



Intravenous Oxytocin and Misoprostol Equally Effective in Managing Uterine Atony Induced Postpartum Hemorrhage among Delivery Mothers: A Two-Year Case Series in Freetown, Sierra Leone

Jia Bainga Kangbai*

Department of Environmental Health Sciences, Njala University, Sierra Leone

Abstract

Background: Sierra Leone has one of the highest maternal mortality rates in the world. Postpartum hemorrhage is one of the common causes of maternal deaths in developing countries.

Methods: We analysed the medical records of mothers who developed postpartum hemorrhage following delivery at the Rokupa Government Hospital in Freetown, Sierra Leone during the period of 1st January 2017 to the 31st December 2018. We reviewed the sociodemographic characteristics and medical features associated with postpartum hemorrhage and the management of PPH.

Results: There were 2,236 deliveries during the period under review of which 0.89% (20/2236) resulted into the postpartum hemorrhage. The mean age of PPH patients was 25.4 years (Standard deviation =6.4 years). Misoprostol (n=5, 50%, $X^2=15.143$, $df=18$, $p\text{-value}=0.6521$) and oxytocin (n=5, 50%, $X^2=15.143$, $df=18$, $p\text{-value}=0.6521$) administered via intravenously were the most common methods used to manage postpartum hemorrhage caused by uterine atony.

Conclusion: Our findings are different from similar studies in which most cases were either referred from homes, clinics, primary or tertiary care hospitals. We are calling for the adoption of the administration of intravenous oxytocin or misoprostol as part of a national algorithm for the management of postpartum hemorrhage in Sierra Leone.

Keywords: Postpartum hemorrhage; Misoprostol; Uterine atony

Introduction

Maternal mortality is a major cause of premature mortality of women globally. There is an estimated 500,000 annual maternal deaths with up to a quarter of those deaths due to postpartum hemorrhage [1]. It is estimated that 1% to 5% of deliveries results into Postpartum Hemorrhage (PPH) and the condition is the most common cause of maternal morbidity and mortality [2]. Sierra Leone has one of the highest maternal mortality rates (1,165 maternal deaths per 100,000 live births) in the world [3]. Postpartum hemorrhage could be classified based on the quantity of blood lost as well as the type of delivery. PPH in terms of vaginal delivery is defined as the occurrence of at least 500 ml blood loss [4]. In the case of C-section delivery PPH is defined as blood loss of above 1500 ml [4]. PPH can also be defined in terms of a 10% drop in the hematocrit [2]. PPH is classified as primary when the blood loss is 500 ml or more due to vaginal delivery or a loss of 1500 ml of blood due to C-section delivery within the first 24 h of delivery [5,6]. Secondary PPH is the excessive vaginal blood loss or heavy lochial discharge within 24 h after the end of the third stage of labor [6].

Many studies have implicated uterine atony, vaginal hematoma, cervical or vaginal tear, adherent placenta, uterine angle extension and retained placenta as the major causes of PPH [4]. Prolong PPH often leads to hypovolemic shock, hepatic dysfunction, disseminated intravascular coagulation, acute respiratory distress syndrome and renal failure [3,4,7]. These complications can be prevented by implementing a systematic PPH management and treatment protocol followed by active case management during third stage of labor.

In this investigation we evaluate the etiology and management methods of postpartum hemorrhage in a popular government maternal hospital in Freetown, Sierra Leone in a bid to compare

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*Correspondence:

Jia Bainga Kangbai, Department of Environmental Health Sciences, Njala University, Bo, Sierra Leone, E-mail: Jia.Kangbai@lrz.uni-muenchen.de

Received Date: 12 Mar 2019

Accepted Date: 02 Apr 2019

Published Date: 15 Apr 2019

Citation:

Kangbai JB. Intravenous Oxytocin and Misoprostol Equally Effective in Managing Uterine Atony Induced Postpartum Hemorrhage among Delivery Mothers: A Two-Year Case Series in Freetown, Sierra Leone. *Ann Womens Health*. 2019; 3(1): 1014.

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the effectiveness of intravenously (IV) oxytocin and misoprostol in managing PPH. There has been conflicting reports about the effectiveness of oxytocin and misoprostol in the management of PPH in the past decades. One study reported misoprostol to be less effective than oxytocin and has many side effects in addition to no adjunctive effect if the mother has been administered oxytocin [8]. Oxytocin has been the best choice because it of its few side effects and can be used safely in hypertensive mothers as well as in women suffering from pre-eclampsia [9]. The fact that it is given intravenously and hence requires constant refrigeration makes it a challenge in most rural settings with electricity and healthcare workers limitations. Misoprostol which is heat stable, orally active, easy to use but more expensive than oxytocin was “parachuted” for use to manage PPH in high risk countries such as Sierra Leone [10].

