Management and outcome of women requiring massive blood transfusion after childbirth: A cross-sectional study at Muhimbili National Hospital, Tanzania

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ABSTRACT

Introduction: Massive Obstetric Haemorrhage is the leading cause of maternal morbidity and mortality in sub-Saharan Africa. The management of obstetric haemorrhage requires a systematic and standardized approach to have a favourable maternal outcome. We describe the prevalence, aetiology, current management and outcomes of women with obstetric haemorrhage at Muhimbili National Hospital (MNH).

Method: A two-year retrospective review of cases with a diagnosis of obstetric haemorrhage whose gestation age was ≥ 24 weeks and blood loss ≥ 2L or required a blood transfusion of ≥ 4L. Data were analysed using SPSS version 23 and summarized into proportions as well as measures of central tendencies (mean and median) where appropriate. The case fatality rate was calculated using the number of deaths of women with obstetric haemorrhage to the total number of women who were diagnosed to have obstetric haemorrhage.

Results: The prevalence of women who had obstetric haemorrhage was 1%. Triggering of massive blood transfusion protocols by informing physician, blood bank, theatre team, pre-transfusion laboratory test and administration of intravenous fluid was performed in more than 98%. About 2.3% of patients received a proper ratio of blood and blood products during management. The percentage of patients with acute kidney injury (AKI), disseminated intravascular coagulopathy (DIC) and heart failure were 13.6%,7.0% and 4.3% respectively. Calcium gluconate was not administered to patients who had obstetric haemorrhage. During the study period the case fatality rate was 4.7%.

Conclusion: Management of patients with obstetric haemorrhage was deficient resulting in high rates of maternal mortality and morbidity. Standardised practice by adopting and use of massive transfusion protocol should reduce the adverse maternal outcomes.

Keywords: massive obstetric haemorrhage, maternal outcomes, Tanzania

Introduction

Massive Obstetric Haemorrhage is blood loss of ≥ 2L or a rate of blood loss of >150ml/min. It is also defined as any blood loss that is associated with significant maternal morbidity. Maternal obstetric haemorrhage remains the leading cause of maternal morbidity worldwide and associated with substandard care.[1,2,3] The main types of obstetric haemorrhage are antepartum haemorrhage, postpartum haemorrhage and uterine rupture.[3,4,5]

Management of obstetric haemorrhage involves a multidisciplinary approach where Obstetrician, Midwives, Haematologist and Anaesthesiologist[1-5] are involved. Management involves massive blood transfusion arbitrarily defined as transfusion of blood volume to patient equivalent to their total blood volume (7% - 8% of the body weight) in less than 24 hours.[6,7,8]

Assessment of near-misses consistently identifies severe haemorrhage as a major cause of maternal morbidity. These includes AKI, acute decompensated heart failure, DIC, pulmonary embolism (PE), admission to Intensive Care Unit (ICU) and emergency hysterectomy.[2,9,10] Optimal use of available guidelines and protocols is essential in providing appropriate care in women presenting with massive obstetric haemorrhage.

This study aimed to assess the current practice in the management of obstetric haemorrhage in our hospital and address gaps by developing standard operating procedures and protocols from existing National or International guidelines.

Method

All files of pregnant women who delivered at MNH from 1st January 2017 to 31st December 2019 and who had obstetric haemorrhage were traced from the labour ward and theatre register book. A desk review of patients' medical records to be included was done manually using clinical and operation notes, laboratory investigation results, recorded estimated blood loss, Intensive Care Unit (ICU) maternal obstetric monitor charts, blood and blood products request forms, blood transfusion notes and discharge summaries. Data were entered into a pretested proforma developed from the management described as part of the massive transfusion protocol for obstetric haemorrhage according to National Clinical Guideline for appropriate use of blood and blood products.[8] Analysis was done using chi-squared and Fisher's exact test where appropriate to calculate the p-value which was significant at $p \leq 0.05$ using SPSS version 23. The case fatality rate was calculated using the number of deaths of women with obstetric haemorrhage to the total number of women who were diagnosed to have obstetric haemorrhage.

