INDICATIONS AND AVAILABILITY OF BLOOD FOR TRANSFUSION IN OBSTETRIC CARE AT MUHIMBILI NATIONAL HOSPITAL, 2016

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By

Luis Ambrose

A Dissertation Submitted in (Partial) Fulfillment of the Requirement for the Degree of Master of Medicine in Obstetrics and Gynaecology of

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CERTIFICATION

The undersigned certifies that she has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: ***"Indications and Availability of Blood for Transfusion in Obstetric Care at Muhimbili National Hospital"*** in (partial) fulfillment of the requirements for the degree of Master of Medicine (Obstetrics and Gynaecology) of the Muhimbili University of Health and Allied Sciences

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I, **Dr Luis Ambrose** declare that this **dissertation** is my own original work and that it has not been submitted to any other University for a similar or any other degree award.

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DEDICATION

I dedicate this dissertation to my parents **MR AMBROSE FELIX SHAYO and MRS HAWA A. SHAYO** who nurtured and provided me with a good education foundation which brought me to where I am today.

ABSTRACT

Background: Adequate supply and timely availability of safe blood for transfusion are important components of achieving good quality obstetric care. This is true because obstetric haemorrhage and anaemia are common obstetric complications that cause maternal morbidity and mortality in resource limited countries.

Objective: The aim of this study was to determine indications and availability of blood for transfusion in obstetric care at MNH.

Methods: This was a cross sectional study conducted at Muhimbili National Hospital (MNH) in Tanzania. Data were collected from records of women admitted for obstetric care and who were in need for blood or blood components transfusion from 1st September 2016 to 30th November 2016. Socio-demographic and clinical data were collected using a questionnaire. Total number of all obstetric admissions in the specified period was used to calculate prevalence of transfusion. Results are presented as median and interquartile range (IQR) for continuous variables and proportions for categorical variables.

Results: A total of 2,826 women were admitted at MNH for obstetric care during the study period. Three hundred and sixty three (363) had indications for blood transfusion; half of the indications (183/363) 50.4% were due to obstetric haemorrhage, (149/363) 41% due to chronic anaemia, (14/363) 3.9% due to HELLP syndrome/Coagulopathy, (12/363) 3.3% due to both chronic anaemia & obstetric haemorrhage and (5/363) 1.4% others. Three hundred and fifty one women (351) received blood transfusion, making blood transfusion prevalence of 351/2,826 (12.4%). Of the women prescribed to receive whole blood, (124/265) 47% were transfused with the prescribed amount of whole blood while those prescribed to receive packed red cells, only (5/103) 4.9% received the prescribed packed red cells. Whole blood was the most common transfused (934/1150) 81.2% followed by fresh frozen plasma (FFP) (135/1150) 11.7%, Packed Red Blood Cells (49/1150) 4.3% and platelets concentrates (32/1150) 2.8%. The median time (IQR) from decision to transfuse to actual blood transfusion was 4:05 (7:54) hours.

Conclusion: Obstetric haemorrhage and anaemia are still important indications for transfusion in obstetric care and in turn whole blood, FFP and PRBCs are the most common transfused blood types and components. Under half of the patients are transfused with blood units' amount as prescribed or recommended by the clinicians. The prevailing blood shortage in health facilities results in a long decision to transfusion time interval.

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LIST OF ABBREVIATIONS

ANC	Ante Natal Care
APH	Ante Partum Haemorrhage
BT	Blood Transfusion
C/S	Caesarean Section
DIC	Disseminated Intravascular Coagulation
EDD	Expected Delivery Date
FFP	Fresh Frozen Plasma
HB	Haemoglobin
HIV	Human Immunodeficiency Virus
IRB	Institution Review Board
LNMP	Last Normal Menstrual Period
MNH	Muhimbili National Hospital
MT	Massive transfusion
NBTS	National Blood Transfusion Service
PIH	Pregnancy Induced Hypertension
PPH	Post-Partum Haemorrhage
PRBCs	Packed Red Blood Cells
RBCs	Red blood cells
SD	Standard deviation

SPE/E	Severe pre-eclampsia/Eclampsia
UK	United Kingdom
USA	United States of America
USS	Ultra Sound Scan
WHO	World Health Organization

OPERATIONAL DEFINITIONS

1. Blood — Refers to whole blood or packed red cells

2. Blood components or products — Refers to one or more constituent of blood. May be FFP, platelets concentrate, or cryoprecipitates (1)

3. Prevalence of blood transfusion — Proportion of women who were transfused with blood upon seeking obstetric care

4. Decision of transfusion — Refers to documented time when a clinician prescribed blood to be transfused to a patient

5. Time of transfusion — Refers to documented time when a patient started to receive blood transfusion

6. Transfused blood — Blood was regarded as being transfused after it was completely infused to a patient without interruption due to either patient developing transfusion reaction or refusal to transfusion

1.0 INTRODUCTION

Blood transfusion in obstetric practice is an important lifesaving procedure due to the fact that obstetrics complications that present with haemorrhage or anemia take short time to claim life of a victim or cause morbidity if not promptly managed. This causes adequate and timely supply of safe blood for transfusion to be important components of achieving good quality obstetric care. Blood transfusion is therapeutic use of whole blood or its products by giving someone donated blood either from another individual or own blood donated earlier (autologous) through the vein (2,3). Donated blood for transfusion can yield up to four components namely red cells, platelets, plasma and cryoprecipitate (4).

Globally about 108 million blood donations are collected for transfusion whereby more than half of these are from high-income countries, home to only 18% of the world's population (5). In WHO African member states the average annual blood collection in 2010 was 4.3 units per 1,000 population, Tanzania is among the lowest country with an average collection of 2.7 units per 1,000 population (6). This low rate of collected blood for transfusion translates to high maternal deaths in this region.
Approximately 70,000 units of RBC are transfused to obstetric patients every year (7). It is estimated that 2% of women require blood transfusion during peripartum period, and in one hospital in Burkina Faso one study found that 33.1% of patient who delivered had a need for blood transfusion (8).

In obstetrics blood transfusion is indicated in cases of haemorrhage, anaemia in pregnancy and in surgeries where blood loss is anticipated. Incorrect management of obstetric conditions that require blood transfusion may lead to serious morbidity and mortality. Postpartum haemorrhage (PPH) and anemia in pregnancy are responsible for 25% and 15% of maternal deaths respectively (9,10). Obstetric haemorrhage can occur before or after delivery and its effect is more pronounced in low income countries where blood shortage is prevailing. Maternal deaths from obstetric haemorrhage range from 13% in developed countries to 34% in Africa (11). Over 25% of all maternal deaths in Sub-Sahara Africa due to haemorrhage could

be prevented by rapid access to blood transfusions but lack of donors, poverty and logistics failures continue to be persistent reasons for unavailability of transfusions (12). A woman with uneventful antenatal may develop emergency obstetric complication example post-partum haemorrhage (PPH) or ante partum haemorrhage (APH) with associated coagulopathy which may necessitate emergency blood or products transfusion. In non-emergency situations for instance elective caesarean deliveries blood is also needed (ready before surgery) due to risks of uncontrolled haemorrhages associated with surgery. So due to this unpredictable nature, ready availability of adequate blood in obstetric wards and theatre is essential.

In low income countries large numbers of women present with anemia or blood loss in peripartum period so is not uncommon to find that demand of blood for transfusion is also very high. Adequate supplies of safe blood is critical but seems to be neglected component of management of obstetric emergencies and sub-Saharan countries are likely to face setbacks in reducing maternal mortality without serious investment in blood transfusion services (12). Blood loss and anemia are still complicating pregnancies in low resource settings and sometimes situation is made worst by delays in securing blood for transfusion. In Nigeria one study found that unacceptable long decision to transfusion time interval among women who needed blood transfusion resulted to debilitating morbidity and mortality. In this study 4% of women died due to delays and difficulty in securing blood for transfusion while those who got transfusion on time were salvaged with minimal morbidity 14% or no morbidity 86% (13). Unavailability and scarcity of blood for transfusion in obstetric care has a direct negative effect on maternal/and or fetal wellbeing. This is evidenced in Burkina Faso by deaths of 3.8% of women among those who had indication for blood transfusion due to either absence 1.8%, insufficient 1.6% or delay of blood for transfusion 0.4% (8). The effect was also noted in a review of 37 studies on maternal haemorrhage deaths associated with lack of blood transfusion, whereby 20 (54%) studies described a direct association between maternal deaths and lack of blood transfusions. In the same review, 5 of 37 selected studies revealed 26% of maternal haemorrhage deaths were due to lack of blood (12).