In this study we are set to investigate the most common causes of PPH at this popular government maternal hospital, to determine how PPH is being managed, its treatment outcome and comorbidities, as well as to compare the overall effectiveness of oxytocin and misoprostol in managing PPH.

Methods

This is a cross sectional study that analysed medical records of mothers who presented with postpartum hemorrhage at the Rokupa Government Maternity Hospital in Freetown, Sierra Leone during the period of July 2011 to May 2012. Rokupa Government Maternity Hospital is located in the east of the capital city Freetown and has a target population of more than 10,000. We reviewed the patients sociodemographic characteristics including, age, occupation, education level, as well as the medical features associated with postpartum hemorrhage such as type of PPH, treatment outcome for PPH (whether survived or died), pulse rate, blood pressure, parity, causes of PPH (uterine atony, retention of product of conception, cervical or vaginal tear, placenta previa, or uterine inversion), management of PPH (evacuation of remaining conception products, hysterectomy, cervical or vaginal repair, internal iliac ligation, or uterine inversion replacement), comorbidity, mode of pregnancy delivery (spontaneous vaginal, C-section, episiotomy), place of delivery, deliverer (specialist obstetrician or gynecologist, medical doctor, nurse, traditional birth attendants). The medical record files and surgical notes provided information on the surgical intervention, mode of delivery and management method of the patients. For this study, PPH was defined as bleeding >500 ml following vaginal delivery or >1500 ml following C-section. PPH was diagnosed as primary loss of blood occurs within 24 h; and as secondary if it occurs beyond 24 h to 6 weeks. Pulse rate and blood pressure were measured at the triage when the patient is presented for admission. Pulse rate was done by a standard method of pulse rate counting while blood pressure was taken using an aneroid manometer. The quantity of blood lost by a PPH patient was obtained by soaking gauze in the blood bath on the bed during the third labor stage and then squeezing the gauze into a bedpan. The blood in the bedpan is then measured in a calibrated cylinder. All data analysed in this study were obtained from both the case report form that was compiled by medical attendants and clinicians working at the triage in the hospital as well as the medical record files and surgical notes of these patients. Because this is a retrospective study that analysed the anonymized medical records of the study subjects we were waived the right to obtain an informed consent from the patients or their relatives. This study included all women who were admitted with postpartum hemorrhage or develop

Table 1: Bio data of patient's sociodemographic and clinical characteristics.

| S.no | Variables | Frequency (n) | Percentage (%) |
|------|--|---------------|----------------|
| 1 | Classification of postpartum hemorrhage | | |
| a | Primary post partum hemorrhage | 18 | 90 |
| b | Secondary post partum hemorrhage | 2 | 10 |
| 2 | Mode of delivery | | |
| a | Spontaneous vaginal delivery | 14 | 70 |
| b | C-section | 2 | 10 |
| c | Vacuum delivery | 4 | 20 |
| 3 | Management and treatment | | |
| a | IV oxytocin | 5 | 25 |
| b | Misoprostol | 5 | 25 |
| c | Virgina repair | 5 | 25 |
| d | EOU | 5 | 25 |
| 4 | Place of delivery | | |
| a | Tertiary hospital | 19 | 95 |
| b | Non hospital | 1 | 5 |
| 5 | Blood pressure | | |
| a | Hypertension | 3 | 15 |
| b | Normal | 17 | 85 |
| c | Hypotension | 0 | 0 |
| 6 | Pulse rate | | |
| a | Bradycardia | 2 | 10 |
| b | Normal | 17 | 85 |
| c | Tachycardia | 1 | 5 |
| 7 | Comorbids | | |
| a | HIV | 1 | 5 |
| b | Eclampsia | 0 | 0 |
| c | None | 19 | 95 |
| 8 | Parity | | |
| a | Parity0 | 7 | 35 |
| b | Parity1 | 9 | 45 |
| c | Parity2 | 3 | 15 |
| d | Parity1 (Dead) | 1 | 5 |
| 9 | Deliverer | | |
| a | Medical doctor | 2 | 10 |
| b | MCHAide | 8 | 40 |
| c | SECHN | 10 | 50 |

Total no of deliveries (n=2236) and total cases of PPH (n=20).

- Highest values were indicated in bold.
- Columns of each variable add up to 100%.
- MCH Aide implies maternal child health worker aide.
- SECHN implies State Enrolled Community Health Nurse.

it during her hospital stay after delivery.

