.1. Study site and setting**

This study was carried out from University Teaching Hospital of Kigali (CHUK) located in Kigali city, Nyarugenge district. The University Teaching Hospital of Kigali is the largest hospital and the biggest referral hospital of the country with the mandate ‘Quality Health Care Training and Research’. CHUK has the capacity of 519 beds including 7 ICU beds and it provides quality healthcare to the population, training, clinical research and technical support to provincial and district hospitals.

### **2.2. Study design**

This study was designed as a retrospective cross-sectional study which evaluated the prevalence, risk factors and outcomes of peripartum hysterectomy among women who presented at University Teaching hospital of Kigali in the department of Obstetrics and gynecology for a five-year period from January 1, 2017 to December 31, 2021.

### **2.3. Study population**

The participants of this study were women who underwent peripartum hysterectomies for different indications in the department of obstetrics and gynecology of University Teaching Hospital of Kigali in a five-year period from January 2017 to December 2021.

### **2.4. Inclusion criteria**

In this study, we recruited participants fulfilling the following criteria:

- All women who underwent hysterectomy within 6 weeks of delivery

### **2.5. Exclusion criteria**

- We excluded hysterectomies indicated for gestational trophoblastic diseases and abortion

### **2.6. Study procedure**

The data were retrospectively collected from patients’ hospital files in the Archives of University teaching hospital of Kigali using the investigator’s recording format, questionnaire, on which the necessary information was gathered.

**Independent variables:** Demographic characteristics including age, year of delivery, economic category, marital status, religion, level of education, body mass index, programmed/non-programmed delivery, parity and gravidity, history of previous PPH, unspecified hemorrhage,, cervical tear/laceration, infections, uterine fibroids, history of placenta pathologies (Previa, accreta, increta...), gestational age, mode of birth, history of induction of labor/trial of labor, history of transfusion, history of chronic diseases, type of pregnancy, uterine atony, uterine rupture, antenatal care attendance were collected.

**Dependent variables:** Presence of complications after emergency hysterectomy, blood transfusion, ICU admission, and the overall outcome (mortality).

## 2.7. Sampling method and sample size

The sample size was calculated using the formula used to estimate a proportion from the population as follows:

$$n = Z^2 \frac{p(1-p)}{e^2}$$

n= the minimum required sample size.

Z<sup>2</sup>= the standard normal value corresponding to 95% confidence interval equaling to 1.96.

p= the estimated proportion or prevalence of peripartum hysterectomy estimated at 5% from the study done by Cho et al. (16).

e= level of precision set at 5%.

Thus,

$$n = 3.84 \frac{0.05(1-0.05)}{0.0025} = 72$$

The study used consecutive sampling and **157** women who underwent peripartum hysterectomy in our study period were recruited.

## **2.8. Data collection and management**

The data were collected from the Archives of University Teaching Hospital of Kigali using a questionnaire, on which the necessary information was collected. The hospital identification numbers of the patients were retrieved from the registers in the department of gynecology and obstetrics and then through EMR system, these hospital IDs were used to get the Archive ID of the individual patient file from the archives. Data collectors were trained on research ethics. Data on hard copies were entered by trained research assistant in software to produce soft data. The soft data were and are kept by the principal investigator.

## **2.9. Data analysis plan**

The collected data were entered into Epidata version 3.1 for database creation and then exported to Stata version 13 for analysis. Descriptive data are presented as follow: categorical data are presented using frequencies and percentages in tables and continuous data are summarized by mean and median values depending on their distribution. Binary and multivariable logistic regression analysis was used to study the relationship between the outcomes and possible predictors/risk factors. Statistical significance for associations was taken at the level  $p < 0.05$ .

## **2.10. Ethical considerations**

The study protocol was reviewed and approved by the Institutional Review Board of College of Medicine and Health Sciences, University of Rwanda and by the Ethics committee of University Teaching Hospital of Kigali prior to data collection period.

All information was de-identified before data entry and no individual respondents' information was presented. Data on hard copies are locked in a cupboard which is accessed only by the Principal investigator and soft data are stored in a password protected folder on the personal computer of the principal investigator and will be destroyed one year after publication of the results from the study. Consent form was not needed because we used information recorded in files retrospectively.

### III. RESULTS

In this study we recruited 157 participants who underwent peripartum hysterectomy in a period of 5 years from 2017 to 2021 from 30,134 mothers who were admitted at CHUK in the peripartum period within the specified period of time which make the prevalence of peripartum hysterectomy to be 0.5% (5 per 1000 deliveries). The median age for the participants was 33 years (range 16 to 48 years). The majority of participants (87.9%) were married and 38.22% were residing in Kigali city. (Table 1)

**Table 1: Sociodemographic characteristics of study participants (n=157)**

| <b>Characteristics</b>     | <b>n</b>   | <b>%</b> |
|----------------------------|------------|----------|
| <b>Age in years</b>        |            |          |
| Median (Q1-Q3)             | 33 (29-37) |          |
| <b>Marital status</b>      |            |          |
| Married                    | 138        | 87.9     |
| Single                     | 18         | 11.46    |
| Divorced/separated         | 1          | 0.64     |
| <b>Province of origin</b>  |            |          |
| Kigali city                | 60         | 38.22    |
| Eastern                    | 14         | 8.92     |
| Western                    | 17         | 10.83    |
| Northern                   | 41         | 26.11    |
| Southern                   | 25         | 15.92    |
| <b>Smoking</b>             |            |          |
| Yes                        | 1          | 0.64     |
| No                         | 156        | 99.36    |
| <b>Alcohol consumption</b> |            |          |
| Yes                        | 8          | 5.1      |
| No                         | 149        | 94.9     |

Among patients who underwent peripartum hysterectomy, the majority had delivered by cesarean section 85.9%(135 of the participants) and 63.0%(99 of participants) had a history of previous Cesarean section; 29.3%(46 of the participants) had placenta previa/accrete, 24%(39 of participants) had uterine infections post cesarean delivery, 17.83%(28 of participants) had uterine atony, 16.56%(26 of participants) had uterine rupture, 6.37%(10 of the participants) had placenta abruption, and 5.1%(8 of the participants) had extending cervical tear/lacerations.