In Tanzania lack of adequate blood for transfusion in obstetrics is the problem that continues to claim lots of women of child bearing ages 15-49 years. In Rufiji district rural Tanzania, nearly one third (1/3) of women 28% died of haemorrhage followed by eclampsia 19% and puerperal sepsis 8% (14). In this country hemorrhage and anemia are major problems not only in rural but also in urban areas. In Muhimbili a largest tertiary referral hospital in the country, maternal mortality from PPH and anemia are among top 3 causes of deaths contributing to 14.9% and 11.3% respectively (15). Most of these deaths could probably have been avoided by few units of blood transfusion.

All activities related to blood transfusion in Tanzania are centrally coordinated by National blood transfusion service (NBTS) which was introduced in 2004. These activities involve donor recruitment & retention, blood collection, processing, distribution, training on appropriate use of blood and its components in research-work (16). According to unpublished data, in 2015 NBTS collected an average of 160,000 units of blood (17). However with estimated current population of 45 million, this blood collection is far below WHO recommendation which requires a minimum of 1% of population to donate to meet country's annual basic blood requirements (18,19). This makes annual country's minimum requirement to be 450,000 units. So the country faces a 64% deficit of blood units, this deficit clearly explains prevailing shortage of blood in health facilities. This is an alarming statement which means Tanzania through NBTS has a lot to do to raise blood donations if we are to provide quality obstetric care and seriously fight high rates of maternal mortality.

There are different ways of avoiding blood transfusion in obstetric care, these involve pre-conception raise of hemoglobin through eating balanced diet rich in iron nutrients and treatment of all conditions that lead to anemia. Pre-natal prevention and or/correction of anemia in pregnancy so that a woman goes into labour with high hemoglobin, this reduces need of blood transfusion in case of excessive blood loss during delivery. This can be achieved by provision of effective antenatal care with iron supplementation, deworming, provision of intermittent preventive treatment for malaria (IPT) and insecticides treated mosquito nets (ITNs).

Another way involves prevention of PPH by conducting active management of third stage of labour (AMTSL) after every child birth. Appropriate management of obstetric hemorrhages as per institutional protocol and standards with emphasize put in ensuring availability of uterotonic drugs, resuscitating fluids, and operating theatre. Presence of functioning operating theatre can significant reduces the need for blood transfusion by timely management of bleeding cases.

In another aspect allogeneic blood transfusion can be avoided by applying various blood conservation techniques like pre-operative autologous blood donation (PABD), acute normal volaemic haemodilution (ANH) and intra operative cell salvage (IOCS)(7,20). ANH involves withdrawing autologous blood immediately before surgery then normal volaemia is maintained by administration of crystalloid or colloid replacement fluids (20). Both PABD and ANH have disadvantage as cannot be used in case of emergency and may induce anaemia. ANH can induce cardiac failure due to fluid overload. Intra operative cell salvage is the method used whereby blood loss during surgery is collected, mixed with anticoagulants, filtered, plasma separated, washed then pumped back to patient circulation. It can be used in events of emergencies. Cell salvage is acceptable, beneficial and without adverse events in both high risk elective caesareans and emergency caesareans for unexpected haemorrhage and has been found to be most practical, effective and useful blood conservation technique (20,21). However it carries risk of contamination with fetal blood cells, amniotic fluid so may cause amniotic fluid embolism and formation of red cell antibody (alloimmunization) (22,23). Cell salvage technique was used in 28 cases of which 46% were delivered by elective C/S, 43% emergency C/S and 2 vaginal delivery in the UK (24). In a low income country like Tanzania the use of this method seems impractical because of lack of equipment, technology to process collected blood, expert personnel to practice it and insufficient clinical experience.

Blood transfusion is not without risks despite screening of all donated blood for four major transfusion transmissible infections (TTIs) HIV, Hepatitis B virus, Hepatitis C virus and Syphilis. It carries risks and unwanted events of transmission of transfusion transmissible infections, red cell alloimmunisation, transfusion reactions, transfusion mis match and iron

over load from repeated transfusions. It is estimated that worldwide between 5-10% of HIV infections are transmitted through transfusion of contaminated blood and blood products (25). This is due to inadequate screening of transfused donated blood in some settings and can be minimized by adhering to screening programme of donated blood or products to all recommended major four TTIs.

It is clear that blood transfusion in obstetrics is an important life-saving practice however blood shortage in low income countries is still a major challenge to overcome. WHO estimates that over 8 million units of blood for transfusion is required in a population of 837 million people in its African member states per annum (6). Developing countries face challenges of lack of availability of safe and adequate blood for transfusion which hinders the goal of achieving quality obstetric care and reduction of maternal mortality. In view of this and since most of obstetric indications for transfusion are urgent, prompt and readily availability of blood for transfusion is important component in delivering quality obstetric care.

1.1 Literature Review

In low income countries most of obstetrics blood transfusion demand is not full covered due to blood shortage. Unavailability and blood scarcity usually leads to patients missing or receiving fewer blood transfusions than those requested by clinicians. In Burkina Faso a study on analysis of blood transfusion requirements during pregnancy and puerperium found that among 450 women, who had indication for transfusion, 84.4% were transfused and 15.6% were not, unavailability of blood 74.6% was the main reason for those who were not transfused (8). Among those transfused 52.6% of transfusion requirement was totally covered and 47.4% was partially covered (8). In Tanzania among 165 cases who underwent emergency peripartum hysterectomies 79 cases received blood transfusion and 31 cases did not due to unavailability of blood (26). Blood shortage still remains a major obstacle in achieving adequate transfusion in many of low income countries. In Ghana among 519 transfused obstetrics & gynaecology patients, nearly half of them 48% were restricted in supply of blood products and 52% were transfused full products supplied (27). Ouédraogo and colleagues in Burkina Faso also found that out of 1226 bags of blood requested, 71.1% were given and about one third 29.9% were not provided (8). In all those cases where blood was not given, unavailability was the main cause.

In high income countries, situation of obstetric blood transfusion widely differs with that in many of low income countries as most of the patients are transfused as per prescribed amount or get units of blood close to prescribed amount. In Toronto-Canada, a study on blood transfusion in patients who developed primary PPH that required blood transfusion revealed that 100% of patients were transfused with PRBCs, 42.3% with FFP , 18.2% platelets and 9.6% with cryoprecipitate and recombinant factor VII 1% (28). In New York-USA, 95% of patients with placenta accreta were transfused with RBCs, 64% plasma, 42% platelets and 23% cryoprecipitate (29). In MNH with existing blood scarcity it is unknown what proportion of women prescribed with blood; do actually receive blood as prescribed. Thus this study aimed to find out the proportion of women who receive blood transfusion as per prescription requirements.

Various obstetric conditions can necessitate need for transfusions among them are uterine atony, disorders of placentation, and trauma. Atony increases risk of blood transfusion due to inadequate closure of uterine sinuses post-delivery and disorders of placenta result in haemorrhage in case of placenta accident or attempt to separate morbid adhered placenta from myometrium. Genital tract trauma results in exposure of bleeding vessels. A study in Canada found major indications for blood transfusion were bleeding from uterine atony 27%, retained placenta 17%, trauma 17%, placenta praevia 7%, abruption placenta 5% and anemia 12% (30). In Japan a study of transfusion management of obstetric haemorrhage revealed indications of blood transfusion in haemorrhagic obstetric patients were uterine atony 25.9%, trauma including rupture of uterus and genital tract injury 23.2%, abruption placenta 21.8%, placenta praevia (without accreta, increta and percreta) 13.6%, placenta praevia (with accreta, increta and percreta) 5.9%, uterine inversion 2.3%, HELLP syndrome 6.8%, and amniotic fluid embolism 0.5% (31). In a study on primary PPH that required blood transfusion it was found that uterine atony 38.5%, retained tissues 33.7%, genital trauma 12.5%, coagulopathy 6.7% were the causes of blood transfusion and in 8.7% the cause was undetermined (28).