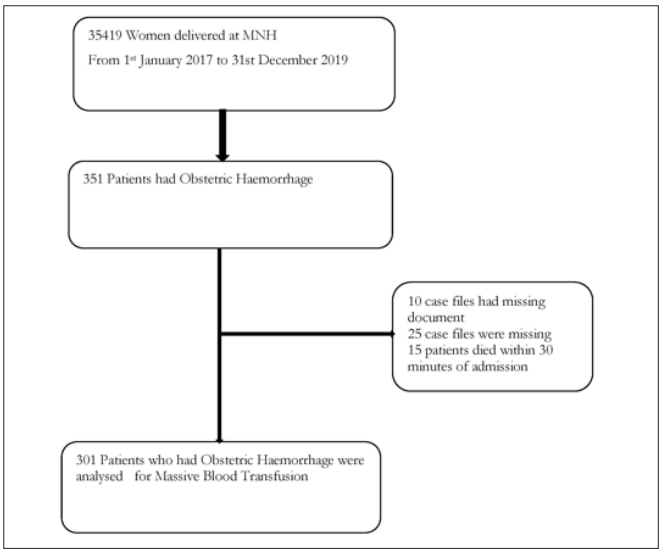

Figure 1. Patient flow chart

Ethical approval was granted by Senate Research and Publication Committee (SRPC), Muhimbili University of Health and Allied Sciences (MUHAS).

Results

During the study period 35,419 women delivered at MNH, 351 were recruited for the study after meeting inclusion criteria for obstetric haemorrhage (Figure 1). Out of these 49.2% lost ≥2L of blood, 35.2% had peripartum hysterectomy, 6% required ≥ 4 units of whole blood/packed red blood cell during acute transfusion and 12.6% had a drop of more than 4g/dl in haemoglobin from baseline. Majority of the study participants delivered by Caesarean Section and reported to have severe PPH. It was also noted that majority of study participant in this aged above 30 years (Table 1). Most patients had no morbidity after massive blood transfusion (64.8%) while 16.9% had ≥ 2 morbidities. The case fatality rate due to massive obstetric haemorrhage was 4.7%. Abruption placenta, uterine atony, perineal tear and uterine rupture were leading causes of obstetric haemorrhage (Table 2) The management of patients with massive obstetric haemorrhage is shown in table 3. Triggering of protocol, pre-transfusion laboratory testing and giving intravenous fluids were performed accurately in women who needed massive blood transfusion (Table 4).

Table 1. Demographic and Obstetric Characteristics of women with obstetric haemorrhage (N=301)

Characteristics		n (%)
Age group (years)	≤19 years	5(1.7)
	20 to 29 years	130(43.2)
	30 to 39 years	157(52.2)
	≥ 40 years	9(3.0)
Gestational age	24 to 27 weeks	1(0.3)
	28 to 36 weeks	119(39.5)
	≥37 weeks	181(60.1)
Mode of delivery	Vaginal delivery	108(35.9)
	Caesarean Section	193(64.1)
Estimated blood loss	500 to 999ml	24 (8.0)
	1000 to 1999ml	129(42.9)
	≥2000ml	148(49.2)
Diagnosis of Post-Partum Haemorrhage (PPH)	500 to 999ml PPH	23(7.6)
	≥1000ml SEVERE PPH	278(92.4)

Discussion

The prevalence of massive obstetric haemorrhage in this study was 1%. About half of these patients had an estimated blood loss of ≤ 2 litres. More than one third underwent emergency peripartum hysterectomy as a means of combating haemorrhage. Abruption placenta, uterine atony and perineal/cervical tear and uterine rupture were the major causes of massive obstetric haemorrhage. Triggering of the protocol for Massive Blood Transfusion was performed appropriately in > 98% in women who had massive obstetrics haemorrhage. A very low proportion of patients received the prescribed ratio of blood and blood products during transfusion. The major source of blood and blood products at MNH is from the blood bank where family members of the patients and free donors contribute. There is a low availability of blood and blood products at MNH as in other developing. Calcium gluconate was not prescribed to any of the patients despite of meeting criteria after receiving ≥ 4 unit of blood. The highest morbidity was AKI, acute decompensated heart failure. The overall fatality rate was 4.7%.

