

Post-Delivery Complications and Quality of Birth Practice in District Hospitals in Rwanda: A cross-Sectional Study

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ABSTRACT

BACKGROUND: The maternal mortality in Rwanda has decreased dramatically in the last 18 years but still remains high. Little is known about the post-delivery complications and the quality of care in district hospitals.

This study aims to determine the outcomes of complications of deliveries and the quality of childbirth in district hospitals referring to CHUK.

METHODS: A retrospective review of all obstetric patients with post-delivery complications was conducted for a 13-month period from June 2016 to July 2017. We collected data on patients age, insurance, length of stay, type of complications, and in hospital mortality. The quality of care in district hospitals was evaluated by using a follow up questionnaire-based survey.

RESULTS: 340 women were transferred with 18.2% mortality. The most common cause of post vaginal complications was PPH (85.6%) due to atony (33%), tear (32%), and retained placenta (16%). On the other hand, the caesarean section (CS) complications were mainly due to peritonitis (63.8%) and PPH (30.3%). Age above 27 years, low social economic status, and length of stay of < 9 days were associated with mortality with p-value < 0.05. Gaps in quality of care were found for caesarean section, emergency care for maternal complications, preeclampsia, and use of guidelines and protocol.

CONCLUSION: Despite a tremendous decrease in maternal mortality in Rwanda, post-delivery complications and deaths are still high amongst women transferred from district hospitals. Effective interventions to improve the quality of maternal care focusing on emergency obstetrical care and CS safety may improve the outcome.

Keywords: Quality of Maternal Care, Post-Delivery Complications, District Hospital

INTRODUCTION

Reducing maternal mortality is a major focus worldwide. It was estimated that about 830 maternal deaths occurred every day around the globe in 2015, which is roughly 303 000 per year; with 95% of the deaths having occurred in low-income countries and over 60% in Sub Saharan Africa [1].

Globally, 75% of maternal deaths are caused by the following five complications: hemorrhage, infections, preeclampsia and eclampsia, obstructed labor, and abortions [1]. This is similar to the situation in Rwanda where these five common causes

of maternal mortality in Rwanda have remained the same for the last six years. In 2016, Post-Partum Hemorrhage (PPH) and sepsis accounted for 46% of maternal deaths in Rwanda; more than 70% of deaths occurred in teaching and district hospitals, and 64% of deaths occurred during the postpartum period [2].

Rwanda has achieved the Millennium Development Goal (MDG) 5 by decreasing the maternal mortality rate (MMR) dramatically from 1071 in the year 2000 to 210 per 100,000 live births in 2015 [3,4]. However, this is still unacceptably high in comparison to the MMR in high income countries [1]. There is evidence that most deaths in tertiary hospitals are associated with problems that began in

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Received: : 04th May 2019; **Initial decision given:** 13th May 2020; **Revised manuscript received:** 26th May 2020; **Accepted:** 14th August 2020

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ISSN: 2079-097X (print); 2410-8626 (online)

Citation for this article: E. Tuyishime; J. P. Mvukiyehe; V. K. Cubaka et al. Post-delivery complications and quality of birth practice in district hospitals in Rwanda: A cross sectional study. Rwanda Medical Journal, Vol. 77, no. 3, pp. 9-15, 2020.

district hospitals. In fact, in 2015, 96% of maternal deaths and near-misses at the main teaching hospital in Kigali (CHUK) occurred after a transfer from district hospitals (DHs) and were mostly due to infections (32%) and PPH (20%). Furthermore, most of these complications were direct obstetric complications [2].

These figures call for effective interventions to improve the safety of deliveries in district hospitals in Rwanda. Indeed, a study done in the United States found that maternal deaths caused by PPH and infections are highly preventable through training and the use of guidelines to screen for risk factors and to manage complications early (by 93% and 43% respectively) [5].

Aims: There are gaps in the knowledge of the outcomes of complications of deliveries and the quality of childbirth in Rwandan district hospitals. Therefore, this study aims to determine the outcomes of complications of deliveries in district hospitals referring to CHUK, to determine the quality of childbirth in selected district hospitals, and to provide recommendations on key interventions needed in order to improve the quality of childbirth in district hospitals in Rwanda.