Haemorrhage continues to be an important indication for transfusion in many settings. In events of severe haemorrhage apart from volume replacement with crystalloids or plasma expanders, blood transfusion is also used for the treatment and improvement of oxygen delivery to the tissues. In Ghana severe peri partum bleeding was the indication for 72.4% of transfused blood followed by anemia 27.6% (27). Furthermore in analysis of blood transfusion requirement it was found that main indications for transfusion were hemorrhage 75.1% and chronic anemia 24.9% (8). In India Obstetric haemorrhage and anemia were also responsible for 68% and 32% of blood transfusion respectively (32). In this study risk factors for transfusion noted were medical conditions (anemia, jaundice, fever) 26%, PIH 23%, previous uterine scar 15%, abruption placenta 14%, 1st trimester haemorrhage 10%, placenta praevia 6%, multiple pregnancy 3%, retained placenta 2% and lacerated cervix 1% (32). All these findings point out on importance of haemorrhage in obstetrics as the cause of transfusion and a need of prompt management of it.

Anemia is a problem in low income countries that needs to be addressed and measures to prevent it taken as it has been found to contribute widely in indication for transfusions. Above all anemia poses risks of morbidity and mortality to both fetus and mother. Blood transfusion is used to treat symptomatic anemia and 1 unit of packed RBC should increase haemoglobin by 1g/dl or 3% of haematocrit (33). In Nigeria a study on blood transfusion trends in obstetrics revealed that anemia 72.2% was the leading indication for transfusion followed by obstetric haemorrhage 27.8% (13). In Ethiopia, prevalence of anaemia in pregnancy was found to be 27.9% with mild, moderate and severe anemia represented by 55%, 32.5% and 12.5% respectively (34). Majority of these women had a high risk of blood transfusion during peripartum period. All these study findings underscore the role of blood transfusion in anemia endemic regions.

Caesarean delivery, genital tract trauma and medical conditions have also been observed to contribute to blood transfusion in obstetric patients. A study by Anorlu in Nigeria found some medical and obstetric conditions in transfused patients were caesarean section 68%, previous caesarean section 20.4%, APH 16.9%, PIH 15.6%, anemia and malaria 14%, induction of labour 13%, ruptured uterus 8.8% and sickle cell anemia 5.2% (35). It has been found that the highest risk of blood transfusion is in intrapartum and elective caesarean delivery and risk is more than double in caesarean deliveries before 33 weeks (36). In women with PPH requiring massive transfusion whereby C/S 69% was the main mode of delivery, uterine atony 40% was the major cause of massive transfusion followed by placenta accreta and trauma (37). In our setting women have been transfused due to both haemorrhage and anaemia but nothing is known as by which percent each contributes to transfusion. Again for women who experience haemorrhages it is unknown what are the obstetric conditions and their percentages that cause haemorrhages. This study aimed to fill this gap of knowledge.

It is necessary to separate, process and store blood components within 6-12 hours of blood donation to ensure adequate supply and appropriate clinical use because many of components, particularly clotting factors and platelets deteriorates within hours of donation (38). Appropriate clinical use of blood by separating it into its components before transfusion is

beneficial and cost effective to a patient and the hospital because the patient gets what she needs and conserving the other products for another patient who needs it. This is important especially in settings where blood and/or products are scarce. In obstetric emergencies especially in massive bleeding, transfusion may be a life-saving procedure but inappropriate use of blood products are associated with increased morbidity and risk of death (39). For instance non leucodepleted blood will release cytokines on storage and may cause non hemolytic febrile transfusion reactions (40). A study on transfusion management in obstetric haemorrhages revealed that, among 453 units of allogeneic transfused blood products, 41.5% were red cell concentrate, 44.8% FFP and 13.7% platelets (31). Of 181 women who required massive transfusion for major obstetric haemorrhage 99% were transfused with FFP, 77% platelets and 61% cryoprecipitate whereby the median number of RBCs units transfused were 10, FFP 6 and cryoprecipitate 2 (24). In blood transfusion during pregnancy, birth and postnatal period data shows PRBCs was the predominant transfused component contributing to 99.4% among 86% of transfused women who received only PRBCs and/or whole blood (41). These study findings point out on importance of appropriate clinical use of blood by separating donated blood and transfusing each blood components separately thus maximizing their use.

However in some circumstances due to either capacity restrictions or a need of whole blood, separation of blood into its components is not possible. A study on appropriateness of blood product transfusion in obstetrics & gynaecology revealed that out of 1001 blood products transfused, 94.6% was whole blood and 6.4% was transfused as red cell concentrate (27). In Sector 30 district hospital-Ouagadougou it was found that 24% of transfusion was whole blood, 69.9% red cell and 6.1% FFP (8). In India, among transfused blood 50% was whole blood, 5% was packed cell and 45% was combination of both whole and packed cells (32). In some of the low income countries separating blood into its components is a problem of concern. Recent data shows that only 45% of blood collected in low income countries is separated into components, 80% in middle income countries and 95% in high income countries (5). In 2014 a report of blood transfusion in Africa revealed among 3.3 million units of blood transfused, 52.2% units were transfused as red blood cell, 35.2% whole blood, 6%

FFP, 3.8% platelets and 0.6% cryoprecipitate (6). Of recent worldwide there have been efforts to separate and transfuse blood components rather than whole blood. By doing this, patients will be transfused with blood types or components that they need as advocated. Muhimbili is a national referral hospital with blood bank that is capable of separating donated blood into its components, but still we do not know the types and proportions of blood and components transfused in obstetric care. This study determined to find out all these unknown information.

Average time interval between decisions to transfuse and blood transfusion varies in different settings according to various factors related to availability of blood. In low income countries this time interval is long and in one study that was done in Nigeria the mean decision to transfusion interval was found to be 12 +/- 4.3 hours (13). None availability of blood, cost of blood and financial restrictions were the reasons for this long interval. A review article on Maternal mortality in sub-Saharan Africa and contribution of ineffective blood transfusion services revealed a direct association between maternal death and/or near misses and lack of timely blood transfusion (12). No specific time was mentioned but there was significant delay in obtaining blood which was contributed by poverty, logistic failure and lack of donors.

In Egypt patients who needed immediate blood transfusion, average time interval between establishment of a need for transfusion to blood transfusion was found to be 1:36 hours and average time between ordering blood until it arrived at the hospital was 50 minutes (42). Delays between making a decision to blood administration was due to time taken to order blood in blood bank, serological testing of donated blood, transport of blood to the ward and preparation of blood before transfusion. A study on availability and quality of emergency obstetric care, average time interval between diagnosis and blood transfusions was reported to be 48 hours, range of (5-72 hours) (43). Again, in this study availability of blood and cost were the main reasons for these delays as husbands and relatives had the responsibilities to find blood for their wives/siblings through paying of donors. Despite of blood scarcity and shortage in our setting, nothing is known on how this has affected decision to transfusion time interval for patients who require blood transfusion. This study aimed to fill up this gap of knowledge.

1.2 Problem Statement

Blood transfusion in obstetric care is an important procedure and lifesaving in other times due to the fact that obstetrics is associated with the risks of anemia and/or hemorrhage. This risk results in high demand of blood for transfusion especially in peripartum period. Tanzania is an example of low income country whereby maternal mortality stands at 398 (44) incidences of anemia in pregnancy and PPH are high. The country faces challenge in fighting high maternal mortality partly because of unavailability of adequate blood for transfusion especially in events of obstetric haemorrhages.

In Muhimbili National Hospital (MNH), MMR is 1,541 per 100,000 live births, PPH 14.9% and anemia 11.3% rank 2nd and 3rd respectively in causing maternal deaths (15). In this hospital 70.4% of blood donations are replacement and 29.6% are voluntary donations (45). In emergency need of blood for transfusion, patient gets blood from blood bank to cover the emergency. However sometimes there is blood scarcity which causes patients to receive less units of blood than those requested/recommended by clinicians or experience delay in transfusions. This scarcity leads to shortage as a result of unavailability of appropriate blood group.

It is not known how much blood is needed for transfusion in obstetric care and how many women need blood transfusion at Muhimbili National hospital. This study aims to find out the proportion of women transfused with blood amount as prescribed, decision to transfusion time interval and obstetric conditions giving rise to high demand of blood transfusion in obstetric care.

1.3 Rationale

Results obtained in this study will inform on the hospital obstetric demand for blood, associated blood shortage and extent of use of blood and blood products at Muhimbili National Hospital. This will lay down strategies on how to solve problems associated with blood shortage and delays in transfusion.

1.4 Research Questions

1. What are the indications for blood transfusion among women receiving obstetric care at MNH in 2016?

2. What is the proportion of women who receive blood transfusions as prescribed by clinicians at MNH in 2016?

3. What is the time interval between decisions to transfuse to actual blood transfusion for women seeking obstetric care at MNH in 2016?