Twenty percent of the patients who underwent peripartum hysterectomy were primipara and uterine infection post Cesarean section was the most common risk factor among them at 43.75% (14 in 32 patients). The majority of the patients 69.4%(109 of participants) who underwent peripartum hysterectomy were transfers from district hospitals after delivery and 30.6%(48 of participants) delivered at CHUK. The most common risk factor of hysterectomy among transferred

patients was uterine infection post Cesarean section at 34.86% vs 2.08% in those who delivered at CHUK. The most common risk factor of hysterectomy among patients who delivered at CHUK was placenta accrete spectrum at 62.5% (30 in 48 patients) vs 14.68% (16 in 109 patients) in patients who were transferred. Other risk factors among the patients who underwent peripartum hysterectomy in our study; 20.4% of the patients had history of antepartum hemorrhage, 11.4% had history of induction of labor, 8.92% had previous history of curettage, 4.4% had previous history of PPH, 5.1% had eclampsia/pre-eclampsia. (Table 2).

**Table 2: Risk factors of peripartum hysterectomy in our study (n=157)**

| <b>Risk factor</b>                 | <b>n</b> | <b>%</b> |
|------------------------------------|----------|----------|
| Parity                             |          |          |
| Primiparous                        | 32       | 20.38    |
| Multiparous                        | 125      | 79.62    |
| Previous history of C/S            | 99       | 63.06    |
| Number of C/S                      |          |          |
| One                                | 36       | 36.36    |
| Two                                | 24       | 24.24    |
| More than 2                        | 39       | 39.39    |
| Hospital of delivery               |          |          |
| CHUK                               | 48       | 30.57    |
| Referred from DH                   | 109      | 69.43    |
| Type of delivery                   |          |          |
| Vaginal                            | 22       | 14.01    |
| C/S                                | 135      | 85.99    |
| Placenta previa/ accrete           | 46       | 29.3     |
| Uterine infections post CS         | 39       | 24.84    |
| Uterine atony                      | 28       | 17.83    |
| Uterine rupture                    | 26       | 16.56    |
| Placenta abruptio                  | 10       | 6.37     |
| Extended Cervical tear/lacerations | 8        | 5.1      |
| History of antepartum hemorrhage   | 32       | 20.38    |
| History of induction of labor      | 18       | 11.46    |
| Previous history of curettage      | 14       | 8.92     |
| History of PPH                     | 7        | 4.46     |
| Eclampsia/pre-eclampsia            | 8        | 5.1      |

Of all the participants who underwent peripartum hysterectomy, 63.69% were hemodynamically stable at the time of operation and the remaining 36.3% were hemodynamically unstable. Considering the type of hysterectomy done, 111 patients (70.7%) underwent sub-total hysterectomy and the remaining 46 patients (29.3%) underwent total abdominal hysterectomy. Considering the duration of operation, 55.4% of the operations lasted less than three hours and 44.6% lasted more than three hours with the mean duration of operation being 1.44 hours. The median estimate blood loss was 1000 ml (range 200 to 4600 ml) and 63.1% had an estimated blood loss of less than 1000 ml and 36.9% had an estimated blood loss of more than 1000 ml. Of all the participants who underwent peripartum hysterectomy 87.9% of the patients were transfused with a median number of 5 units of blood components (range 2 to 39 units). (Table 3).

**Table 3: Management modalities of peripartum hysterectomy**

| <b>Characteristics</b>                            | <b>n</b>        | <b>%</b> |
|---------------------------------------------------|-----------------|----------|
| <b>Hemodynamic status at time of hysterectomy</b> |                 |          |
| Stable                                            | 100             | 63.69    |
| Unstable                                          | 57              | 36.31    |
| <b>Type of hysterectomy</b>                       |                 |          |
| STH                                               | 111             | 70.70    |
| TAH                                               | 46              | 29.30    |
| <b>Operative time</b>                             |                 |          |
| <3 hours                                          | 87              | 55.41    |
| ≥3 hours                                          | 70              | 44.59    |
| <b>Estimated blood loss in ml</b>                 |                 |          |
| Median (Min-Max)                                  | 1000 (200-4600) |          |
| ≤1000 ml                                          | 99              | 63.06    |
| >1000 ml                                          | 58              | 36.94    |
| <b>Blood transfusion</b>                          |                 |          |
| Yes                                               | 138             | 87.9     |
| No                                                | 19              | 12.1     |
| <b>Number of units transfused</b>                 |                 |          |
| Median (Min-Max)                                  | 5 (2-39)        |          |

Of all 157 patients who underwent peripartum hysterectomy, 19 patients (12.1%) were admitted in ICU with mean ICU stay of 4.3 days (range 1 to 45 days) and of these patients who were admitted in ICU, 6(31.58%) patients stayed for one day, 10 patients (52.6%) were hospitalized for 2-3 days and 3 patients (15.79%) were hospitalized in ICU for more than 3 days. Patients who were referred from the district hospitals were more likely admitted in ICU compared to those who delivered at CHUK where 14.68% of patients who delivered outside CHUK then referred for the further management were admitted in ICU while 6.25% of those who delivered at CHUK were admitted in ICU. Three patients (7.69%) of the patients who had uterine infections post CS were admitted in ICU compared to 13.56% of those without uterine infection who were admitted in ICU but the difference was not statistically significant ( $p=0.330$ ). There was no statistically significant difference in ICU admission and mortality according to number of previous uterine scars because 3.17% of patients with more than one uterine scar died compared to 8.33% of the patients with only one uterine scar ( $p=260$ ) and 9.52% of patients with more than one uterine scar were admitted in ICU compared to 5.56% of the patients with one uterine scar ( $p=0.486$ ).

Considering the frequency and types of other complications of peripartum hysterectomy among our study participants, 16.56% were put on the mechanical ventilation, 14.65% experienced internal organ injuries, 17.2% developed post-operative wound infections, 21.66% underwent relook laparotomy, 10.9% had coagulopathy issues (DIC), 10.83% developed acute respiratory failure 2 patients (1.27%) developed pulmonary embolism. Patients who were referred were more likely to undergo relook laparotomy where 28.44% of the patients (31 of 109 patients) who were referred from DH underwent relook laparotomy compared to 6.25% (3 of 48patients) of those who delivered at CHUK.

The median length of hospital stay was 6 days ranging from 1 day to 75 days and when considering the mortality rate as the overall final outcome of patients who underwent peripartum hysterectomy, 14 patients (8.92%) died among them 8(57.1%) had septic shock for post CS infection and 6(42.9) had hemorrhagic shock (Table 4).