METHODOLOGY

Study design and setting: A retrospective review of all obstetric patients with post-delivery complications was conducted for a 13-month period from June 2016 to July 2017. All patients from the 24 district hospitals which were referring to CHUK during the study period were included in the study. Data on patients age, insurance, length of stay, type of complications, and in-hospital mortality were collected. The quality of care in district hospitals was evaluated by introducing a follow up questionnaire-based survey with staff from nine district hospitals. The targeted hospitals are as follows: two from Northern Province (Ngarama, Kiziguro), one from Kigali (Masaka), and six from Eastern Province (Rwamagana, Rwinkwavu, Nyamata, Nyagatare, Kibungo, Gahini).

Selection of study participants

Inclusion criteria: Post-delivery complications transferred to CHUK from district hospitals (DHs) during the study. DHs transferring to CHUK.

Exclusion criteria: Post-delivery complications that started at CHUK.

DHs not transferring to CHUK during the study period.

Sampling/enrolment: As the common causes of maternal morbidity and mortality have been the same in the previous five years preceding this study, a purposive sampling method was used to review available data of post-delivery complications for a 13-month period. In addition, another purposive sampling method was used to evaluate the quality of maternal care in DHs where concurrently the principal investigator was conducting a simulation-based course during the study period. Questionnaires were given immediately before the course.

Post-delivery complications and quality of birth practice

Data collection: A data collection sheet on the complications of pregnancy was designed using the International Classification of Disease (ICD) 10 criteria for direct and indirect maternal complications. Complications that occurred in CHUK after referral during the study period were identified from the patients' charts.

In order to understand the quality of maternity care in DHs, questionnaires were sent to key informants (doctor, midwife or non-physician anesthetist) in the selected nine hospitals. The questionnaire used was adapted by the research team from the 2014 World Health Organization Hospital care for mothers and newborns quality assessment and improvement tool [6].

Ten criteria for quality of maternal care were assessed with the target to have at least 80% of hospitals meet all criteria. Two different staff from the same hospital completed the survey separately to ensure reliability of their responses; they met to compare their results to reach a consensus for each answer and then they gave their final filled questionnaire to the data collector.

Sample size calculation: As this was a retrospective study followed by a survey to describe the baseline outcome of post-delivery complications, the sample size calculation was not necessary.

Data analysis: The data was stored in Microsoft Excel. Descriptive statistics were used to describe complications of deliveries and the quality of childbirth in district hospitals using frequencies and percentages for categorical data, and mean and standard deviations for continuous data. A chi-squared test was used to determine factors associated with mortality. SPSS software version 24 was used for analysis.

Ethical consideration: Ethical approval was granted by the Rwanda National Ethics Committee (RNEC) with reference number (No. 205/RNEC/2018). The consent form was signed by participants before completing the survey.

RESULTS

Participants: Among the 340 patients referred to CHUK for post-delivery complications, the median age was 29 years (Sd=7.1). The majority of patients had insurance (83%), the median length of stay was 14.3 days (Sd=16.7), most complications were following CS (79.7%), most of the deaths were following CS (14.4%), and the overall mortality was 18.2% (Table 1).

During analysis with a chi-squared test to determine the difference between patients who died and those who survived, the results showed that age >27 years, low socio-economic status, and length of stay were associated with mortality with p-values of 0.0001, 0.049, and 0.0001 respectively. Origin, insurance, and type of complication by delivery were not associated with mortality with p-values of 0.350, 0.874, and 0.884 respectively (Table 2).