4. Which types of blood and its components are transfused in obstetric care at MNH in 2016?

1.5 Objectives

1.5.1 Broad Objective

To determine indications and availability of blood for transfusion in obstetric care at Muhimbili National Hospital, 2016

1.5.2 Specific Objectives

1. To determine indications for blood transfusion in obstetric care at MNH
2. To determine proportion of women who receive blood transfusions as prescribed by clinicians
3. To determine the types of blood and its components transfused in obstetric care at MNH during the study period
4. To determine time interval between decision to transfuse to actual blood transfusion

2.0 METHODOLOGY

2.1 Study area and setting

The study area was Muhimbili National Hospital (MNH) Maternity block. MNH is the largest hospital in Tanzania and serves as a national referral hospital and a teaching hospital for Muhimbili University of Health and Allied Sciences. Average number of deliveries per day is 20 to 40 (900 per month). This hospital is in Dar es Salaam, the largest commercial city in Tanzania with a population of 4, 364, 541 according to 2012 census (18). In obstetrics, it mainly receives patients from three Dar es Salaam regional referral hospitals namely Amana, Temeke and Mwananyamala. Within Dar es Salaam it also receives referred patients from Lugalo Military Hospital, Vijibweni hospital, private hospitals and health centers. Outside this region it receives patients from nearby Pwani regional referral hospital-Kibaha and its district hospitals Mkuranga, Bagamoyo and Kisarawe and occasionally patients from other regions of Tanzania

Admitted patients who have indications for blood transfusion among other things do have their venous blood withdrawn for investigations to determine ABO blood group & cross matching and level of haemoglobin before transfusion. However, depending on the clinical presentation of the patient blood may be transfused without haemoglobin results or based on documented referral haemoglobin concentration. After initial transfusions to stabilize the patient based on clinical response, subsequent transfusion will be judged by the level of post transfusion control haemoglobin which is done at least 24 hours from the last unit of transfused blood. Patients scheduled for elective surgeries or are due to undergo emergency surgeries group specific blood is cross matched in anticipation for haemorrhage during surgery.

In emergency situations blood is issued to a patient for initial resuscitation thereafter relatives are asked to donate blood for replacement or add on blood in case subsequent transfusion is needed. Elective surgeries with high risk of bleeding like caesarean section due to placenta praevia, lower segment uterine myomas, abruption placenta with previous uterine scar patient enters operating theatre with at least 2 units of fresh whole blood, there after transfusion may

be done intraoperative if blood is needed. All transfused blood and/or products are screened for Hepatitis B & C viruses, HIV and syphilis.

In this hospital blood transfusion is done according to MOH guidelines on the clinical use of blood and blood products. Blood transfusion is indicated for the treatment of symptomatic anemia in pregnancy to improve oxygen-carrying capacity of blood (while actual cause of that anemia is investigated or under treatment) (38). It is also indicated in acute blood loss with clinical evidence of inadequate oxgen-carrying capacity, in ongoing obstetric haemorrhage to maintain tissue oxygenation whereby initial volume resuscitation has been carried out with crystalloids and in disseminated intravascular coagulopathy (38). Blood is also transfused to pregnant women with severe anemia (Hb <7g/dl) at any gestation age to raise haemoglobin concentration.

All blood for transfusion comes from hospital blood bank. A patient who has indication for blood transfusion, venous blood sample is withdrawn and a blood request form is filled with patient's identification details and briefly history. Sample is then booked to the blood bank computer system then physically sent to blood bank for grouping, rhesus typing, cross matching and collection of blood. This is the case in requesting for any blood components. Requested whole blood for transfusion comes in the volume of 450 mls in 500 mls plastic bag that contains 63mls of anticoagulant. Packed red cells come in the volume of 250-300 mls, FFP 200-250 mls and platelets (50-70 mls) come in 300 mls bags.

Blood bank obtains blood mainly from donors who come to donate for their admitted relatives who need blood (family replacement donors) and voluntary donors. Other sources of blood are National Blood Transfusion Service (NBTS) and outreach programmmes for blood collection. There is no specific number of blood units which are allocated for use in obstetrics rather blood bank issues blood according to requests that have been made. Data from blood bank shows that in the period of 5 months before the start of this study (April to August) an average of 539 units of blood per month was issued to both Obstetrics & Gynaecology wards/theatre. There is no separation of how many units were issued to Obstetrics and how many to Gynaecology, so amount issued to obstetric only could not be determined.

2.2 Study design

This was a cross sectional study that involved 365 participants and was conducted at Muhimbili National Hospital in 2016

2.3 Study duration

It was done in a period of 3 months, from 1st September to 30st November 2016

2.4 Study population

This involved all pregnant and post-delivery women (who are within 42 days of birth) who were admitted in antenatal and postnatal wards during the study period from 1st September to 30th November 2016.

2.5 Study sample

This was all women admitted during the study period (Sept-November 2016) who were prescribed blood or blood component for transfusion.

2.6 Sampling procedure

A consecutive recruitment method was used whereby women in study population who met inclusion criteria were included as they were admitted or appeared during the whole study period.

2.7 Sample size estimation

- Sample size was calculated based on objective number 1 whereby in a study of Analysis of blood transfusion requirements during pregnancy and puerperium period in a hospital in Ouagadougou, abruption placenta as one of the haemorrhagic condition contributed to 6.9% of blood transfusions (8).
- Using 95% confidence level, maximum error 3%, and adjusting for 10% for non-respondents, then minimum estimated sample size was 305, the formula below was used (46).

$$N = \frac{Z_{\alpha/2}{}^2 P (1 - P)}{E^2}$$

Whereby;

N= estimated sample size

$Z_{\alpha/2}$ = is the standard normal deviate at 95% confidence level

P = proportion of patients who were transfused with blood due to abruption placenta in a previous study

E = level of precision

Then;

Z = 1.96, P = 6.9% = 0.069, E = 3% = 0.03

$N = 1.96^2 * 0.069(1-0.069)/0.03^2$

N = 274

Then by adjusting for non-respondents:

Total estimated sample size (N') was obtained using the formula

N' = N * adjusted factor

Adjusted factor = 100%/100%-f%

f% = Estimated percentage of women who did not respond=10%

N' = 274* 100%/100%-10%

N' = 305

2.8 Pre testing of questionnaire

Questionnaire was tested for one week before the start of data collection. Noted queries were then adjusted accordingly.

2.9 Data collection

Data were collected by a principal investigator from Ward Round Registers, Ward Report books, Labour ward Report book, Obstetric theatre post procedure Report book, Wards' and

theatre's Blood tracing books (where names and registration numbers of patients who needed blood for transfusion are documented for follow up of blood at the blood bank) and Maternity block reception. The study included both emergency and elective cases whereby daily total numbers of admissions for the whole study period were recorded. Data from patients' records that had indication and prescription of blood or product transfusion were recorded. Patients who were in the wards for the treatment of other obstetric condition(s) but developed condition that required blood or product transfusion their information was also recorded at the time of diagnosis of the condition.

Information on socio-demographic characteristics, obstetrics history, place of delivery, mode of delivery, pre transfusion HB, peripartum complications that necessitated transfusion, timing of transfusion whether before, during or after-delivery, time interval taken from decision to transfuse to actual transfusion, whether she was transfused or not, reasons for non-transfusion, patient status at the end of follow up, types and number of units of transfused blood or products were extracted. Patients were followed up until discharge or death. During the period of follow up any complication(s) which developed that required transfusion, number and types of requested units of blood or products, number and types of transfused units of blood or blood products were documented.