Table 2. Distribution of the causes and morbidities associated with Massive Blood Transfusion (n=301)

Variable	Mode of delivery		Total	p-value
	Vaginal delivery n (%)	Caesarean Section n (%)		
Abruptio placenta	27(26.7)	74(73.3)	101	0.019
Placenta Praevia	2(8.0)	23(92)	25	0.002
Placenta accreta*	4(30.8)	9(69.2)	13	0.776
Perineal tear	49(96.1)	2(3.9)	51	
Retained tissue	9(64.3)	5(35.7)	14	0.023
Uterine atony	24(45.3)	29(54.7)	53	0.116
Thrombin*	2(40.0)	3(60.0)	5	>0.999
Uterine rupture	4(11.8)	30(88.2)	34	0.002
Haemoperitoneum Post-caesarean section	0(0)	32(100)	32	<0.001
Morbidity associated with Obstetrics Haemorrhage				
Acute kidney injury	12(29.3)	29(70.7)	41	0.342
Heart failure*	1(7.7)	12(92.3)	13	0.037
Disseminated intravascular coagulation*	3(14.3)	18(85.7)	21	0.034
Pulmonary embolism*	2(40)	3(60)	5	>0.999
ICU admission	32(31.7)	69(68.3)	101	0.281

* Fisher's exact test was used instead of chi-squared

Table 3. Management of patients with Massive Obstetric Haemorrhage N=301

Variable		Mode of Delivery		Total	p-value
		Vaginal delivery n (%)	Caesarean Section n (%)		
Triggering of protocol (call for help, attending physician informed, blood bank and theatre team involved)		105(35.4)	192(64.6)	297	0.134
Laboratory testing of blood samples pre- transfusion for FBP*, PT$^{\alpha}$, aPTT$^{¥}$, and ABO$^{\beta}$		106(35.8)	190(64.2)	296	>0.999
IV fluid resuscitation with crystalloid and/or colloid infusion		107(35.8)	192(64.2)	299	>0.999
Request and administer in parallel a 1:1:1 ratio of 6 Units of RBCs$^{\gamma}$, 6 Units of FFP‡ and 6 Units of Platelets over 6 hours*		4(57.9)	3(42.9)	7	0.255
Peripartum hysterectomy		17(16.0)	89(84.0)	106	0.001
Use of tranexamic acid 10mg/kg Intravenous followed by 1g over 8 hours for patients presenting with intractable bleeding		15(51.7)	14(48.3)	29	0.061
No correction of hypocalcaemia if ≥ 4 units of whole blood is given by infusion used by injection calcium chloride or calcium gluconate		62(41.1)	89(58.9)	151	0.060
Control FBC*, PT$^{\alpha}$ and aPTT$^{¥}$ every 4hrs after blood transfusion		74(35.7)	133(64.3)	207	0.944
Women with some morbidities after massive obstetric haemorrhage		34(31.2)	75(68.8)	109	0.201
Maternal status	Alive on discharge	105(36.6)	182(63.4)	287	0.248
	Death	3(21.4)	11(78.6)	14	
Provision of packed red blood cells	Not given	65(31.9)	139(68.1)	204	0.108
	Given of ≥ 4 unit	19(44.2)	24(55.8)	43	
	Given <4 unit	24(44.4)	30(55.6)	54	
Provision of whole blood	Not given	39(41.1)	56(58.9)	95	0.106
	Given of ≥ 4 unit	40(39.2)	62(60.8)	102	
	Given <4 unit	29(27.9)	75(72.1)	104	
Provision of fresh frozen plasma	Not given	39(30.5)	89(69.5)	128	0.019
	Given of ≥ 4 unit	15(60.0)	10(40.0)	25	
	Given <4 unit	54(36.5)	94(63.5)	148	
Provision of platelet concentrate	Not given	104(36.0)	185(64.0)	289	0.319
	Given of ≥ 4 unit	2(66.7)	1(33.3)	3	
	Given <4 unit	2(22.2)	7(77.8)	9	