Out of 340 complications, 80% followed caesarean section (CS) and 20% followed vaginal delivery. Among post vaginal delivery complications, the most common cause was PPH (85.6%) mainly due to

Table 1: Sociodemographic and clinical characteristics of obstetric patients with complications referred from district hospitals to the University Teaching Hospital of Kigali

Variable	N=340 (%)
Age	
<18	6 (1.7)
18-26	111(32.6)
27-35	156(45.9)
>35	67(19.7)
Mean (Sd)	29(7.1)
Origin	
Kigali	125(36.8)
Out of Kigali	215(63.2)
Social economic status	
Low	204(60)
Moderate or High	21(6.2)
Missing	115(33.8)
Insurance	
Yes	282 (83)
No	58 (17)
Length of stay (days)	
<3	83 (24.4)
4-9	103 (30.3)
>9	154 (45.3)
Mean (Sd)	14.3 (16.7)
Complications	
Post vaginal	69 (20.3)
Post caesarean	271 (79.7)
Mortality	
Post vaginal	13 (3.8)
Post caesarean	49 (14.4)
Overall mortality	62 (18.2)

atony (33%), tear (32%), and retained placenta (16%). In comparison, the CS complications were mainly due to post CS peritonitis (63.8%) and PPH (30.3%) (Table 2). Among the nine hospitals included in the survey for quality of maternity care, Nyagatare and Nyamata have the highest volume of deliveries with 600 and 570 deliveries respectively. Masaka and Nyagatare had the bigger number of complications respectively 26 and 22 (Table 3).

Among the ten criteria for quality of maternal care assessed in nine DHs, four criteria were not met by the required target (80%) in all hospitals.

Those criteria for quality of maternal care included caesarean section, emergency care for maternal complications, preeclampsia, and use of guidelines and protocols, which were met by 54%, 54.5%, 71.1% and 72.7% of hospitals respectively (Supplementary data).

Table 2: Factors associated with mortality among obstetric patients with complications referred from district hospitals to the University Teaching Hospital of Kigali

Variable	Total N=340, N (%)	Mortality (N=62) (Yes)	Mortality (N=278) (No)	P value
Age				0.0001*
<18	6 (1.7)	1(1.6)	5(1.8)	
18-26	111(32.6)	10(16.1)	101(36.3)	
27-35	156(45.9)	28(45.2)	128(46)	
>35	67(19.7)	23(37.1)	44(15.8)	
Origin				0.350
Kigali	125(36.8)	26(41.9)	99(36.6)	
Out of Kigali	215(63.2)	36(58.1)	179(64.4)	
Social economic status				0.049*
Low	204(60)	33(53.2)	171(61.5)	
Moderate or High	21(6.2)	1(1.6)	20(7.2)	
Missing	115(33.8)	28(45.2)	87(31.3)	
Insurance				0.874
Yes	282 (83)	51(82.3)	231(83.1)	
No	58 (17)	11(17.7)	47(16.9)	
Length of stay (days)				0.0001*
<3	83 (24.4)	26(41.9)	57(20.5)	
4-9	103 (30.3)	27(43.6)	76(27.3)	
>9	154 (45.3)	9(14.5)	145(52.2)	
Complications				0.884
Post vaginal	69 (20.3)	13(21)	56(20.1)	
PPH/Atony	23 (33.3)	3(4.8)	20(7.2)	
PPH/Perineal tear	17 (24.6)	6 (9.7)	11(4)	
PPH/Cervical tear	5 (7.2)	1 (1.6)	4(1.4)	
PPH/Retained placenta	11 (15.9)	3 (4.8)	8(2.9)	
Endometritis	6 (8.7)	0(0)	6(2.2)	
Preeclampsia/eclampsia	5 (2.9)	0(0)	5(1.8)	
Malaria	1 (1.4)	0(0)	1(0.4)	
Bartholin's abscess	1 (1.4)	0(0)	1(0.4)	
Post caesarean	271(79.7)	49(79)	222(79.9)	
Post CS peritonitis	173 (63.8)	25 (40.3)	148(53.2)	
PPH	82 (30.3)	17 (27.4)	65(23.4)	
Preeclampsia/eclampsia	11 (4.1)	4 (6.4)	7(2.5)	
Pulmonary embolism	2 (0.6)	2 (3.2)	0(0)	
Acute Kidney Injury	1 (0.4)	0(0)	0(0)	
Congestive heart failure	1 (0.4)	1 (1.6)	0(0)	
Pneumonia	1 (0.4)	0(0)	0(0)	

