

Compliance to maternal care guidelines is high in patients with complications compared to patients without complications. The tip of an iceberg? A retrospective case-control study

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ABSTRACT

BACKGROUND: Rwanda achieved Millennium Development Goal Five (MDG5) and continues to register improvements in maternal health. Maternal death audit revealed that a great number of deaths were due to preventable causes in hospitals.

OBJECTIVE: To identify preventable causes of severe maternal outcomes linked to poor guideline utilization in hospitals.

METHODS: A retrospective case-control study was conducted. Data were collected for 196 controls (discharged without complications) and 100 cases with severe maternal outcomes (dead or discharged after complications) between 2016 to 2018 at Ruhengeri Referral Hospital in Musanze, Northern Province, Rwanda. Medical case files were reviewed, and outcomes were compared.

RESULTS: Guideline utilization in diagnosis during ward rounds was 59% and 54% respectively. Correct guideline utilization [76% vs. 51%, OR: 3.21; 95% CI: 1.69-6.28], noting of vital signs [65% vs. 22%, OR: 6.50, 95% CI: 3.55-11.96], lab results [76% vs. 48%, OR: 3.59, 95% CI: 2.09-6.21] and regular ward rounds [76% vs. 39%, OR: 4.81 95% CI: 2.64-8.89] were statistically different between the two groups.

CONCLUSION: Guideline utilization was noted in complicated cases compared to patients without complications, post discharge mortality of 59% could be improved by putting guidelines in place, and attention to the details. There is a need for nationwide medical record review and implementation of a standardized guideline.

KEYWORDS: compliance; guidelines; causality; maternal mortality; preventive medicine

INTRODUCTION

Maternal mortality is defined as deaths resulting from complications of pregnancy and childbirth in a given population. Maternal morbidity refers to pregnancy-related complications for every 100,000 live births. Despite the decrease in maternal mortality in all the regions of the world, maternal deaths are still high in sub-Saharan Africa and most causes are the result of preventable causes including hemorrhage, infection and hypertension [1]. Maternal data estimates in Africa range is 216-920 maternal deaths per 100,000 live births. This is the highest maternal mortality rate worldwide, contributing to 66% of all maternal deaths per year [2]. From 1990 to 2015, nearly 10.7 million women died globally secondary to obstetric complications as reported by World Health Organization (WHO) [3]. As reported

by the United Nations International Children's Emergency Fund (UNICEF), the life risk for maternal death in high-income countries is 1 in 3,300 versus 1 in 41 in low-income countries. Clinical practice guidelines are "systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances. They are intended to offer concise instructions on how to provide healthcare services. The most important benefit of clinical practice guidelines is their potential to improve both the quality or process of care and patient outcomes [4].

Among the widely reported gaps in maternal care, utilization of maternal guidelines by health care providers has been cited. Beigi et al. reported that physician's behavior during the care of pregnant women was key in determining the outcome of

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pregnancy [5]. Lack of maternal checklists and inefficient, inconsistent use of the referral system were among the main inconsistencies. A study done in Zimbabwe found that 9 out of 10 maternal deaths could have been prevented. Among many preventable causes identified were; delay of transfer, delay of treatment, inaccurate diagnosis, incorrect treatment and lack of medical supplies [2].

A multi-site study done in Africa (Cameroon, Chad, Morocco, Nicaragua, Niger, Rwanda, Sri Lanka and Tanzania) showed that health care providers (HCPs) who implemented obstetric guidelines such as emergency care can contribute to the reduction of maternal deaths and other adverse outcomes [6]. The 2017 data extracted from the Rwanda health information system (RHIS) demonstrated that Ruhengeri Referral Hospital has the third highest rate of maternal deaths in Rwanda. The 2017 review indicated that 67% of patients who died at Ruhengeri Referral Hospital came from the referring district hospitals while 33% came from the community or from health centers [7].

Objectives: The goal of this study was to identify preventable causes of adverse maternal outcomes and assess causes.

METHODS

Design: Retrospective case-control study.

Setting: Data were collected in the maternity department of Ruhengeri Referral Hospital (RRH) located in the Northern Province of Rwanda. The hospital has 300 beds with 95% average bed occupation rate. RRH registers between 400 and 500 births per month.

Participants: Three-hundred medical files were reviewed for patients who were admitted at hospital from January 1st, 2016 to June 30th, 2018.

Inclusion criteria: Patients admitted in maternity for obstetrical causes, patients re-admitted for obstetrical complications in maternity department.

Exclusion criteria: Patients who died on arrival at maternity of RRH, patients with complications not related to the pregnancy.