Blood or product that was not completely transfused due to either patient developed transfusion reaction, patient refusal to transfusion, damage of the blood unit bag or any other cause was not counted as being transfused but details of its availability was counted.
Type and amount of requested blood or components (in units) was obtained from Blood Transfusion Request & Report Form. Amount of blood or components (in units) obtained for transfusion was obtained from Blood Transfusion Request & Report Form. Type and amount of blood or components (in units) that have been transfused was obtained from Blood Transfusion Form. Date and time of which decision to transfuse was made, was obtained from patient's daily clinical notes in the file. Date and time of which blood was transfused was obtained from the Blood transfusion Form or Anaesthesia form (for patients whose transfusion was made intra operative). Patients whose decision to transfusion and blood transfusion was

made intraoperatively due to PPH, time of decision to transfuse was taken as that time when baby was delivered, "baby out time". This is because these patients had high risk of PPH (e.g. those with placenta praevia or abruptio placenta with previous scar) whereby blood was pre ordered and usually these patients enter in theatre with blood units ready for transfusion incase the need arises. So since PPH occurs after a baby has been delivered that's why "baby out time" was estimated as a reference time. Patients who had intraoperative decision & transfusion due to burst abdomen, time of decision to transfusion could not be referred so they were excluded from analysis (these patients' blood units were pre ordered and got in theatre with blood ready for transfusion incase the need arouse). Total amount of blood and/or its components issued to obstetrics for the whole period of study was obtained by summation of each patient's blood or components for transfusion obtained from blood bank. This information is on the Blood Transfusion Request & Report Form. Details of the ante natal complication(s) that necessitated transfusion was obtained from patient's daily progress clinical notes in the file. Details of indication for transfusion that occurred during or after delivery was obtained from patient's daily progress clinical notes in the file and operative notes on Anaesthesia form (for those patients who were managed in theatre). Total number of patients admitted in the whole period of study was obtained by summation of daily admissions records which were taken from medical records at the maternity reception. To minimize the possible effects of missing data bias, the number of study participants of 365 were recruited which exceeded the adjusted number of 305.

2.10 Data collection tool

This was a questionnaire that picked all required information from patients' hospital files which consisted of (Progress clinical notes, Blood Transfusion Request and Report Form, Blood Transfusion Forms, Partograph, ANC card, and referral case note), Labour Ward Report book, wards and theatre-blood tracing book and maternity medical records. There was also a daily admission summary form that recorded all numbers of patients admitted in each ward from medical records at the reception.

2.11 Data analysis

All questionnaires were coded and checked for completeness before entered into computer. Statistical Package for Social Science (SPSS) version 20 program was used for analysis. Data cleaning was done by checking of missing data and then analyzed. All continuous variables were analyzed using median, categorical variables were presented by using proportions.

2.12 Study outcomes

The study was expected to come with the following findings:

Indications for blood transfusions in obstetric care at MNH

Proportion of women who were transfused with blood amount as prescribed

Time interval between decisions to transfuse to actual transfusion

Types of blood and its components transfused in obstetric care at MNH

Proportion of women seeking obstetric care who would be transfused during the study period

Amount of blood requested and transfused during the study period

2.13 Inclusion criteria

All admitted pregnant women who had indication(s) for blood or product transfusion during the study period.

All pre-and post-delivery women who were in the wards on treatment for other obstetric condition(s) and during the course of treatment they developed conditions that required blood or product transfusion.

All post-delivery women (within 42 days of birth) who are in the wards and who required blood or products transfusion.

All admitted post-delivery women (within 42 days of birth) who were referred to MNH for blood or product transfusion.

2.14 Exclusion criteria

1. Those women who refused to give consent to participate
2. Women who declined blood transfusion

2.15 Ethical Issues

2.15.1 Ethical clearance

The ethical clearance was granted by the Muhimbili University of Health and Allied Sciences Senate Research and Publications Committee, and permission to conduct the study was obtained from Executive director of Muhimbili National Hospital and head of department Obstetrics and gynaecology.

2.15.2 Ethical consideration

Consent to participate in the study was sought from the patients or relatives (for the unconscious or very sick) and confidentiality was assured and maintained whereby no name appeared on the check list or analysis. To ensure patients are fully informed about the nature of the study they were given consent form to read and encouraged to ask questions if something was not understood, those who could not read the purpose of the study was explained to them.   Refusal to participate in the study did not deny any patient the right to treatment. Women who died before consent had been signed, consent was not sought but their confidentiality was handled with due respect.

3.0 RESULTS

During the three months period (from 1st September to 30th November 2016) there were 2,826 admissions in MNH maternity building for obstetric care. Of these, 365 women were prescribed to receive blood or blood components transfusion, 363 were prescribe to receive blood and of these, 351 received blood transfusion making prevalence of transfusion to be 351/2,826 (12.4%).

Among 365 women who were prescribed to receive blood or blood components transfusion, 351/365 (96.2%) were transfused with blood and 14/365 (3.8%) were not transfused with blood. Most women (219/365) 60% were referred from the 3 regional referral hospitals in Dar-es Salaam (Amana, Temeke and Mwananyamala), were in age group 25-29 (96/365) 26.3%. Seventy six percent (279/365) 76.4% of the women were pregnant by the time of admission and (86/365) 24% had delivered already by the time of admission, table 1.

Table 1: Socio-demographic and clinical characteristics of the study participants, N= 365

Description	n (%)
Age group (years)	
≤19	24 (6.6)
20-24	77 (21.1)
25-29	96 (26.3)
30-34	91 (24.9)
35-39	63 (17.3)
40-44	14 (3.8)
Education level	
No formal education	24 (7.4)
Primary education	207 (63.5)
Secondary education	76 (23.3)
Post-secondary education	19 (5.8)
Missing data	39
Occupation	
Housewife	141 (43.3)
Petty trader	113 (34.7)
Peasant	36 (11.0)
Employed	33 (10.1)
Student	3 (0.9)
Missing data	39
Entry point to MNH maternity	
Amana hospital	95 (26.0)
Temeke hospital	67 (18.4)
Mwananyamala hospital	57 (15.6)
Muhimbili ANC clinic	19 (5.2)
Other health facilities in Dar	59 (16.2)
Referral hospitals outside Dar	38 (10.4)
Home	30 (8.2)
Pregnancy status on admission	
Pregnant	279 (76.4)
Had already delivered	86 (23.6)

Table 2: Indications for blood transfusion

Description	n (%)	
Indication for blood transfusion, N=363[a]		
Obstetric haemorrhages only	183	(50.4)
Chronic anemia only	149	(41)
HELLP syndrome/Coagulopathy	14	(3.9)
Chronic anemia & Obstetric haemorrhage	12	(3.3)
Others[b]	5	(1.4)
Haemorrhagic conditions as indications for blood transfusion, N=195[c]		
PPH only	113	(57.9)
APH only	45	(23.1)
APH & PPH	37	(19.0)
Causes of PPH among the participants, N = 150		
Uterine atony	46	(31)
Abruptio placenta	25	(16.7)
Cervical/perineal/vaginal tears & lacerations	20	(13.3)
Ruptured uterus	15	(10)
Trauma from c/s, hystorotomy	14	(9.3)
Retained placenta/membranes	10	(6.7)
Placenta praevia	9	(6)
Coagulopathy/HELLP syndrome	3	(2)
Others[d]	8	(5.3)

[a]Two women had indication of platelets transfusion only

[b]Leukemia, blood loss during burst abdomen repair

[c]Some women experienced both chronic anaemia & obstretric haemorrhage

[d]Sepsis, bone marrow failure, not documented

Obstetric haemorrhage was the leading indication for blood transfusion occurred in 183/363 (50.4%) of the women. Of the haemorrhagic conditions, PPH only was the leading indication, represented by 113/195 (57.9%) as shown on table 2.

Table 3: Women who were transfused with blood units as per prescription requirement

Units of whole blood, N=265*	Number of women Prescribed	Number of women transfused (%)	
1	12	10	(83.3)
2	83	49	(59)
3	85	32	(37.6)
4	37	14	(37.8)
5	15	10	(66.7)
>5	33	9	(27.3)
Total	265	124	(47)
Units of PRBCs, N=103*			
1	5	2	(40)
2	36	1	(2.8)
3	35	2	(5.7)
4	12	0	(0)
5	8	0	(0)
>5	7	0	(0)
Total	103	5	(4.9)

Some women were prescribed to receive both whole blood and PRBCs

Forty seven percent 124/265 (47%) of the participants were transfused with whole blood amount as prescribed. Only 5/103 (4.9%) of the women prescribed to receive PRBCs were transfused the prescribed amount, table 3. This table shows that the fewer the number of units of whole blood prescribed, the higher the chance of being transfused the prescribed amount and vice versa, $P < 0.001$, 95% CI= 0.52-0.64. Exception occurs in those women who were prescribed with 5 units of whole blood whose majority (7/10) were in theatre with ongoing haemorrhage (where blood units were ordered in emergency note) while the rest (3/10) were severe anaemic, (1/3) in failure.

Reasons for non-blood transfusion

Fourteen (14) women were not transfused with blood at all, the reasons for non-transfusion were deaths before transfusion in 6 (43%), in 6 (43%) women the need for blood transfusion was no longer there (as they waited for a long time while on oral haematenics and diet rich in iron supplements until Hb was adequate) and 2 (14.3%) women had indication of platelets transfusion only.