*Full blood Picture; α Prothrombin time; ¥ Partial Prothrombin time; β . blood grouping for A, B and O; γ, Red blood cell concentrate; ‡ Fresh Frozen Plasma

Table 4. Management of patients with Massive Blood Transfusion (n=301)

Steps in management of Massive Obstetrics Haemorrhage	n (%)
Informed attending physician and blood bank	297(98.7)
Pre-transfusion laboratory testing	296(98.3)
Resuscitation with Intravenous fluids	299(99.3)
Request and administration of appropriate blood and blood products.	7(2.3)
Use of tranexamic acid.	29(9.6)
Correction of hypocalcaemia if ≥4 units of whole blood are used.	0(0)
Repeat laboratory tests after blood transfusion.	150(49.8)

The leading cause of massive obstetric haemorrhage in this study was at odds with a study done in developed countries where uterine atony was the main cause.[6] There is higher percentage of relaparotomies after delivery by Caesarean Section compared to vaginal delivery.[10,11] The proportion of those with massive obstetric haemorrhage in this study was lower than that reported by Gutierrez et al.[2] Although the proportion of massive obstetrics haemorrhage at MNH falls within the sub-Saharan region's prevalence of 0.06%-3.05% it was significantly lower than the prevalence reported in Ghana.[12,13]

The commonest aetiologies for massive obstetric haemorrhage in this study were abruption placenta, uterine atony, perineal /cervical tear, uterine rupture and haemoperitoneum after abdominal delivery. Initial described practices (Table 4) in the management of women with massive obstetrics haemorrhage at MNH were performed well when compared to the study done in Karachi, Pakistan.[14] More than 97% of our cases did not receive the recommended ratio of blood and blood products. We found that the highest morbidity after massive blood transfusion was AKI (13.6%) a finding similar to a study conducted in Pakistan where AKI was the leading complication among women who received massive blood transfusion.[13,14]

The case fatality rate in sub-Saharan Africa due to obstetric haemorrhage ranges between 2.8%- 27.3%, indicating a deficiency in the management of obstetric haemorrhage. Studies in Ghana and Rwanda reported case fatality rates between 5.9% and 22% which are greater compared to our finding.[13-15] This clearly implies that there is a need to review and improve our practice in the management of massive obstetric haemorrhage .

Our study highlights where we are in terms of good clinical practice based on existing guidelines. It emphasises areas where focus is needed.

This study was done in a tertiary facility where most cases are referred and thus any extrapolation to other populations must be cautious. Underestimation of blood loss was one of the limitations in this study; efforts were made to use a combination of criteria to extract women who had obstetric haemorrhage. Documentation of blood loss on the way to operating rooms or waiting room prior to operation was not noted. Being a retrospective case review it was not possible to capture factors that affect current practice when administering massive blood transfusion. Further studies on this important topic are needed.

Conclusion

Massive blood transfusion was associated with high rate of maternal morbidity and mortality. Adoption of a protocol for massive transfusion from the national guideline for use in the maternity unit at MNH should reduce maternal morbidities significantly. Informed attending physician and blood bank, pre transfusion laboratory testing and resuscitation with intravenous fluids were among the three steps in the management of obstetric haemorrhage which were effectively performed.

Management of obstetric haemorrhage requires the adherence to an accepted transfusion protocol in every labour and delivery unit and obstetric theatre. Training of health workers on massive transfusion protocol in the maternity unit is essential to reduce maternal morbidity and mortality.

Conflicts of interest: None

Authors' contributions: SEL, PJW and MER: Participated in study design, data collection, analysis and manuscript preparation and review.

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