**Table 4: Outcomes of patients who underwent peripartum hysterectomy**

| <b>Outcome</b>                           | <b>n</b> | <b>%</b> |
|------------------------------------------|----------|----------|
| ICU admission                            | 19       | 12.1     |
| <b>ICU stay</b>                          |          |          |
| One day                                  | 6        | 31.58    |
| 2-3 days                                 | 10       | 52.63    |
| >3 days                                  | 3        | 15.79    |
| Coagulopathy (DIC)                       | 16       | 10.19    |
| Acute respiratory failure                | 17       | 10.83    |
| Mechanical ventilation                   | 26       | 16.56    |
| Number of days on mechanical ventilation |          |          |
| One day                                  | 14       | 53.85    |

|                                 |          |             |
|---------------------------------|----------|-------------|
| More than one day               | 12       | 46.15       |
| Internal organ injury           | 23       | 14.65       |
| Post-operative wound infection  | 27       | 17.2        |
| DVT                             | 1        | 0.64        |
| Pulmonary embolism              | 2        | 1.27        |
| Relook laparotomy               | 34       | 21.66       |
| Length of hospital stay in days |          |             |
| Median (Min-Max)                | 6 (1-75) |             |
| Maternal death                  |          |             |
| Yes                             | 14       | <b>8.92</b> |
| No                              | 143      | 91.08       |

### Outcomes of hysterectomy with respect to risk factors

Patients with placenta accrete spectrum as risk factor of hysterectomy were more likely to be transfused (82.61%) compared to 39.64% of patients without placenta accrete spectrum as risk factor of hysterectomy ( $p<0.05$ ). Patients with uterine atony were more likely to be transfused (83.33%) compared to 46.62% of patients without uterine atony ( $p<0.05$ ). All 5 patients (100%) with placenta abruptio were transfused to 50.66% of patients without placenta abruptio ( $p<0.05$ ). Patients with extended cervical tear were more likely to die and to be admitted in ICU compared to patients with other risk factors ( $p<0.05$ ). Patients who had uterine infection post CS as risk factor of hysterectomy were more likely to die compared to patients without uterine infection as risk factors of hysterectomy ( $p<0.05$ ) and patients who had uterine atony as risk factor of hysterectomy were more likely to die and to be admitted in ICU compared to those who did not have uterine atony as risk factor ( $p<0.05$ ) [Table 5].

**Table 5: Outcomes of hysterectomy with respect to risk factors**

| Risk factors of hysterectomy      | Mortality         |                    | ICU admission     |                    | Blood transfusion  |                    |
|-----------------------------------|-------------------|--------------------|-------------------|--------------------|--------------------|--------------------|
|                                   | Yes               | No                 | Yes               | No                 | Yes                | No                 |
| <b>Placenta accrete spectrum</b>  |                   |                    |                   |                    |                    |                    |
| Yes                               | <b>0 (0.00%)</b>  | <b>46 (100%)</b>   | <b>1 (2.17%)</b>  | <b>45 (97.8%)</b>  | <b>38 (82.61%)</b> | <b>8 (17.39%)</b>  |
| No                                | <b>14 (12.6%)</b> | <b>97 (87.39%)</b> | <b>18 (16.2%)</b> | <b>93 (83.78%)</b> | <b>44 (39.64%)</b> | <b>67 (60.36%)</b> |
| <b>Uterine infection post C/S</b> |                   |                    |                   |                    |                    |                    |
| Yes                               | <b>8 (17.95%)</b> | <b>31 (82.05%)</b> | 3 (7.69%)         | 36 (92.31%)        | <b>4 (10.26%)</b>  | <b>35 (89.74%)</b> |
| No                                | <b>6 (5.93%)</b>  | <b>112 (94.0%)</b> | 16 (13.5%)        | 102 (86.4%)        | <b>78 (66.10%)</b> | <b>40 (33.90%)</b> |

|                               |            |              |            |             |             |             |
|-------------------------------|------------|--------------|------------|-------------|-------------|-------------|
| <b>Uterine atony</b>          |            |              |            |             |             |             |
| Yes                           | 6 (25.00%) | 18 (75.00%)  | 9 (37.50%) | 15 (62.50%) | 20 (83.33%) | 4 (16.67%)  |
| No                            | 8 (6.02%)  | 125 (93.9%)  | 10 (7.52%) | 123 (92.4%) | 62 (46.62%) | 71 (53.38%) |
| <b>Uterine rupture</b>        |            |              |            |             |             |             |
| Yes                           | 1 (3.85%)  | 25 (96.15%)  | 2 (7.69%)  | 24 (92.31%) | 14 (53.85%) | 12 (46.15%) |
| No                            | 13 (9.92%) | 118 (90.08%) | 17 (12.9%) | 114 (87.0%) | 68 (51.91%) | 63 (48.09%) |
| <b>Placenta abruptio</b>      |            |              |            |             |             |             |
| Yes                           | 1 (20.00%) | 4 (80.00%)   | 1 (20.00%) | 4 (80.00%)  | 5 (100%)    | 0 (0.00%)   |
| No                            | 13 (8.55%) | 139 (91.45%) | 18 (11.8%) | 134 (88.1%) | 77 (50.66%) | 75 (49.34%) |
| <b>Extended cervical tear</b> |            |              |            |             |             |             |
| Yes                           | 3 (37.50%) | 5 (62.50%)   | 3 (37.50%) | 5 (62.50%)  | 4 (50.00%)  | 5 (50.00%)  |
| No                            | 11 (7.38%) | 138 (92.6%)  | 16 (10.7%) | 133 (89.2%) | 78 (52.35%) | 71 (47.63%) |

### Factors associated with mortality among patients who underwent peripartum hysterectomy

In the bivariate analysis, patients with parity  $\leq 2$  were 12.6 times more likely to die as those with parity  $> 2$  with a statistically significant difference (OR=12.6; 95% CI: 2.72-58.87;  $p=0.001$ ). Patients with parity  $\leq 2$  were more likely to have uterine infections 34.48%) compared to those with parity  $> 2$  (19.19%) and the difference was statistically significant ( $p=0.032$ ). Patients who developed DIC as a complication were 6.6 times more likely to die as those who did not develop DIC (OR=6.66; 95% CI: 1.90-23.37;  $p=0.003$ ). Patients who were admitted in ICU were 16 times more likely to die as those who were not admitted in ICU (OR=16.0 95% CI: 4.7-54.4;  $p<0.001$ ). Patients with history of previous C/S were 3.45 times more likely to die as those without history of C/S (OR=3.45; 95% CI: 1.09-10.8;  $p=0.034$ ). Patients with uterine infection post cesarean section were 3.47 times more likely to die as those who did not have uterine infections (OR=3.47; 95% CI: 1.13-10.62;  $P=0.023$ ). Patients who were hemodynamically unstable before surgery were 29 times more likely to die as those who were hemodynamically stable (OR=29.25; 95% CI: 3.71-230.6;  $p=0.001$ ). Patients who developed acute respiratory failure were 48.6 times more likely to die as those who did not have acute respiratory failure (OR=48.6; 95% CI: 12.1-194.2;  $p<0.001$ ).