Table 4: Status and causes of deaths of the participants at the end of follow up

Status, N=365	n	(%)
Alive	344	(94.2)
Died	21	(5.8)
Haemorrhagic shock	*4*	*(1.1)*
Heart failure 2° severe anaemia	*3*	*(0.8)*
Severe malaria with anaemia	*2*	*(0.6)*
Others[a]	*12*	*(3.3)*

Key: [a]Eclampsia/HELLP syndrome/AKI, leukemia, sepsis, bone marrow failure, advanced submandibular malignancy, pulmonary embolism, HIV encephalopathy

Table 4 shows that 21/365 (5.8%) of the participants died, of them 7/365 (1.9%) died as a result of conditions which directly require blood transfusion as main part of their management i.e. haemorrhagic shock and heart failure due to severe anemia and 6/365 (1.6%) died before transfusion.

Requested blood for transfusion versus availability

During the study period, 906 units of whole blood were requested for patients' transfusion and out of those 741 units (81.8%) became available and were transfused. However generally a total of 934 units of whole blood were transfused during the whole study period because there were 193* units of whole blood that were not requested but were transfused as an alternative to the requested PRBCs, FFP or platelets which were not available at that particular time.

On the other hand 321 units of PRBCs were requested for patients' transfusion whereby 36 units (11.2%) became available and transfused. Generally a total of 49 units of PRBCs were transfused whereby there were 13* units of PRBCs that were not requested but were transfused as alternative to the requested whole blood that was not available at that particular time.

*Note: *Some units of blood were transfused without being requested because at that time the requested blood or component was not available.*

9 Units of blood became available but were not transfused due to either patient developed transfusion reaction 4, blood bag damaged 2 or excess to requirement 3.

Table 5: Units of blood and components transfused

Blood / components	Units transfused n (%)
Whole blood	934 (81.2)
FFP	135 (11.7)
PRBCs	49 (4.3)
Platelets	32 (2.8)
Total	1150 (100)

Among 1150 transfused units, whole blood 934 (81.2%) was the most common transfused, platelets 32 (2.8%) were the least transfused components as shown on table 5.

Time interval from decision to transfuse to actual blood transfusion

The median time (Interquartile Range, (IQR)) from decision to transfuse to actual blood transfusion was 4:05 (7:54) hours with a minimum & maximum time of 0:05 to 45:10 hours respectively. Median time (IQR) taken for the blood specimen withdrawn from the patient to reach blood bank was 1:38 (2:01) hours with a minimum & maximum time of 0:05 – 7: 04 hours respectively.

Women who were transfused due to obstetric haemorrhage, median time (IQR) taken for blood specimen to reach blood bank was 1:23 (1:51) hours, minimum & maximum time was 0:05 - 7 hours respectively. Women who were transfused due to chronic anaemia median time (IQR) taken for blood specimen to reach blood bank was 2:03 (2:14) hours, minimum & maximum time 0:15-7:04 hours.

Table 6: Time interval from decision to transfuse to actual blood transfusion by indications of transfusion

Indication	N	Time in hours		
		Median time (IQR)	Minimum	Maximum
Chronic anaemia	103[a]	6:25 (9:39)	0:25	45:10
Obstetric haemorrhage	164[b]	3:08 (4:38)	0:05	36:14
Chronic anaemia & Obstetric haemorrhage	10[c]	3:59 (15:05)	1:20	35:30
HELLP syndrome/Coagulopathy	9[d]	5:10 (7:17)	3:35	17:06
Others[f]	2[e]	11:45	9	14:30

Key: Missing time pairs; a = 46, b = 19, c = 2, d = 7, e = 3 excluded, f= Leukemia, blood loss during burst abdomen repair

The shortest decision to actual transfusion interval was observed among women who were transfused due to obstetric haemorrhages, median of 3:08 hours, table 6.

4.0 DISCUSSION

In this study half of the women had indications for blood transfusion due to obstetric haemorrhage, (41%) chronic anemia, (3.9%) HELLP syndrome/coagulopathy, (3.3%) due to both chronic anemia & obstetric haemorrhage and (1.4%) due to other indications.

Majority of women required blood due to obstetric haemorrhage probably due to the fact that this is a tertiary referral hospital where most of complicated cases e.g. obstetric haemorrhages and high risk patients from peripheral health facilities are referred for management of respective complications and/or blood transfusion. This is also the case in patients with chronic anemia whereby this hospital is better than the rest in terms of blood collections and availability (as it has multiple sources) and it has a blood bank where collected blood is processed and stored. Other hospitals which refer patients to MNH (especial the three Dar es Salaam regional referral hospitals) do not have blood banks instead they obtain their blood requirements from replacement donors through NBTS coordination which may not be enough to fulfill their demands. This is evidenced by almost a quarter of women who had already delivered at the time of admission but were referred to this hospital for either blood transfusion/and or management of the obstetric complications.

This finding is similar to those reported by other researchers in Burkina Faso, Ghana and Japan who also reported haemorrhage followed by chronic anemia were the leading causes of transfusion (8,27,32). On the other hand it is different from that of Lawani in Nigeria who found anemia (72.2%) was the leading indication for transfusion followed by obstetric haemorrhage 27.8% (13). This difference may be due to the method used in data collection whereby in Lawani's study data were collected using questionnaires, this probably caused interviewees recall bias e.g. status or reason for transfusion could easily be forgotten by a patient who was unconscious by the time of transfusion. Lawani also excluded from the study women who failed to undergo pre transfusion HIV 1&2, Hepatitis B & C screening and those who had high risk of exposure to these infections since he needed to test them again 3 months post transfusion. This also probably excluded substantial number of women who were transfused due to haemorrhage. Transfusions due to haemorrhage may be avoided by strictly

adherence to good obstetric practices during labour and child birth. These include conducting active management of third stage of labour (AMTSL) after every child birth, avoidance of unnecessary episiotomies, early identification of pregnant women at risk of PPH e.g. those with polyhydramnious, big baby with prompt administration of uterotonics drugs after birth. Monitoring progress of labour using partographs to pick out early obstructions hence prevent uterine rupture and application of proper surgical skills to repair bleeding sites may also minimize need of blood transfusion due to haemorrhage. Blood transfusions due to chronic anemia can also be minimized by provision of effective ante natal care whereby women are screened for anemia, malaria, UTI and managed accordingly. Women are also supplemented with haematenics iron & folic acid, given anti-malarial drugs (SP) for intermittent presumptive treatment, dewormed, encouraged to sleep under subsidized insecticide treated mosquito nets and given health education on health eating.

Of the women who were prescribed whole blood, just under half of them were transfused the prescribed amount. This is due to blood scarcity and/or lack of timely availability of blood. Over prescription may also be a contributing factor whereby at times in emergency situations, a clinician may prescribe too many units of blood to cover the emergency only to find out later that the patient will not need all of the prescribed amount following that emergency. Non adherence to guideline on clinical use of blood may also be a contributing factor. In non-emergency situations after a need for blood transfusion is established, sometimes a patient may wait for blood to become available until the need for blood is no longer there, this is evidenced by 43% of women among those who did not receive blood transfusion, whose need of blood was no longer there after waiting for blood for some time. This explains why some patients' blood prescriptions were fully covered and others were not.

In addition among women prescribed to receive PRBCs, only (4.9%) had their requirements fully covered; this is because most of the women who had PRBCs prescriptions were transfused with whole blood due to unavailability of requested packed red cells at that time. PRBCs is mostly indicated for the resuscitation and treatment of patients with symptomatic chronic anemia as it contains only packed red cells so there is a reduced risk of circulatory overload and cardiac failure.

This finding is lower than reports from studies conducted in other African countries of Ghana and Burkina Faso which found that 52 to 52.6% of blood transfusion requirements were totally covered and 48% to 47.4 respectively were partially covered (8,27). Wide difference is seen in studies conducted in high income countries; for instance in Canada one study revealed that 100% of patients that developed PPH were transfused with PRBCs and in the USA 95% of patients with placenta accreta were transfused with RBCs (28,29). This difference can be explained by the fact that in high income countries there are effective blood collection systems and blood banks to process and store the collected blood, so there is no blood scarcity. In our setting low turnover of blood donations contributes to shortages seen in the hospitals. We urge families of pregnant women to take a leading role in blood donation so as to provide adequate blood ready to use when needed. Efforts to educate and motivate voluntary donors should also be enhanced. Strictly adherence of transfusion guideline by the clinicians may also help in rational use of available blood.

