Section A-Research paper

The Best Transfusion practices of Single unit and Massive protocols in Obstetric Emergencies among women admitted in a Tertiary care Hospital: A Cross-Sectional study

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Abstract

Background: Obstetrics emergencies occur suddenly and unexpectedly. Obstetric hemorrhage either during pregnancy, labor or in postpartum period and severe anemia due to nutritional deficiency, are the commonest indications for blood transfusion worldwide [1]. Blood transfusion is recognized as one of the eight essential components of the comprehensive emergency obstetric care module, which has been designed to reduce maternal mortality rate [2]. The main objective of our study is to determine the best transfusion practices regarding single unit and massive protocols in obstetric hemorrhage among women admitted for obstetric care.

Methods: The study was conducted in the Department of Obstetrics and Gynaecology, Southern Railway Headquarters Hospital, Ayanavaram, Chennai, over 18 months between December 2017 and May 2019. The study area includes all the women admitted in antenatal, labor, post-natal wards, ICU, those seeking an abortion, and emergency inpatient services of obstetrics.

Results: The rate of single unit transfusion was 26.3% and the two major indications were anaemia in pregnancy and postpartum haemorrhage. The rate of massive blood transfusion was 3.5%.

Conclusions: The single-unit transfusion rate in the current study is considered higher and such practices should be avoided which has a great impact on the work load on blood banks and more importantly, the risks involved in blood transfusions can be minimized. Hence, we need regular, active medical audits to study, discuss and to find out decision analysis for rational use of blood and blood products. The two major indications when single units were given are anaemia complicating pregnancy and PPH, which could have been avoided by maximizing the haemoglobin level during

ante-natal period and minimizing the amount of blood loss during delivery and post-partum period. The rate of massive blood transfusion was 3.5% and the indications were caesarean peri-partum hysterectomy and HELLP syndrome.

Keywords: Blood transfusion, single unit, obstetric care, massive transfusion protocols

Introduction

Transfusion in obstetric patients poses challenges due to changes in maternal physiology, risk of alloimmunisation and infections to the fetus. While indications for transfusion in obstetrics may be on emergency basis as well as on elective basis, the keystone of transfusion practice is that it should be appropriate that is, not given when not required and not missed when required. Transfusion guidelines have been designed by various organizations in various countries. While the basics remain the same, availability of resources decides the practice.

WHO restricts the transfusion policy with single unit as it does not benefit the patients with anemia and has resulted in the clinical transfusion practice of two unit transfusions [3]. Diverse opinion exists among the treating personnel regarding this entity of blood transfusion. Scarce availability forces them to transfuse what is available-i.e. the single unit, as something is worth than nothing. The appropriateness of this transfusion could be considered if ordered with good clinical judgment. In countries with resource constraints, single unit transfusion could be considered acceptable [4].

Obstetric hemorrhage is one of the most common cause of maternal morbidity and mortality in the world. It is defined (among others) as the loss of >2500ml of blood, and is associated to a need for admission to critical care and or hysterectomy [5]. Obstetric hemorrhage remains an important cause of "near miss" events. Approximately 140,000 women die of PPH annually worldwide, and of these, more than 50% occur in the first 24 hours postpartum period. WHO has estimated that per year approximately 20 million mothers suffer significant morbidity from PPH [6]. By saving lives in obstetric emergencies, blood bank services play a very important role [2]. According to WHO, the national system, volunteer donations, blood testing and avoidance of unnecessary transfusion remain the main cornerstones of safe and effective blood donor services.

Various definitions of massive blood transfusion have been published in the medical literature such as,

1. Replacement of one entire blood volume within 24 hours.
2. Transfusion of >10 units of packed red blood cells (PRBCs) in 24 hours.
3. Transfusion of >20 units of PRBCs in 24 hours.
4. Transfusion of >4 units of PRBCs in 1 hour when on-going need is foreseeable.
5. Replacement of 50% of total blood volume (TBV) within 3 hrs.