In the multivariable logistic regression analysis, having acute respiratory failure, having coagulopathy issues (DIC) and having parity  $\leq 2$  were identified to be the real predictors of mortality among patients who undergo emergency peripartum hysterectomy (Table 6).

**Table 6: Factors associated with mortality among patients who underwent emergency peripartum hysterectomy**

| Predictors                                       | Mortality    |             | COR (95% CI)       | p     | AOR (95% CI)     | p     |
|--------------------------------------------------|--------------|-------------|--------------------|-------|------------------|-------|
|                                                  | Alive        | Died        |                    |       |                  |       |
| <b>Parity</b>                                    |              |             |                    |       |                  |       |
| ≤2                                               | 46 (79.31%)  | 12 (20.6%)  | 12.6 (2.72-58.87)  | 0.001 | 50.1 (3.6-696.3) | 0.004 |
| >2                                               | 97 (97.98%)  | 2 (2.02%)   |                    |       |                  |       |
| <b>Estimated blood loss</b>                      |              |             |                    |       |                  |       |
| ≤1000 ml                                         | 89 (89.90%)  | 10 (10.10%) | 1.51 (0.45-5.07)   | 0.499 | -                |       |
| >1000 ml                                         | 54 (93.10%)  | 4 (6.90%)   |                    |       |                  |       |
| <b>Previous history of C/S</b>                   |              |             |                    |       |                  |       |
| Yes                                              | 94 (94.95%)  | 5 (5.05%)   | 3.45 (1.09-10.8)   | 0.034 | -                |       |
| No                                               | 49 (84.48%)  | 9 (15.52%)  |                    |       |                  |       |
| <b>Type of delivery</b>                          |              |             |                    |       |                  |       |
| SVD                                              | 19 (86.36%)  | 3 (13.64%)  | 1.78 (0.45-6.96)   | 0.408 | -                |       |
| C/S                                              | 124 (91.85%) | 11 (8.15%)  |                    |       |                  |       |
| <b>Uterine infections post CS</b>                |              |             |                    |       |                  |       |
| Yes                                              | 31 (82.05%)  | 8 (17.95%)  | 3.47 (1.13-10.6)   | 0.029 | -                |       |
| No                                               | 112 (94.07%) | 6 (5.93%)   |                    |       |                  |       |
| <b>Operative time</b>                            |              |             |                    |       |                  |       |
| ≤3 hours                                         | 81 (93.10%)  | 6 (6.90%)   | 1.74 (0.57-5.28)   | 0.327 | -                |       |
| >3 hours                                         | 62 (88.57%)  | 8 (11.43%)  |                    |       |                  |       |
| <b>Hemodynamic status at the time of surgery</b> |              |             |                    |       |                  |       |
| Stable                                           | 99 (99.0%)   | 1 (1.00%)   | 29.25 (3.71-230.6) | 0.001 | -                |       |
| Unstable                                         | 44 (77.19%)  | 13 (22.81%) |                    |       |                  |       |

Table 6: Factors associated with mortality among patients who underwent emergency peripartum hysterectomy (continued)

| Predictors               | Mortality    |            | COR (95% CI)      | p      | AOR (95% CI)      | p     |
|--------------------------|--------------|------------|-------------------|--------|-------------------|-------|
|                          | Alive        | Died       |                   |        |                   |       |
| <b>ICU admission</b>     |              |            |                   |        |                   |       |
| Yes                      | 11 (57.89%)  | 8 (42.11%) | 16.0 (4.70-54.4)  | <0.001 | -                 |       |
| No                       | 132 (95.65%) | 6 (4.35%)  |                   |        |                   |       |
| <b>Coagulopathy</b>      |              |            |                   |        |                   |       |
| Yes                      | 11 (68.75%)  | 5 (31.25%) | 6.66 (1.90-23.37) | 0.003  | 38.1 (3.55-408.2) | 0.003 |
| No                       | 132 (93.62%) | 9 (6.38%)  |                   |        |                   |       |
| <b>Blood transfusion</b> |              |            |                   |        |                   |       |

|                                  |              |             |                   |         |                   |
|----------------------------------|--------------|-------------|-------------------|---------|-------------------|
| Yes                              | 126 (91.30%) | 12 (8.70%)  | 0.81 (0.16-3.93)  | 0.793   | -                 |
| No                               | 17 (89.47%)  | 2 (10.53%)  |                   |         |                   |
| <b>Acute respiratory failure</b> |              |             |                   |         |                   |
| Yes                              | 7 (41.18%)   | 10 (58.82%) | 48.6 (12.1-194.2) | <0.001  | 414.6 (24.8-6918) |
| No                               | 136 (97.14%) | 4 (2.86%)   |                   |         | <0.001            |
| <b>Mechanical ventilation</b>    |              |             |                   |         |                   |
| Yes                              | 12 (46.15%)  | 14 (53.85%) |                   | <0.001* |                   |
| No                               | 131 (100%)   | 0 (0.00%)   |                   |         |                   |
| <b>Internal organ injury</b>     |              |             |                   |         |                   |
| Yes                              | 21 (91.30%)  | 2 (8.70%)   | 0.96 (0.20-4.64)  | 0.968   | -                 |
| No                               | 122 (91.04%) | 12 (8.96%)  |                   |         |                   |
| <b>Relook laparotomy</b>         |              |             |                   |         |                   |
| Yes                              | 29 (85.29%)  | 5 (14.71%)  | 2.18 (0.68-7.01)  | 0.189   | -                 |
| No                               | 114 (92.68%) | 9 (7.32%)   |                   |         |                   |
| <b>Hospital of delivery</b>      |              |             |                   |         |                   |
| CHUK                             | 46 (95.83%)  | 2 (4.17%)   |                   |         |                   |
| Outside CHUK                     | 97 (88.99%)  | 12 (11.01%) | 2.84 (0.61-13.24) | 0.183   | -                 |