Table 3: Capacity and outcome of patients referred from DHs to CHUK from the nine hospitals included in the survey for quality of maternity care

Criteria	Gahini	Kibungo	Kiziguro	Masaka	Ngarama	Nyagatare	Nyamata	Rwamagana	Rwinkwavu
Staff									
Midwives	13	27	10	24	11	20	15	12	10
General practitioners	11	14	10	15	11	11	13	14	15
Anaesthetists	5	5	5	8	3	4	5	5	3
Obstetricians	0	1	0	0	0	0	0	1	1
Paediatricians	0	1	0	1	0	0	0	1	1
Deliveries per month									
Vaginal deliveries	90	250	300	300	130	480	420	200	210
Caesarean sections	40	160	100	170	60	120	150	130	90
Total	130	410	400	470	190	600	570	330	300
Average quality score for 66 criteria (%)	89	66	68	92	80	77	72	89	64
Number of complications referred	5	10	13	26	9	22	15	13	7
Mortality N (%)	0 (0)	2 (20)	3 (23)	8 (30.7)	1 (11)	2 (9)	5 (33.3)	4 (30.7)	3 (42.8)

*Average quality score = (Sum of scores of each criteria per hospital/Total score)*100*

At the end of the survey, participants provided recommendations in order to improve the quality of maternal care in DHs;

these included a regular CPD program, availability of equipment and drugs, and use of guidelines and protocols (Table 4).

Table 4: Actions needed in order to improve quality of maternal care and prevent complications in district hospitals

Hospital staff	Hospital administration	Referral hospital	Ministry of Health
Participation in accreditation activities	Achieve accreditation requirements Offer CPD opportunities	Minimize delay to authorize transfers,	Regular meeting with hospital staff
Participation in CPD opportunities	Ensure wellness of the staff	Regular feedback, mentorship, and CPD opportunities	Fund CPD opportunities and ensure professional growth for staff
Prevention of burnout	Ensure adequate number of staffs, availability of adequate equipment, and compliance to international standards	Guide DH staff via phone call in case of emergencies	Ensure adequate number of staffs, availability of adequate equipment, and compliance to international standards
Improve communication, team work, and timely call for help	Ensure motivation and support of staff, and provide salary on time	Support the use of guidelines, algorithms, and checklists for management of emergencies	Ensure motivation, financial stability, and good work environment for staff, and increase salary
Follow hospital standards and participate in staff meeting	Ensure availability and use of guidelines, algorithms, and checklists for management of emergencies		Ensure availability and use of guidelines, algorithms, and checklists for management of emergencies
Do regular auto-evaluation			

DISCUSSION

Our study aimed to determine the outcomes of complications of deliveries and the quality of childbirth in the selected district hospitals of Rwanda.

Our findings demonstrated a difference in complication rate following caesarean section (CS) and vaginal delivery respec-

tively at 80% and 20%. These findings are consistent with the results from other studies: studies carried out in France in 2006, South Africa in 2013, and US in 2016 found more than a three-fold increase in mortality following CS in comparison to vaginal delivery [7-9].

Our findings demonstrated that the most common cause of vaginal complications was PPH, estimated at 85.6% which was mainly due to

atony (33%), tear (32%), and retained placenta (16%). In addition, all post vaginal delivery deaths were due to PPH. This is similar to the findings from other studies done previously where PPH caused between 30% and 57% of complications following delivery [2,10]. On the other hand, the post caesarean section complications and deaths were mainly due to post CS peritonitis (64%) and PPH (30%); these causes are comparable to the findings from the study done in CHUK previously where the common complications were infections (32%) and PPH (20%) [2].

The factors leading to these complications have been described in other LICs; which included delay in reaching the hospital, delay in receiving care within the hospital, delayed recognition of complications and referral to tertiary level, lack of enough skills for general practitioners to perform CS and to manage obstetrical complications, lack of essential equipment and drugs, and lacking locally applicable evidence-based guidelines and protocols [11,12].

Age, socio-economic status, and length of stay were significantly associated with mortality. This association may be explained by the fact that older women are more likely to undergo CS with more complications, low social economic status may impact timely access to care and the capacity to afford some treatment, and short length of stay may be explained by severe acute complications at admission [2,10,11].