Recruitment: Cases were identified using the central register in which all the patients admitted in maternity are recorded.

Assessment tool: The tool used to assess the compliance to service delivery is the national EmOC (Emergency Obstetrical Care) guideline. In order to achieve the Millennium Development Goal of a 75% reduction in the maternal mortality ratio between 1990 and 2015, countries throughout the world have invested resources into providing equitable, adequate maternal health services. One way of reducing maternal mortality was to improve the availability, accessibility, quality and use of services for the treatment of complications that arise during pregnancy and childbirth. These services are collectively known as Emergency Obstetrical Care (EmOC)[8].

Variables: The review consisted of assessing the level of completeness of the medical file, the compliance to Emergency Maternal Obstetrical Care (EMOC) guideline for both admission

period and follow up period. Key variables consisted of: a well conducted physical examination, recording and noting the vital signs, anamnesis and taking current and past medical history, differential diagnosis based on past medical history, chief complaints, physical examination, recording and consulting laboratory results in making the final diagnosis.

Medical records: Specialists and general practitioners consult and admit pregnant women with pregnancy related complications. They also keep all the follow up records in medical files as recommended by hospital accreditation policy and procedures. All patients treated in the maternity department of RRH are recorded in one single register. After identifying the patients in the register to be included in the study, the patient identification number is matched to the corresponding file number to be retrieved in the archive department.

Data-collection: Data collection was undertaken using a questionnaire designed according to EMOC guidelines. Data was captured into Epi Data Manager (Denmark, V4.4.0.0) and was double-checked before processing for data analysis by Stata 14.1. The flow of the questions were designed according to EMOC guidelines.

Sample size calculation: Using the method described by Kelsey et al.[9], the sample size was calculated as follows:

Hypothetical proportion of controls with exposure= 50% , hypothetical proportional of cases with exposure= 66.67%, ratio of control to cases= 2:1, the power= 80%; two-sided confidence level of 95%. In order to detect the difference between cases and controls, 105 cases and 210 controls were calculated.

Matching and assigning controls to every case: Cases were defined as patients whose exit outcome was death, discharged after a laparotomy secondary to post c-section sepsis or laparotomy for another indication done for pregnancy complications (for example: extra-uterine pregnancy) and those discharged after being admitted in the high dependency unit of RRH for a severe medical condition such as malaria. Controls were patients who were admitted in maternity for obstetrical reasons without complications on admission and at discharge time. A 2:1 un-matched ratio was used to select controls. For every case, the control was the patient registered before the case in the admission register of maternity department. The second control was the patient registered after the case.

Statistical analysis: The cases and controls were compared using Chi-square test and two-sample t-test for categorical and continuous variables, respectively. To estimate the risk of developing poor maternal outcomes in patients whom maternal care guidelines were respected compared to those they were not respected, a logistic regression model was performed. A two-sided p-value of <0.05 was considered as threshold for statistical significance. All the analyses were performed using Stata 14.1.

Ethics statement: This study used secondary data analysis. It is an observational, retrospective and non-interventional study. Ethical approval was issued by the Rwanda National Ethics Committee No. 198/RNEC/2018.

RESULTS

Missing data: During the data cleaning, four controls were excluded. Two of them had no age recorded and the other two missed the final diagnosis.

Participants: In total, 315 medical files were reviewed. Only 100 cases and 200 controls met the inclusion criteria at first medical record review. Among all the patients who consulted the maternity department from January 1st, 2016 to June 30th, 2018,

100 cases and 196 controls were selected to participate in the study.

The cases and controls were drawn from the same population (Table 1). There was no difference in the age, obstetrical background and area of residence. Cases stayed at the hospital four times longer than controls (11±10 vs. 3±2, $p<0.01$).

Table 1: Comparison between cases and controls

	Cases n=100	Controls n=196	p-value
Age	29±6	29±7	0.65
Gravidity	3±2	3±2	0.47
Parity	2±2	2±2	0.07
Number of abortions	0.12±0.41	0.24±0.78	0.15
Number of children alive	2±2	1±2	0.16
Number of children who died	0.11±0.04	0.24±0.78	0.15
Living in urban area	33%	67%	0.43
Transfer from District Hospital	50%	50%	0.63
Length of stay (in days) after admission	11±10	3±2	<0.01

Use of maternal care guidelines: As outlined in the EMOC (Emergency Maternal and Obstetrical Care) guideline that has long been utilized in Rwanda health care facilities [6, 7], every medical file must be well completed starting from anamnesis (medical history), physical examination, vital signs, laboratory exams and differential diagnosis. During both admission and ward round periods, all the steps of examining the patients are followed. In every patient's conclusion, all the information must

be recorded and considered. Recording lab results and their consideration to decide final diagnosis and treatment were better in cases versus controls (Table 2). They were below 70% in cases but below 50% in controls. The role of recording laboratory results and considering them to define the outcome of patients was statistically significant for both cases and controls.