\*: Fischer's exact test used

## IV. DISCUSSION

The current study analyzed the data from 157 patients who underwent peripartum hysterectomy at CHUK in the period from 2017 to 2021, majority of them were transfers from district hospitals which can reflect that most likely they arrived in unstable clinical status which yielded peripartum hysterectomy. The current study results show that the prevalence of emergency peripartum hysterectomy among the study participants was found to be 5.0 per 1,000 deliveries. The prevalence in the current study is high compared to the prevalence rate reported from high income countries but is closer to the prevalence rate reported from the other low and middle income countries (35). Our results are in agreement with the findings from the previously done studies, which reported the prevalence of emergency peripartum hysterectomy ranging from 0.4 to 5.09 per 1000 deliveries (2-23) where the lowest prevalence was reported by Karen et al. from Ireland who reported a prevalence of 0.4 per 1000 deliveries (14) and the highest prevalence was reported by Sahin et al. from Turkey who reported a prevalence of 5.09 per 1000 deliveries (17). Sumaya et al. reported the same prevalence of peripartum hysterectomy of 5% among women with postpartum hemorrhage (24). However, the prevalence in our study is slightly high, this can be explained by the fact that our study was conducted in a tertiary teaching hospital which receives complicated cases from the District Hospitals, like previously scarred uterus and peritonitis post CS.

The current study found that 86% of the patients who underwent peripartum hysterectomy delivered by cesarean section while 14.0% of them delivered by spontaneous vaginal delivery. Our results are in accordance with the results from the study done by Meshbah et al. who reported that among their study participants, 86.2% of the patients who underwent emergency peripartum hysterectomy delivered by Cesarean section while the remaining 13.8% had vaginal deliveries (26). Our results are also supported by the findings from the study done by Thomas et al who reported that Cesarean delivery in the current pregnancy, previous cesarean delivery and high parity were the factors of peripartum hysterectomy (31). The findings from another study done by Kacmar et al. also supports our finding as they reported that cesarean delivery was found to be a significant risk factor of peripartum and postpartum hysterectomy (32). Our finding is slightly high compared to the finding from the study done by Habek et al. who reported that among 17 cases of emergency peripartum hysterectomy, 29.4% were done after vaginal deliveries and 70.6% were done after cesarean deliveries (27). High cesarean section rate is explained by the fact that in our country most repeat CS are done in tertiary hospitals where Obstetricians are present.

Our results showed that 20.4% of the patients had history of antepartum hemorrhage which was reported to be among the common risk factor of emergency peripartum hysterectomy as reported by Manjula et al. (21). Our study also found that of all the participants who underwent peripartum hysterectomy, 99 patients (63.0%) had history of previous Cesarean delivery which is supported by the findings from other studies which reported that previous Cesarean delivery, abnormal placentation and peripartum hemorrhage are the risk factors of emergency peripartum hysterectomy (21).

The current study found that of all the patients who underwent peripartum hysterectomy, 46 patients (29.3%) had placenta previa/accrete, 17.83% had uterine atony, 16.56% of patients had uterine rupture, 6.37% had placenta abruption, and 5.1% had extending cervical tear/lacerations. Our results are in accordance with the results from the study by Sumaya et al. who reported that placenta previa and placenta accreta (abnormal placentation) were the most common indication of emergency peripartum hysterectomy among their study participants (24). The findings from the study by Orbach et al also support our findings as they reported that placenta previa, placenta accreta, uterine rupture, postpartum hemorrhage, cervical tear were the most common indications of emergency peripartum hysterectomy among their participants (30) and by the study by Zeba et

al. in Bangladesh (25). Furkan et al. reported that abnormal placentation (placenta accreta and placenta previa), uterine rupture, and uterine atony were the most common indications of emergency peripartum hysterectomy (11). However, our study showed that uterine infections post cesarean deliveries are associated with peripartum hysterectomy. Our finding is in accordance with the findings reported by previous researchers where Bodelon et al. (38), Wandabwa et al. (33) and Dorigon et al. (39) reported that uterine infections were significantly associated with peripartum hysterectomy among their study participants.

The results of analysis in our study showed that the median estimate blood loss was 1000 ml (range 200 to 4600 ml) and of all the participants who underwent emergency peripartum hysterectomy, 87.9% of them were transfused with a median number of 5 units of blood components (range 2 to 39 units). Our results are supported by the results from other studies which reported that peripartum hysterectomies are associated with high blood loss that required blood transfusion. The findings from the study by Yucel et al. reported that transfusion was required in 88% of the patients (18). Another study done by Andrea et al reported that 79% of the patients who underwent peripartum hysterectomy required transfusion (20). Meshbah et al. reported slightly different findings from their study where all women (100%) who underwent peripartum hysterectomy required blood transfusion (26).

The current study found that of all the 157 patients who underwent peripartum hysterectomy, 19 patients (12.1%) were admitted in ICU. The frequency of ICU admission in our study is slightly low compared to the finding from the study done by Mesbah et al. who reported that 17.2% of women who underwent peripartum hysterectomy required ICU admission (26) and compared to the rate of ICU admission reported by Wandabwa et al. who reported that 39.7% of patients who underwent emergency hysterectomy were admitted in ICU (33). The lower rate of ICU admission in our study was due to a shortage of ICU beds in the hospital which are full most of the time making it hard for everyone who needs an ICU bed to obtain it.

The results from the current study showed that 14.65% of the total patients experienced internal organ injuries, 17.2% developed post-operative wound infections, 21.66% underwent relook laparotomy, 10.9% had coagulopathy issues (DIC), 10.83% developed acute respiratory failure

patients (1.27%) developed pulmonary embolism. The rate of coagulopathy among our patients is low compared to the results from the study done by Tarik who reported that 53% of the patients developed coagulopathy (DIC) (5). Another study reported that bladder injury was a common complication reported from different studies (30). The rate of relook laparotomy in the current study (21.6%) was high compared to the frequency of relook laparotomy in the study by Wandebwa who reported that 15% of the patients underwent relook laparotomy (33).