Whole blood was the most common transfused tissue, and contributed to (81.2%) followed by FFP (11.7%), PRBCs (4.3%) and platelets concentrates (2.8%). This is not surprising find because the majority of patients had PPH so they needed whole blood for correction of volume loss, improve oxygen carrying capacity and replacement of lost clotting factors respectively. PRBCs are mostly indicated in chronic anemia to correct anemia and improve oxygen carrying capacity hence enhance tissues oxygenation. Small percent of packed red blood cells transfused may be explained by inadequate separation of donated blood into its components, this is confirmed by presence of only 4.9% of patients whose PRBCs requirements were fully covered. It is also a practice in this hospital that chronically anaemic patients are slowly transfused with whole blood (with pre transfusion administration of furosemide to minimize risks of volume overload). If this whole blood had been separated it would enable patients to receive the PRBCs that they needed and conserving the other components e.g. plasma and platelets for other patients in need.

Whole blood being the predominantly transfused blood type followed by PRBCs was also reported by Osei and Pandya in Ghana and India respectively (27,32). On the other hand, this finding is in contrast to Ouedraogo in Burkina Faso who found red blood cells 69.9%, whole blood 24%, and FFP 6.1% were the most common transfused blood types and components (8). It also differs with the study done in Japan by Matsunaga which found that among allogeneic transfused blood products, packed red cells 41.5%, FFP 44.8% and platelets 13.7% were commonly transfused and in Australia packed red cells 99.4% were found to be the predominant transfused components among women who received PRBCs and/or blood (31,47). This difference may be due to the fact that the last two studies were conducted in resources rich countries where there are adequate facilities to separate donated blood into various blood components.

Median time interval between decisions to transfuse to actual blood transfusion was 4:05 hours. This long interval is due to several factors including none availability of appropriate blood group and/or time taken to accomplish blood ordering procedures and probable time taken from when blood has become available in the blood bank to patient's transfusion. For instance it was found that, median time taken from when patients' blood specimen was withdrawn until it reached blood bank was 1:38 hours. All these contributed to a delay in patients' transfusion, patient ought to receive blood transfusion as soon as the need arises so as to reduce morbidity and mortality associated with delaying transfusion. In this study 5.8% of the participants died, of these 1.6% died before they were transfused even a single unit of blood although they spent an average of 1:52 hours from when decision to transfuse was made until they died. However most of these patients were admitted from referring health facilities in critical conditions, 2 with heart failure due to severe chronic anemia, 1 with haemorrhagic shock and 1 severe malaria with anaemia. Others were already in the wards with eclampsia complicated by HELLP syndrome and severe anemia (1 patient), and obstetric haemorrhage due to placenta praevia co-existed with suspected pulmonary embolism (1 patient).

Long transfusion interval could also have an impact on costs and health care provision as women had to stay in the wards for long time waiting for transfusion. This could have exerted

costs to their families and heavy workload to hospital staff in low human resources for health setting and limited hospital infrastructures.

The transfusion interval of 4:05 hours observed in our study is higher than 1:36 hours found by Nada in Egypt (42). It is lower than 12 +/- 4.3 hours found by Lawani in Nigeria and 48 hours reported by Cham in Gambia (13,43). The observed difference seen in Lawani and Cham's studies could be explained by the fact that in settings where these studies were conducted blood is sold and relatives had responsibilities to find and pay blood donors, all these contributed to delay in blood transfusion. In our setting blood is not sold rather obtained from replacement and/or non-remunerated voluntary donors. Creating awareness to the community on importance of voluntary blood donations is crucial in recruiting and retaining more blood donors. This will ensure adequate supply of blood to the health facilities thus reduce long decision to transfusion time interval.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Obstetric haemorrhage and anaemia are still important indications for transfusion in obstetric care and in turn whole blood, FFP and PRBCs are the most common transfused blood types and components. Under half of the patients are transfused with blood units' amount as prescribed or recommended by the clinicians. The prevailing blood shortage in health facilities result in a long decision to transfusion time interval.

5.2 Strength

1. To the best of my knowledge, this is the first study relating to blood transfusion in obstetrics in our setting so it is going to open up further researches in this area.

5.3 Limitations

1. The study was conducted in tertiary referral hospital it may not a be a good representative of the situation in other health care levels because the hospital receives complicated cases
2. Some data were missing because of incomplete documentations

5.4 Recommendations

1. Any pregnant woman who is attending ANC at MNH should be counseled to bring blood donors to donate at least 2 units that would be ready for her in case she develops complication that needs transfusion.
2. Peripheral hospitals especially the three Dar es Salaam regional referral hospitals (Amana, Temeke and Mwananyamala) should be empowered on blood collection techniques, donors motivation and retention
3. It is high time for authorities in Dar es Salaam referral hospitals to improve blood collections to sustain hospitals' demands

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APPENDICES

Appendix 1: Check List English Version

QUESTIONNAIRE FOR THE STUDY ON INDICATIONS AND AVAILABILITY OF BLOOD FOR TRANSFUSION IN OBSTETRIC CARE AT MUHIMBILI NATIONAL HOSPITAL, 2016

Questionnaire number………………….

1. Age…….…………………
2. Residence…………………..
3. Gravidity…………………...
4. Parity……………………….
5. Abortions…………………..
6. Number of living children………..
7. LNMP……........................
8. EDD……………………..
9. Gestation age………………
10. Referring Institution/admitted from…………………………...
11. Level of Education
    1. No formal education
    2. Primary education
    3. Secondary education
    4. Post-secondary education (College/University education and above)
12. Occupation
    1. House wife
    2. Petty trader
    3. Peasant
    4. Pastoralist

5. Employed

6. Student

7. Others (specify)………………………

13. Number of ANC clinic attendance………….

14. Gestation age at booking………………

15. What was/were the diagnosis (es) at admission

(1)…………………..……………………..(2)………..………………………..…………...

(3)…………………………..………………....

16. What was/were the diagnosis (es) during the course of treatment

(1)……….…………………… (2)…………...........…….…………………

(3)……………...…………………………..

17. On admission was the patient pregnant?

1. Yes

2. No

If the answer is NO, proceed with questions 18 & 19 and if is YES go to question 20-23.

18. If she was not pregnant upon admission, where did she deliver?

1. MNH

2. At the Health facility other than Muhimbili

3. Other …………………………………….(specify)

19. If she was not pregnant on admission, by which mode did she deliver?

1. Vaginal delivery

2. Abdominal delivery

3. Both 1 and 2

20. If she was pregnant upon admission, at discharge has the patient delivered?

1. Yes

2. No

21. If she has delivered, what was the mode of delivery?

    1. Vaginal delivery

    2. Abdominal delivery

    3. Both 1 and 2

22. If mode of delivery was vaginal, was it;

    1. SVD

    2. ABD

    3. Vacuum delivery

    4. Others……………………(specify)

23. If mode of delivery was abdominal, what type of surgery was it?

    1. Caesarean Section (C/S)

    2. Hystorotomy

    3. Laparotomy for ruptured uterus

    4. Others…………………….(specify)

24. What was peripartum complication(s) that necessitated indication for blood transfusion

    1. Chronic anemia

    2. Obstetric haemorrhage

    3. Both 1 &2

    4. Others (specify)…………………….

25. If she was transfused due to haemorrhage, what type of haemorrhage was it?

(a) Ante Partum Haemorrhage (APH)

(b) Post-Partum Haemorrhage (PPH)

(c) Both 1 & 2

(d) Others (specify)………………………

26. If she had Ante Partum Haemorrhage (APH), what caused that APH?

    1. Abruptio placenta

    2. Placenta Praevia

    3. Others (specify)………………………

27. If the patient had PPH, what was the cause of PPH?

    1. Uterine atony

    2. Cervical/Perineal/Vaginal tears& lacerations

    3. Abruptio placenta

    4. Placenta praevia

    5. Ruptured uterus

    6. Retained placenta/tissues

    7. Trauma from C/S, hystorotomy

    8. Coagulopathy

    9. Others (specify)………………..………………..

28. Was the patient transfused?

    1. Yes

    2. No

29. If not transfused, what was the reason……………………………………….

30. What was the Haemoglobin (g/dl) before blood transfusion………………….

31. What was the Haemoglobin (g/dl) at discharge/death………………………….

32. What types of blood or component(s) were transfused? (There may be multiple responses)

    1. Whole blood

    2. Packed red blood cells

    3. Fresh Frozen Plasma (FFP)

    4. Platelets concentrate

33. How many units of blood or components were transfused? (There may be multiple responses)

    1. Whole blood …………………………units

    2. Packed red blood cells……...………...units

    3. FFP………………………………...units

    4. Platelets………………………………units

34. How many units of blood or components were requested? (There may be multiple responses)

    1. Whole blood…………………………units
    2. Packed red blood cells………………units
    3. FFP…………………………………...units
    4. Platelets……………………………...units

35. How many units of blood or components were obtained/issued for transfusion? (There may be multiple responses)

    1. Whole blood…………………………units
    2. Red cells……………………………..units
    3. FFP…………………………………..units
    4. Platelets……………….…………..units

36. For units of blood obtained/issued for transfusion

    1. Time interval from decision-to-transfusion of 1st unit…………….(minutes)

       Date & **time** of decision………………………Date & **time** of transfusion………….