Table 2: Association between utilization of maternal care guideline and severe maternal outcomes

	Cases	Controls	OR (95% CI)	p-value
At admission				
Recording lab results in the file	70%	38%	3.81 (2.21-6.63)	<0.01
Consulting lab results to decide final diagnosis	76%	47%	3.55 (1.93-6.65)	<0.01
Providing treatment as prescribed	56%	69%	0.57 (0.31-1.03)	0.05
Adjusting treatment after laboratory results	23%	9%	2.82 (1.21-6.88)	<0.01
During ward round				
Taking current complaints of the patient	68%	39%	3.67 (2.05-6.62)	<0.01
Well conducted physical exam	78%	44%	4.59 (2.47-8.68)	<0.01
Consulting vital signs	66%	22%	6.89 (3.71-12.69)	<0.01
Recording laboratory results	82%	71%	1.91 (0.98-3.83)	<0.01
Considering physical exam to conclude the diagnosis	75%	43%	4.05 (1.99-8.35)	<0.01
Considering laboratory results in adjusting treatment	28%	10%	3.28 (1.26-8.93)	<0.01

DISCUSSION

The overall goal of this study was to identify preventable causes of adverse maternal outcomes and assess causes. It found there was a link to poor utilization of maternal care guidelines (EMOC). This study has determined the level of utilization of maternal care

guidelines at Ruhengeri Referral Hospital and the preventable causes of maternal mortality and morbidity at RRH.

In this study, we investigated the utilization of maternal care guidelines and guidelines to determine the effect of non-compliance in patients' outcomes. Our results show that maternal

care guidelines and guidelines, as recorded in patients' files are more respected in cases than in controls (Table 2). Compliance to guidelines and guidelines is better in cases where 70% of lab results were recorded in the files of cases compared to 38% in controls ($p < 0.01$). In addition, diagnosis was concluded after considering physical examination in cases in 75% of cases compared to 43% controls; treatment was adjusted after lab results in 28% of cases compared to 10% controls. As shown in Table 2, guideline and guidelines are more respected in cases than in controls during the ward round. Our second finding which confirms our hypothesis that non-compliance to guidelines and guidelines have a significant impact in developing or not developing severe maternal outcomes:

There is increased risk of adverse maternal outcomes if meticulous attention to lab, physical findings, and history are overlooked, and effective treatments are not promptly initiated. Previous studies have shown that failing to take the blood pressure of patients frequently in post-partum period resulted in hypertensive complications and death. This is consistent with the observation that vital signs are neither recorded nor noted during the ward round in our study. Stevens et al have found that neglecting post-partum vital signs put pregnant women at risk of mortality and morbidity in the United States [10].

Delays in recognition, evaluation, diagnosis, and treatment are consistent findings among detailed case reviews of maternal deaths caused by peripartum hemorrhage and complications of preeclampsia. Evidence-based hemorrhage guidelines to direct care in the event of acute hypertensive crisis are well supported and seem to be improving outcomes; however, the value of prompt bedside evaluation by an experienced physician cannot be overstated" [11]. In a study done at Kigali Teaching Hospital by Jackson et al., it was found that most of the patients referred to the hospital ended up being near misses. If appropriate care were given to the women while at the referring hospitals, their quality of life would have improved [12].

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Strength and limitations of the study: This study is the first in its kind to review the medical files for both complicated and uncomplicated cases. Control charts were not analyzed in detail which highlights the lack of patients' care at the hospital. It also emphasizes the need to strengthen postpartum care both in hospitals and in the community. Despite all the benefits brought by this study, it has different limitations making the findings hard to generalize. Maternal deaths audits practice in hospitals may be the source of bias. This practice advocates the importance that health care providers complete correctly the charts of complicated cases. This study used a non-matching sampling between cases and control which is less preferable in a case-control study. A qualitative study is needed to address the queries of health care providers. We did not achieve our pre-defined sample size calculation, however as our results were statistically significant, we are unlikely to have committed a type-II error.

CONCLUSION

This study enlightens the health care providers and decision makers to strengthen the post-partum care. The medical charts were more complete for cases than controls. Post-partum care of non-complicated cases was neglected. Poor post-partum care is a preventable cause for maternal mortality and morbidity at both community and the hospital. There is a need for nationwide medical record review to design a new intervention that will address the post-partum follow up of patients at the hospital level.

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