Considering the overall final outcome of patients who underwent peripartum hysterectomy, the results of analysis in our study showed a mortality rate of 8.92% (14 of 157 patients). Our results are almost the same as the findings from the study done by Manjula et al. who reported 1 death in 13 peripartum hysterectomies (7.69%). Our finding was high compared to the findings from Cara et al. in their systematic review who reported that the mean percentage of maternal deaths from peripartum hysterectomy was 3.0% (19). The mortality rate from our study was low compared to the findings from the study by Andrea who reported that the fatality rate was 10.3% (20). Our finding was also low compared to the finding from the study by Monday who reported the case fatality rate of 14.3% (10), Mesbah et al. who reported that 13.8% of patients who underwent emergency hysterectomy died (26), Okogbenin et al. who reported the mortality rate of 12.5% (2), Nwobodo and Nnadi from Nigeria who reported the mortality rate of 12.1% among patients who underwent emergency hysterectomy (27) and Umezurike from Nigeria who reported the mortality rate of 23.8% (26). Patients who had hysterectomy for uterine infection were 3.5 times more likely to die compared to those who had other risk factors. This finding is supported by other studies that evaluated causes of maternal near-miss and mortality in Rwanda. Rulisa et al. reported that the majority of severe obstetric morbidity and mortality resulted from sepsis/peritonitis primarily complicating cesarean section (40,41).

## **V. CONCLUSION AND RECOMMENDATIONS**

### **5.1. Conclusion**

The prevalence of emergency peripartum hysterectomy among women delivering at CHUK was found to be 5.0 per 1000 deliveries. In our settings, peripartum hysterectomy carries significant maternal morbidity and mortality. Cesarean section in current pregnancy and previous cesarean section history were independent strong risk factors of peripartum hysterectomy. Abnormal placentation (placenta accreta and placenta previa) and uterine infection after c/section are the 2 leading causes of peripartum hysterectomy. Therefore, there is need for further enhancement of primary cesarean section prevention strategies and the promotion of safe cesarean section practice.

### **5.2. Recommendations**

- ✓ Health care providers should make an effort in reducing the rate of Cesarean section.
- ✓ Medical doctors should identify the common risk factors of peripartum hysterectomy among pregnant women during their routine antenatal consultation in order to prepare the delivery.
- ✓ Early decision or/and intervention should be made to minimize morbidity and mortality.
- ✓ Safe Cesarean section should be the aim of every Health care provider to minimize post CS uterine infection

## References

1. Castaneda S, Karrison T, Cibils LA. Peripartum hysterectomy. *J Perinat Med*. 2000;28:472–81.
2. Bolnga JW, Mola GDL, Lufele E, Laman M, Ao P, Sapau W, et al. Mortality and morbidity after emergency peripartum hysterectomy in a provincial referral hospital in Papua New Guinea : A seven-year audit. *ANZ J Obstet Gynecol*. 2020;1–6.
3. Karayalc R, Mollamahmutog L. Emergency peripartum hysterectomy. *Arch Argent Pediatr*. 2011;283:723–7.
4. Serag I, Ihab A, Gomaa A. Incidence of emergency peripartum hysterectomy in Ain-shams University Maternity Hospital , Egypt : a retrospective study. *Arch Gynecol Obstet*. 2014;1–6.
5. Chaudhary V, Singh M, Nain S, Reena FNU, Aggarwal K, Biswas R, et al. Incidence , Management and Outcomes in Women Undergoing Peripartum Hysterectomy in a Tertiary Care Centre in India. *Cureus*. 2021;13(3):e14171.
6. Whiteman MK, Kuklina E, Hillis SD, Jamieson DJ. Incidence and Determinants of Peripartum Hysterectomy. *Am Coll Obstet Gynecol*. 2006;108(6):1486–92.
7. Okogbenin SA, Gharoro EP, Otoide VO, Okonta PI. Obstetric hysterectomy : fifteen years ' experience in a Nigerian tertiary centre. *J Obstet Gynecol*. 2003;23(4):356–9.
8. Huang Y, Alton MED, Friedman AM. Risk for Peripartum Hysterectomy and Center Hysterectomy and Delivery Volume. *Obstet Gynecol*. 2017;128(6):1215–24.
9. Hsu Y, Kung F, Roan C, Ou C, Hsu T. E MERGENCY P ERIPARTUM H YSTERECTOMY DUE TO P LACENTA P REVIA / A CCRETA : 10 Y EARS ' E XPERIENCE. *Taiwan J Obstet Gynecol* [Internet]. 2004;43(4):206–10. Available from: [http://dx.doi.org/10.1016/S1028-4559\(09\)60087-5](http://dx.doi.org/10.1016/S1028-4559(09)60087-5)
10. Abasiattai AM, Umoiyoho AJ, Utuk NM, Inyang-etoh EC, Asuquo P. Emergency peripartum hysterectomy in a tertiary hospital in southern Nigeria. *Pan Afr Med J*. 2013;8688:1–7.
11. Kayabasoglu F, Guzin K, Aydogdu S, Sezginsoy S, Turkgeldi L, Gunduz G. Emergency peripartum hysterectomy in a tertiary Istanbul hospital. *Arch Gynecol Obstet*. 2008;278:251–6.
12. Bhattacharjee DOSÆP. Emergency peripartum hysterectomy in a tertiary London hospital. *Arch Gynecol Obstet*. 2005;271(January 1993):154–9.

13. Medicine M, Sahin S, Guzin K, Erog M, Kayabasoglu F, Serdar M. Emergency peripartum hysterectomy: our 12-year experience ~. Arch Gynecol Obstet. 2013;2–7.
14. Flood KM, Said S, Geary M, Robson M, Fitzpatrick C, Malone FD. Changing trends in peripartum hysterectomy over the last 4 decades. Am J Obstet Gynecol [Internet]. 2009;200(6):632.e1-632.e6. Available from: <http://dx.doi.org/10.1016/j.ajog.2009.02.001>
15. Fatima M, Kasi PM, Baloch SN, Afghan AK. Experience of Emergency Peripartum Hysterectomies at a Tertiary Care Hospital in Quetta , Pakistan. Int Sch Res Netw Obstet Gynecol. 2011;2011:2–5.
16. Cho GJ, Kim LY, Hong H, Lee CE, Hong S, Oh M, et al. Trends in the Rates of Peripartum Hysterectomy and Uterine Artery Embolization. PLoS One. 2013;8(4):1–5.
17. Zeteroglu S, Ustun Y, Engin-ustun Y, Sahin G, Kamacı M. Peripartum hysterectomy in a teaching hospital in the eastern region of Turkey. Eur J Obstet Gynecol Reprod Biol. 2005;120:57–62.
18. Yucel O, Ozdemir I, Asl NY. Emergency peripartum hysterectomy : a 9-year review. Arch Gynecol Obstet. 2006;274:84–7.
19. Obstet AG, De CZ, Erika C, Kathleen LT, Nembhard WN. Cesarean section and the risk of emergency peripartum hysterectomy in high-income countries : a systematic review. Arch Gynecol Obstet. 2015;
20. Pembe AB, Wangwe PJT, Massawe SN. Emergency peripartum hysterectomies at Muhimbili National Hospital , Tanzania : a review of cases from 2003 to 2007. Tanzan J Health Res. 2012;14(1):1–10.
21. Manjula SK, Katakam S, Shobha G. Emergency peripartum hysterectomy : a 7-year review at tertiary hospital. Int J Reprod Conception, Obstet Gynecol. 2019;8(9):3812–6.
22. Awan N, Bennett MJ, Walters WAW. Emergency peripartum hysterectomy : A 10-year review at the Royal Hospital for Women , Sydney. Aust New Zeal J Obstet Gynecol. 2011;51:210–5.
23. Kastner ES, Figueroa R, Garry D, Maulik D. Emergency Peripartum Hysterectomy : Experience at a Community Teaching Hospital. Am Coll Obstet Gynecol. 2002;99(6):971–5.
24. Huque S, Roberts I, Fawole B, Chaudhri R, Arulkumaran S. Risk factors for peripartum hysterectomy among women with postpartum haemorrhage : analysis of data from the WOMAN