Findings on the quality of maternal care from the survey in nine hospitals showed that 6 out of 10 criteria were met by the required target of 80% of hospitals, however four criteria were not met by the required target of 80% of hospitals. Those four unmet criteria for quality of maternal care include caesarean section, emergency care for maternal complications, preeclampsia, and use of guidelines and protocols, which were met by 54%, 54.5%, 71.1% and 72.7% of hospitals respectively. These unmet criteria may contribute to the common obstetric complications and causes of maternal death in low resources complications [13].

These gaps may be explained by the scarcity of specialists (obstetricians and anaesthesiologists) at DHs; general practitioners (GPs) and non-physician anaesthetists (NPAs) work at DHs very often without supervision or mentorship. GPs have six years of general medicine training and NPAs have three to four years of anaesthesia training; they may lack skills in some complex procedures like hysterectomy and management of complications such as eclampsia and severe PPH. In February 2018, for 42 district hospitals in Rwanda, there were only 14 Obstetricians and 2 anesthesiologists

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working mainly in Kigali and in referral hospitals [14].

In addition, regular CPD programs focusing on emergency obstetrical care and CS safety, availability of equipment and drugs, and use of evidence-based guidelines and protocols for early recognition and appropriate management of complications should be implemented as they have been effective in other settings [5,13].

This study had a number of limitations. Firstly, the small sample size which included only one referral hospital and some district hospitals from its catchment area meant that the results could not be generalized to the whole country. In addition, there is risk of desirability bias where respondents provide answers which the researcher wants to hear and this may have underestimated the gaps of quality of care in some district hospitals. Finally, some data was missing from patients' charts and was excluded from analysis, however this did not concern the main outcomes and has a low risk to affect the validity of our results.

CONCLUSION

Despite a tremendous decrease in maternal mortality in Rwanda, post-delivery complications and death are still high among women transferred from district hospitals. Effective interventions to improve the quality of maternal care in district hospitals such as CPD programs focusing on emergency obstetrical care and CS safety, availability of equipment and drugs, and use of evidence-based guidelines and protocols for early recognition may be appropriate to minimize complications and improve their outcome.

Policy implications

Based on the findings of this study, we recommend the following strategies:

To organize the cesarean section training for non-specialists (GPs, Non-Physician Anesthetists, and Recovery and Operating Room Nurses).

To organize regular training in emergency care for maternal complications for DHs maternity Staff (GPs, nurses, and midwives).

To ensure the use of appropriate guidelines in management of maternal complications in district hospitals in Rwanda.

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Supplementary data: Key practices/Items score for the quality of care in nine selected district hospitals

4.1 Phase I key practices

I. NORMAL LABOUR AND VAGINAL BIRTH	Yes (%)	No (%)
Case identification and admission is appropriate	100	0
Care at admission is appropriate	77.8	22.2
Infection prevention is appropriate	77.8	22.2
Labour support is appropriate	77.8	22.2
Partograph is used regularly	77.8	22.2
Care during first stage is appropriate	100	0
Care during second stage is appropriate	88.9	11.1
Third stage management is appropriate	77.8	22.2
Fourth stage – early puerperium management is appropriate	66.7	33.3
Number of staff in maternity is appropriate	88.9	11.1
Foetal monitoring during labour and birth is appropriate	55.6	44.4
Average	80.8	19.2
II. CAESAREAN -SECTION	Yes (%)	No (%)
Emergency caesarean section is performed without delay	66.7	33.3
Caesarean section is not performed without indication or with inappropriate indication	44.4	55.6
Policies to reduce the likelihood of caesarean section are implemented	77.8	22.2
Procedures related to caesarean section agree with the international standards	77.8	22.2
Surgical technique for caesarean section is appropriate	88.9	11.1
Care in recovery room is appropriate	44.4	55.6
Care of women after the first 24 hours is appropriate	33.3	66.7
Postoperative care of women after caesarean section within 24 hours is appropriate	55.6	44.4
Average	54.3	45.7