    2. Time interval from decision-to-transfusion of 2nd unit…………….(minutes)

       Date & **time** of decision………………….Date & **time** of transfusion……………..

37. Time taken for blood specimen to reach blood bank……………….(minutes)

       Date and **time** of specimen collection…………………………………

       Date and **time** of specimen reception at blood bank……………………………...

38. At the end of follow up, what was the status of the patient?

    1. Alive
    2. Died

39. If she is alive, what complication(s) did she suffer?

       1...
       2…………………………….

40. If the patient died, what was/were the cause(s) of death?

    1. ……………………….
    2. ……………………….
    3. ……………………….

Appendix 2: Daily Wards Admission Summary Form

Date	Ward number	Total wards' admissions	Admitting firm(ward)
e.g. 01/09/2016	32	0	4 (39)
	33	3	
	34	12	
	35	4	
	38	6	
	39	9	
	42	2	
	Total admissions/day	36	
02/09/2016	32	1	3 (38)
	33	0	
	34	10	
	35	1	
	38	7	
	39	2	
	42	0	
	Total admissions/day	21	

Appendix 3: Consent Form (English version)

Introduction

I am **Dr Luis Ambrose**, a postgraduate student pursuing Master of Medicine in Obstetrics and Gynaecology at Muhimbili University of Health and Allied Sciences (MUHAS). I am conducting a research on **INDICATIONS AND AVAILABILITY OF BLOOD FOR TRANSFUSION IN OBSTETRIC CARE AT MNH**.

Purpose of the study

The purpose of this study is to determine indications for blood transfusions and availability of blood needed for transfusion for women receiving obstetric care at Muhimbili National Hospital. Results findings will lie down strategies to solve the problems associated with blood shortage thus reduce maternal mortality associated with blood loss and anemia.

Participation in the study

You are kindly requested to participate in this study because you are one of the women who have an indication for blood/products transfusion or you have been transfused. If you are willing to participate in this study, your information on your file will be recorded and used for the purposes of study.

Confidentiality

Information collected from your file will remain confidential and be used for research purpose only. To maintain anonymity no names will be used on the questionnaire.

Benefits

There will be no financial benefit from participating in this research but the results so obtained will lead to a better obstetric care for women in need of blood transfusion.

Risk to participant

No any anticipated risk or harm will happen to you as a result of participating in the study

Right of participation in the study

Your participation is voluntary and you can decide to refuse or withdraw from participation anytime without giving reason and there will be no penalty for that. Your rights as a patient will remain unharmed upon withdrawal.

Contact person

If you have any queries about the study you can contact principal investigator, Dr Luis Ambrose (0713767198).

However in the event of any question concerning your rights as a participant you may contact Professor Said Aboud, Chairman of Senate Research and Publications Committee, MUHAS, P.O BOX 65001 Dar es Salaam. Telephone; 2150302-6.

If you agree to participate in this study, please sign this consent form.

I …………………………………………………. have read and understood the content of this consent form and my questions have been sufficiently answered. I therefore consent to participate in this study.

Signature of the participant……………..

Signature of researcher/assistant……………..

Date………………….

Appendix 4: Consent Form (Kiswahili version)

Utangulizi

Jina langu ni **Dkt Luis Ambrose**. Mimi ni mwanafunzi wa shahada ya uzamili ya Magonjwa ya uzazi na kina mama kutoka Chuo Kikuu cha Sayansi za Afya na Tiba Shirikishi Muhimbili. Ninafanya utafiti unaohusu **SABABU ZA KUONGEZEWA DAMU NA UPATIKANAJI WAKE KWA WAGONJWA WANAOPATA HUDUMA YA UZAZI KATIKA HOSPITALI YA TAIFA YA MUHIMBILI.**

Dhumuni la utafiti

Dhumuni la utafiti huu ni kutaka kufahamu sababu za ungezewa damu na upatikanaji wake kwa wagonjwa husika. Matokeo ya utafiti huu yatasaidia kutatua tatizo la uhaba wa damu hivyo basi kupunguza vifo vya kina mama vinavyotokana na upungufu wa damu na kuvuja damu nyingi wakati wa uzazi.

Ushiriki wako kwenye utafiti

Unaombwa kushiriki kwenye utafiti huu kwasababu wewe ni mmoja wa wagonjwa walioongezewa/wanaohitaji kuongezewa damu au moja wapo ya zao la damu. Ukiridhia kushiriki taarifa zako zilizo kwenye jalada lako la matibabu zitanakiliwa kwa minajili ya matumizi ya kwenye utafiti huu.

Usiri wa taarifa za mshiriki

Taarifa zako zitakuwa ni siri na zitatumika kwa madhumuni ya ufafiti huu tuu. Sitahitaji kuandika jina lako mahali popote kwenye dodoso la utafiti au kompyuta

Faida ya ushiriki

Hakutakuwa na faida ya moja kwa moja mfano malipo ya pesa yanayotokana na ushiriki wako kwenye utafiti huu lakini matokeo yatakayopatikana yatasaidia kuboresha utoaji wa huduma za uzazi hapa hospitalini

Athari za utafiti kwa mshiriki

Kushiriki utafiti huu hakutakupa athari au madhara yeyote

Haki ya kushiriki au kutoshiriki katika utafiti huu

Ushiriki wako ni wa hiyari na unao uhuru wa kujitoa wakati wowote pasipo kutoa sababu. Kutataa ama kujitoa kushiriki kwenye utafiti huu hakutakunyima haki yeyote ya matibabu wala hakutakuwa na hatua yeyote itakayochukuliwa dhidi yako.

Mawasiliano

Iwapo una maswali au unahitaji ufafanuzi kuhusu utafiti huu, wasiliana na mtafiti mkuu Dkt Luis Ambrose kwa namba ya simu 0713767198

Hata hivyo endapo utakuwa na maswali kuhusu haki yako kama mshiriki unaweza kuwasiliana Profesa Said Aboud, Mwenyekiti wa Baraza la Utafiti na Uchapishaji la Chuo Kikuu cha Muhimbili (MUHAS) kupitia mawasiliano yafuatayo: S.L.P 65001 Dar es Salaam. Namba za simu 2150302-6.

Kama umeridhia kushiriki, tafadhali weka sahihi yako hapa chini.

Mimi …………………………………………………………. Nimesoma na nimeelewa maudhui ya fomu hii na swali/maswali niliyouliza yamejibiwa kikamilifu. Hivyo basi natoa idhini ya kukubali kushiriki utafiti huu.
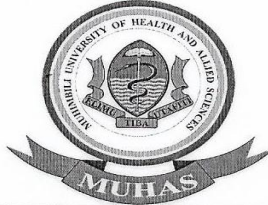
Sahihi ya mshiriki……………………

Sahihi ya mtafiti/mtafiti msaidizi……………..

Tarehe………………….

Appendix 5: Ethical Clearance Letter

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR OF POSTGRADUATE STUDIES

P.O. Box 65001
DAR ES SALAAM
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Ref. No. MU/ PGS/SAEC/Vol. XVI/

15th July, 2016

Dr. Luis Ambrose
MMed. Obstetrics and Gynaecology
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED: "INDICATIONS AND AVAILABILITY OF BLOD FOR TRANSFUSION IN OBSTETRIC CARE AT MUHIMBILI NATIONAL HOSPITAL".

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 14th July, 2016 to 13th July, 2017. In case you do not complete data analysis and dissertation report writing by 13th July, 2017, you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. E. Balandya
DEPUTY DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Medicine

MANUSCRIPT