- trial. BMC Pregnancy Childbirth. 2018;1–8.
25. Zeba D, Biswas T, Das SR, Roy B, Khair MA. Emergency Peripartum Hysterectomy: A Life Saving Procedure in Obstetrics. Faridpur Med Coll J. 2018;13(1):12–6.
  26. Anke Heitkamp; Jorrit Seinstra; Thomas van den Akker; Linda Vollmer; Stefan Gebhardt; Jos van Roosmalen; Johanna I. de. A district-wide population-based descriptive study of emergency peripartum.pdf. Wiley. 2018;146:103–9.
  27. Nwobodo E, Nnadi D. Emergency obstetric hysterectomy in a tertiary hospital in Sokoto, Nigeria. Ann Med Health Sci Res. 2012;2(1):37.
  28. Glaze, s; Ekwilanga, P; Roberts G. Peripartum Hysterectomy:1999 to 2006. Obstet Gynecol. 2008;111:240–1.
  29. Mesbah Y, Ragab A, Fialla E, Barakat R, Badawy A, Ragab A. Emergency peripartum hysterectomy : The experience of a tertiary referral hospital. Middle East Fertil Soc J [Internet]. 2013;18(2):89–93. Available from: <http://dx.doi.org/10.1016/j.mefs.2012.10.006>
  30. Habek D. Emergency Peripartum Hysterectomy in a Tertiary Obstetric Center : 8-Year Evaluation. Fetal Diagn Ther. 2007;22:139–42.
  31. Saxena S V, Bagga R, Jain V, Gopalan S. Emergency peripartum hysterectomy. Int J Gynecol Obstet. 2004;85:172–3.
  32. Campbell ,Sarah M; Manning Edel, Paul; Greene RA. Title: Peripartum hysterectomy incidence, risk factors and clinical characteristics in Ireland. Eur J Obstet Gynecol Reprod Biol. 2016;
  33. Jn W, Businge C, Ml M, Kiondo P. Peripartum hysterectomy : two years experience at Nelson Mandela Academic hospital , Mthatha , Eastern Cape South Africa. :469–74.
  34. Orbach ADI, Levy A, Wiznitzer A, Mazor M, Holcberg G, Sheiner E. Peripartum cesarean hysterectomy : critical analysis of risk factors and trends over the years. J Matern Neonatal Med. 2011;24(February 2010):480–4.
  35. Review AS, Akker T Van Den, Brobbel C. Outcomes of Emergency Peripartum Hysterectomy Worldwide. Obstet Gynecol. 2016;128(6):1281–94.
  36. Kacmar J, Bhimani L, Boyd M, Shah-hosseini R, Peipert JF. Route of Delivery as a Risk Factor for Emergent Peripartum Hysterectomy : A Case – Control Study. Obstet Gynecol.

- 2003;102(1):141–5.
37. Zamzami TYY. Indication of emergency peripartum hysterectomy : review of 17 cases. Arch Gynecol Obstet. 2003;268:131–5.
  38. Lin FR, Niparko JK, Ferrucci and L. Factors Associated With Peripartum Hysterectomy. Bone [Internet]. 2014;23(1):1–7. Available from:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3624763/pdf/nihms412728.pdf>
  39. Dorigon A, Martins-Costa SH, Ramos JGL. Peripartum Hysterectomies over a Fifteen-year Period. Rev Bras Ginecol e Obstet. 2021;43(1):3–8.
  40. Rulisa S, Umuziranenge I, Small M, van Roosmalen J. Maternal near miss and mortality in a tertiary care hospital in Rwanda. BMC Pregnancy Childbirth. 2015;15(1):1–7.
  41. Rulisa S, Ntihinyurwa P, Ntirushwa D, Wong A, Olufolabi A. Causes of Maternal Mortality in Rwanda, 2017-2019. Obstet Gynecol. 2021;138(4):552–6.

## ANNEXES

### Data collection tool

#### 1. Demographic information

|                       |                                                                                                         |
|-----------------------|---------------------------------------------------------------------------------------------------------|
| Record ID             | .....                                                                                                   |
| Age in years          | .....years                                                                                              |
| Year of delivery      | .....                                                                                                   |
| Marital status        | Married 1<br>Single 2<br>Divorced 3                                                                     |
| Origin                | Kigali City 1<br>Eastern Province 2<br>Western Province 3<br>Northern Province 4<br>Southern Province 5 |
| Profession            | Farmer 1<br>Business 2<br>Other 3<br>If other, specify.....                                             |
| Religion              | Catholic<br>Protestant<br>Muslim<br>None                                                                |
| Education             | None 1<br>Primary 2<br>Secondary 3<br>University 4                                                      |
| Socio-economic status | Ubudehe 1 1<br>Ubudehe 2 2<br>Ubudehe 3 3<br>Ubudehe 4 4                                                |
| Smoking               | Yes 1<br>No 2                                                                                           |
| Alcohol consumption   | Yes 1<br>No 2                                                                                           |

## 2. Anthropometric factors

|        |          |
|--------|----------|
| Weight | ..... kg |
| Height | ..... cm |
| BMI    | .....    |