Ethics and privacy

This study was approved by the health authorities at Rokupa Government Maternity Hospital and the Njala University Institutional Review Board in Sierra Leone which granted us ethical clearance and waived the requirement to obtain individual informed consent since we are analyzing anonymous data that has been

Table 2: Association between causes and the different types of postpartum hemorrhage.

| S.no | Causes of postpartum hemorrhage | Primary postpartum hemorrhage n (%) | Secondary postpartum hemorrhage n (%) | P- value |
|------|---------------------------------|-------------------------------------|---------------------------------------|----------|
| 1 | Uterine atony | 10 | 0 | 0.003 |
| 2 | Virginal tear | 3 | 0 | 0.003 |
| 3 | Retainlobes | 1 | 0 | 0.003 |
| 4 | Perineum tear | 1 | 0 | 0.003 |
| 5 | Cervicaltear | 2 | 0 | 0.003 |
| 6 | Repairplacentatissue | 0 | 2 | 0.003 |
| 7 | Retainproducts | 1 | 0 | 0.003 |

Total no of deliveries (n=2236) and total cases of PPH (n=20).

- Threshold for significance is 0.05.
- Highest values indicated in bold.
- Results were evaluated by considering the group of primary and secondary postpartum hemorrhage as 100%.

Table 3: Distribution of methods of management and causes of postpartum hemorrhage.

| S.no | Causes of postpartum hemorrhage | EOU 5(25%) | Oxytocin 5(25%) | Misoprostol 5(25%) | Tissue repair 5(25%) |
|------|---------------------------------|------------|-----------------|--------------------|----------------------|
| 1 | Cervical tear | 0 | 0 | 0 | 2 |
| 2 | Perineum tear | 1 | 0 | 0 | 0 |
| 3 | Repair placenta tissue | 2 | 0 | 0 | 0 |
| 4 | Retain lobes | 1 | 0 | 0 | 0 |
| 5 | Retain product | 1 | 0 | 0 | 0 |
| 6 | Uterine atony | 0 | 5 | 5 | 0 |
| 7 | Virginal tear | 0 | 0 | 0 | 3 |

Total no of deliveries (n=2236) and total cases of PPH (n=20).

- p value is 0.05.
- Bold figures represent highest value.
- Results were evaluated by considering the causes and methods of managing of postpartum hemorrhage.
- Rows of each variable add up to 100%.
- EOU implies evacuation of uterine tissues.

collected retrospectively and hence presented little of no risk to our study subjects.

Statistical analysis

We used R software package version 3.3.1 for all data analysis in this study [11]. A p-values <0.05 were considered significant for all two-sided statistical tests employed in this study. Results from our descriptive analysis were presented as frequencies, proportions, means and standard deviations (for continuous variables if they are normally distributed); medians and interquartile ranges (for continuous variables that are not normally distributed). We also used Chi square test to compare proportion of categorical variables.

Results

Twenty PPH patients were treated at the Rokupa Government Hospital in our selected time period of study. Two thousand two hundred and thirty-six deliveries occurred at Rokupa Government Maternity Hospital during the review period (PPH cases =20/149=1.7%). All PPH cases in this study were successfully managed and treated. The mean age of PPH patients was 25.4 years (Standard deviation =6.4 years). There were no referral PPH cases and all the cases were fully conscious. Majority of the cases were primary PPH (n=18, 90%), house wives (n=14, 70%), had no formal education (n=11, 55%), and had spontaneous delivery (n=14, 70%). Most of the PPH cases were treated by the administration of intra venous oxytocin (n=10, 50%). Fifty percent (n=10) of the deliveries that led to PPH were done by State Enrolled Community Health Nurses (SECHN). Most of the PPH cases occur among women who had one previous birth (Table 1).

Most of the primary PPH cases were due to uterine atony (n=10, 58.8%, $X^2=20$, $df=6$, p-value =0.002769), while most of the spontaneous virginal deliveries resulted into uterine atony induced PPHs (n=6, 42.9%, $X^2=15.143$, $df=18$, p-value =0.652) (Table 2).

Different management procedures were adopted for managing the different causes of PPH at the study site. Misoprostol (n=5, 50%, $X^2=15.143$, $df=18$, p-value =0.6521) and oxytocin (n=5, 50%, $X^2=15.143$, $df=18$, p-value =0.6521) that is administered via intravenous injection were the most common methods used to manage PPH caused by uterine atony (Table 3).

The association between management procedures and the types of PPH were not statistically significant ($X^2 =6.6667$, $df=3$, p-value =0.08332). Misoprostol, IV oxytocin and repairing of cervical tissues are the common management procedures for primary PPH (Table 4).