III. EMERGENCY CARE FOR MATERNAL COMPLICATIONS	Yes (%)	No (%)
Layout and structure of the obstetric department are appropriate	77.8	22.2
There is a system in place for prioritizing emergencies (triage)	88.9	11.1
Staff training is adequate to deal with emergencies	22.2	77.8
Staff number is adequate to deal with emergencies	33.3	66.7
Adequate equipment, medicines, and supplies are readily available in the emergency area	44.4	55.6
Management of emergencies is efficient and appropriate	22.2	77.8
Referral process is adequate	88.9	11.1
Average	54	46
IV. POST PARTUM HEMORRHAGE (PPH)	Yes (%)	No (%)
The unit has adequate organization to cope with a major PPH	88.9	11.1
Early recognition and initiation of measures to reduce bleeding are in place	88.9	11.1
Case management is in line with international standards	88.9	11.1
Initial resuscitation is correctly managed	88.9	11.1
Uterine atony is correctly managed	100	0
Refractory hemorrhage after medical treatment is treated according to the international standards	88.9	11.1
Average	90.8	9.2
V. PREECLAMPSIA	Yes (%)	No (%)
All women are screened for preeclampsia at their antenatal assessments and pre-eclampsia is correctly diagnosed	44.4	55.6

There is adequate organization to manage preeclampsia and eclampsia	77.8	22.2
Supportive treatment, monitoring, and diagnostic workup are correct in case of severe preeclampsia	77.8	22.2
Antihypertensive treatment and prevention/treatment of eclamptic fits are correctly performed	77.8	22.2
Decisions regarding timing and mode of birth agree with current recommendations	77.8	22.2
Average	71.1	28.9

4.2. Phase II key practices

VI. POOR PROGRESS IN LABOUR	Yes (%)	No (%)
Progress of labor is adequately assessed and poor progress of labour is adequately diagnosed and managed	88.9	11.1
Oxytocin augmentation is correctly performed	88.9	11.1
Instrumental delivery is correctly performed	88.9	11.1
Average	88.9	11.1
VII. SEPSIS	Yes (%)	No (%)
There is an adequate policy in place to prevent streptococcus group B (GBS) neonatal infection and to treat clinical chorioamnionitis	66.7	33.3
The system is able to implement early diagnosis, early referral, expert advice, and prompt treatment for suspected maternal sepsis	88.9	11.1
Diagnosis, management, and monitoring are appropriate	88.9	11.1
Prompt and appropriate treatment are implemented	88.9	11.1
Measures for infection control are appropriately implemented	88.9	11.1
Average	84.5	15.5

VIII. MALARIA	Yes (%)	No (%)
Diagnosis and treatment are appropriate	88.9	11.1
Monitoring, follow-up, and management of complications are appropriate	88.9	11.1
Average	88.9	11.1
IX. NEONATAL CARE AT THE BIRTH AND IN THE FIRST 2 HOURS		
Preparedness for the birth	88.9	11.1
Assessment and immediate care	88.9	11.1
Neonatal resuscitation	100	0
Initiation of breastfeeding	100	0
Average	94.5	5.5
X. GUIDELINES AND PROTOCOLS AVAILABLE AND RESPECTED	Yes (%)	No (%)
Appropriate triage and risk assessment	77.8	22.3
Appropriate continuous care and monitoring	77.8	22.3
Infection control is appropriate	66.7	33.3
Management of Obstetric Emergencies (preeclampsia, sepsis, PPH) is appropriate	88.9	11.1
Use and maintenance of equipment is appropriate	66.7	33.3
Essential medicine list is appropriate	77.8	22.3
Use of blood for transfusions is appropriate	66.7	33.3
Pharmacy product procurement and inventory are appropriate	66.7	33.3
Preparedness for referral	77.8	22.2
Audit and review of case management are appropriate	88.9	11.1
Continuous Professional Development (CPD) opportunities are sufficient	11.1	88.9
Accreditation level is appropriate	77.8	22.2
Wellness program and burn out prevention are appropriate	22.2	77.8
Average	72.7	27.3