## 3. Clinical characteristics

|                                  |                                        |
|----------------------------------|----------------------------------------|
| Parity                           | .....                                  |
| Gestation                        | .....                                  |
| Antenatal visit during pregnancy | Yes<br>No                              |
| Type of pregnancy                | Singleton 1<br>Multiple 2              |
| Gestational age in weeks         | ..... weeks                            |
| Previous history of C/S          | Yes 1<br>No 2                          |
|                                  | Number of scars.....                   |
| Previous curettage               | Yes 1<br>No 2                          |
| Placenta previa                  | Yes 1<br>No 2                          |
| Eclampsia/pre-eclampsia          | Yes 1<br>No 2                          |
| Uterine atony                    | Yes 1<br>No 2                          |
| Uterine rupture                  | Yes 1<br>No 2                          |
| Hospital of delivery             | CHUK 1<br>Referred (Other than CHUK) 2 |
| Type of delivery                 | Vaginal 1<br>C/S 2                     |
| Placenta accrete/increta         | Yes 1<br>No 2                          |

|                                                    |               |
|----------------------------------------------------|---------------|
|                                                    |               |
| Placenta abruptio                                  | Yes 1<br>No 2 |
| History of other uterine surgeries like myomectomy | Yes 1<br>No 2 |
| Uterotonics given for prophylaxis                  | Yes 1<br>No 2 |
| Full delivery of placenta                          | Yes 1<br>No 2 |
| History of gestational diabetes                    | Yes 1<br>No 2 |
| Cervical tear/laceration                           | Yes 1<br>No 2 |
| Uterine fibroids                                   | Yes 1<br>No 2 |
| Uterine infections post CS                         | Yes 1<br>No 2 |
| History of chronic hypertension                    | Yes 1<br>No 2 |
| History of gestational hypertension                | Yes 1<br>No 2 |
| History of antepartum hemorrhage                   | Yes 1<br>No 2 |
| History of PPH on previous pregnancies             | Yes 1<br>No 2 |
| History of induction of labor                      | Yes 1<br>No 2 |
| History of abdomen larger for gestational age      | Yes 1<br>No 2 |
| Blood transfusion on this delivery                 | Yes 1<br>No 2 |
| Rupture of membranes >24 hours                     | Yes 1<br>No 2 |

#### 4. Management, outcome and complications

|                                        |                                   |
|----------------------------------------|-----------------------------------|
| Type of hysterectomy                   | TAH 1<br>STH 2                    |
| Mean operative time                    | .....minutes                      |
| Estimated Blood Loss                   | .....cc                           |
| ICU admission                          | Yes 1<br>No 2                     |
| Length of stay in ICU                  | ..... days                        |
| Coagulopathy                           | Yes 1<br>No 2                     |
| Blood transfusion                      | Yes 1<br>No 2                     |
| If yes, number of units                | .....U of PRBC, Other.....        |
| Acute respiratory failure              | Yes 1<br>No 2                     |
| Mechanical ventilation                 | Yes<br>No 2<br>How many days..... |
| Bladder injury                         | Yes 1<br>No 2                     |
| Post-operative wound infection/ sepsis | Yes 1<br>No 2                     |
| Venous thromboembolism (DVT)           | Yes 1<br>No 2                     |
| Pulmonary embolism                     | Yes 1<br>No 2                     |
| Re-laparotomy                          | Yes 1<br>No 2                     |
| Salpingectomy                          | Yes 1<br>No 2                     |
| Length of hospital stay in days        | ..... Days                        |
| Maternal death                         | Yes 1<br>No 2                     |
| If yes, cause of death                 | .....<br>.....                    |

## IRB approval



UNIVERSITY of  
RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

### CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 9<sup>th</sup> /March /2022

Dr Sibomana Joseph  
School of Medicine and Pharmacy, UR

#### Approval Notice: No 191/CMHS IRB/2022

Your Project Title "*Prevalence, Risk Factors and Outcomes of Peripartum Hysterectomy AT CHUK*" "*A Retrospective Study From 2017-2021*" has been evaluated by CMHS Institutional Review Board.

| Name of Members             | Institute            | Involved in the decision |             |                               |
|-----------------------------|----------------------|--------------------------|-------------|-------------------------------|
|                             |                      | Yes                      | No (Reason) |                               |
|                             |                      |                          | Absent      | Withdrawn from the proceeding |
| Prof Kato J. Njunwa         | UR-CMHS              | X                        |             |                               |
| Prof 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           |                               |
| Prof Gishoma Darius         | UR-CMHS              | X                        |             |                               |
| Prof 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 7<sup>th</sup> March 2022, **Approval has been granted to your study.**

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

Email: [researchcenter@ur.ac.rw](mailto:researchcenter@ur.ac.rw)

P.O Box 3286 Kigali, Rwanda

[www.ur.ac.rw](http://www.ur.ac.rw)

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 9<sup>th</sup> March 2022

Expiration date: The 9<sup>th</sup> March 2023

**Assoc. Prof Stefan Jansen**  
**Ag. 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



CENTRE HOSPITALIER UNIVERSITAIRE  
UNIVERSITY TEACHING HOSPITAL

Ethics Committee / Comité d'éthique

22<sup>nd</sup> Apr. 2022

Ref.: EC/CHUK/068/2022

**Review Approval Notice**

Dear SIBOMANA JOSEPH,

Your research project: **"PREVALENCE, RISK FACTORS AND OUTCOMES OF PERIPARTUM HYSTERECTOMY AT KIGALI UNIVERSITY TEACHING HOSPITAL: A retrospective study from 2017 to 2021 "**

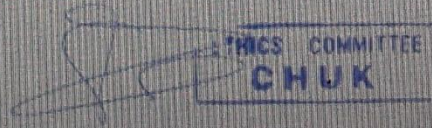
During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 22<sup>nd</sup> Apr. 2022 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication by using this link: [www.chuk.rw/research/fullreport/?appid=560&&chuk](http://www.chuk.rw/research/fullreport/?appid=560&&chuk).

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

**Dr Emmanuel Rusingiza Kamanzi**  
The Chairperson, Ethics Committee,  
University Teaching Hospital of Kigali



Date:04/01/2023

Note

The Study Entitled "PREVALENCE, RISK FACTORS AND OUTCOMES OF PERIPARTUM HYSTERECTOMY AT KIGALI UNIVERSITY TEACHING HOSPITAL: A retrospective study from 2017 to 2021", is approved by the Directorate of Research and Innovation for submission in UR\_CMHS Library . The plagiarism report is 14% with the following parameters:

Exclude quote: on

Exclude bibliography : on

Exclude matches: <5 words

Sincerely

A handwritten signature in blue ink, appearing to read 'Emile Nisingizwe', is written over a light yellow rectangular background.

Emile Nisingizwe

Research and Innovation Officer, CMHS