Discussion

Postpartum hemorrhage is responsible for an estimated 140,000 deaths annual worldwide and is the 5th most common cause of maternal mortality throughout the world [4,9-13]. No patient was referred to our study site and all patients survived after treatment. Our findings are different from others in which all cases were either referred from homes, clinics, primary or tertiary care hospitals. There were also deaths due to PPH for the period under review; these findings were comparable with previous studies [4,9].

All our patients were conscious; few were hypertensive (15.0%), tachycardic (5.0%) and bradycardic (10.0%). Our results supported the fact that the loose of blood can lead to tachycardia in addition to

Table 4: Association between types of postpartum hemorrhage and management.

| S.no | Management | Primary postpartum hemorrhage n (%) | Secondary postpartum hemorrhage n (%) | P-value |
|------|-----------------------|-------------------------------------|---------------------------------------|---------|
| 1 | Evacuation of uterine | 3 | 2 | 0.003 |
| 2 | iv oxytocin | 5 | 0 | 0.003 |
| 3 | Misoprostol | 5 | 0 | 0.003 |
| 4 | Repair | 5 | 0 | 0.003 |

Total no of deliveries (n=2236) and total cases of PPH (n=20).

- Threshold for significance is 0.05.
- Highest values indicated in bold.
- Results were evaluated by considering the group of primary and secondary postpartum hemorrhage as 100%.

the hypotension and hypovolemic shock [14].

The most common form of delivery was spontaneous vaginal delivery (70%) followed by vacuum delivery (20%). Two Pakistani studies reported spontaneous vaginal delivery and C-section as the common mode of deliveries [4,6].

Uterine atony was the most common cause of PPH in our study. Uterine atony is the loss of the uterine musculature tone. When the uterine musculature contracts the blood vessels compresses and blood flow reduces. This contraction thus increases blood coagulation and hence prevents bleeds. In the presence of uterine atony, the uterine muscle contraction is prevented due to lack of tone resulting into acute hemorrhage. Uterine atony has been reported as the major cause of PPH in America and Pakistan [4,6,13,15].

Uterine atony was the most common cause for primary PPH (p-value=0.003). Our results is similar to that of Edhi MM et al. who reported uterine atony as the most common causes of secondary postpartum hemorrhage. Weisbrod et al. [2]; Hoveyda and MacKenzie [7] had previously reported that retained uterine products and not uterine atone as the most common cause of secondary postpartum hemorrhage. Cervical as well as vaginal tear have also be cited as the causes of delayed or secondary postpartum hemorrhage [2,7,14].

This study targeted a small population of the capital Freetown and may not be a true representative of the entire capital or the country. Rokupa Government Maternity Hospital is the only government owned maternity hospital in that part of the city and is affordable by the low class mothers. To better understand the condition of postpartum hemorrhage in Sierra Leone a national study covering the entire population is required. Sierra Leone has the worst maternal mortality in the world and postpartum hemorrhage is one of the commonest causes of maternal mortality. In this vein it is necessary for country's to include it in their national health policy for every healthcare facility to correctly assess blood loss after delivery as well as to construct well defined algorithm for the management of postpartum hemorrhage patients accordingly.

Conclusion

We are calling for a postpartum hemorrhage risk factors assessment including that of the age of the mother as well her parity in order to assemble the various PPH management logistics prior to child delivery, if the impact of PPH is to be mitigated. This study is requesting that all postpartum hemorrhage patients should receive active management at the 3rd labor stage of child delivery. Strict adherence to formulated national protocols and guidelines is required in order to improve the management outcomes in PPH patients. We are recommending similar studies at national scale in a bid to recognize and rectify causes to postpartum hemorrhage prior to their commencement.

Declarations

Ethics approval and consent to participate

The Institutional Review Board at the Njala University, Sierra Leone approved this study. The Institutional Review Board at the Njala University provided ethical clearance for conducting this study and waived the requirement to obtain informed consent from the patients whose medical records were analysed in this study on the grounds that this is an observational retrospective study that did not allow at that time for individualized informed consent to be obtained. Also, the medical administrator at the Rokupa Government Maternity Hospital also provided official clearance to access the medical records of these patients.

Authors' Contribution

JK, MBK and AAS conceived and designed this study as well as organized the conduct of this research in the research field. JK, SLM and JM performed the statistical analysis. JK MBK and AAS drafted the manuscript. JK, MBK, SLM and JM reviewed and revised the manuscript. JBK oversaw the collection and collating of the research data. MBK obtained ethical clearance.

Acknowledgement

Our sincere thanks goes to the health workers attached to the Rokupa Government Maternity Hospital in Freetown, Sierra Leone for collecting and collating the medical data that were analyzed in this study, as well as all those mothers who suffered from postpartum hemorrhage during the period under review.

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