Definitions that use the period of 24 hours are not useful during active management of blood loss. More dynamic definitions, which identify rapid blood transfusions are better suited for use in day-to-day practice [7]. Massive transfusion protocols are generally activated after transfusion of 4-10 units. Massive transfusion practices have a predefined ratio of RBCs: FFP/cryoprecipitate: platelets units of 1:1:1 in each pack. Once the patient is in the protocol, the blood bank ensures rapid and timely delivery of all blood components together to facilitate resuscitation. Targets of resuscitation in

massive blood loss are, Mean arterial pressure (MAP) around 60 mmHg, systolic arterial pressure 80-100 mmHg (in hypertensive patients one may need to target higher MAP), Hb 7-9 g/dl, INR <1.5; aPTT< 42s, Fibrinogen > 1.5-2 g/L, Platelets >50 x 10^9/L, pH 7.35-7.45 and Core body temperature > 35^o celsius.
This reduces dependency on laboratory testing during resuscitation and decrease the need for communication between the blood bank, laboratory and the physician.

Methods
A cross-sectional study was carried out in the Department of Obstetrics and Gynecology, Southern Railway Headquarters Hospital, a tertiary care hospital at Ayanavaram, Chennai, for 18 months from December 01, 2017 to May 31, 201. The study population include, all the women admitted and underwent transfusion of blood and blood components in the antenatal, labor, post-natal ward, ICU and those seeking abortion and emergency inpatient services of obstetrics during this period. The patient who required an emergency transfusion was explained about its necessity and the possible risk associated with it. Informed consent was obtained from all the patients before transfusion, as per the hospital protocol and guideline. They were also provided with a patient information sheet. Clinical details and the indications for ordering a blood or blood product were noted in the patient's case sheet and the blood requisition orders were processed and cross-matched as per the hospital transfusion guidelines. The hospital has a well-equipped blood bank facility, which functions 24 hours a day, under the Pathology Department.

Sample size: The sample size was calculated assuming the expected rate of single unit transfusion as 13.77%, according to the study done by Bangal VB *et al*. [1]. The other parameters considered were 1% absolute precision and 95% confidence level.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where,
n = Sample size.
Z = Z statistic for a level of confidence = 1.96.
P = Expected prevalence of proportion.
(If the expected prevalence is 5.3%, then *P*= 0.053).
d = Precision (If the precision is 1%, then *d*=0.01) [8].

According to the calculation, the required sample size was 1929 women. Assuming 5% of non-participation rate, another 96 women were added. Hence, we planned to include not less than 2115 women in the final study. A total of 2381 women underwent obstetric care during our study period and same were included in the final analysis. The final study included a total of 57 subjects.

Statistical methods
The rate of single unit transfusion of blood was considered the primary outcome variable and the indications of its transfusion were considered the primary explanatory variables. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, and frequency and proportion for categorical variable. Since the study is only descriptive, no inferential statistical analysis has been

done. Hence no P values have been reported. IBM SPSS statistical software was used for data analysis [9].

Results

Among the study population, 15 (26.32%) participants had single unit transfusion (Table 1).

Table 1: Descriptive analysis of single unit transfusion in the study population (N=57)

Single unit transfusion	Frequency	Percentages
Yes	15	26.32%
No	42	73.68%

The two major causes for single unit transfusion were anemia in pregnancy and postpartum haemorrhage (Figure 1).

Among the study participants, 2 participants (3.5%) received massive blood transfusion. (Table 2) and the indications were caesarean peripartum hysterectomy and HELLP syndrome.

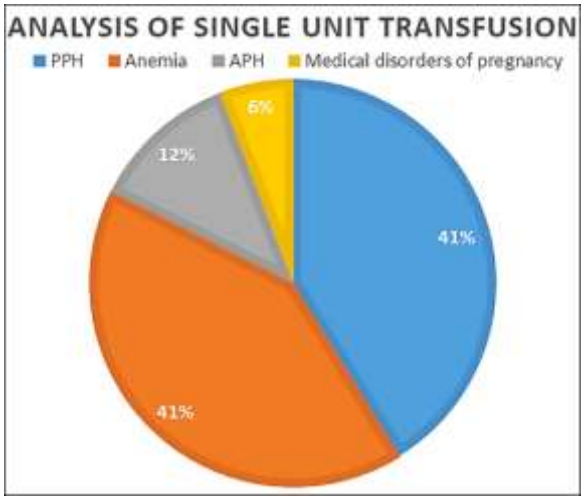

Fig 1: Pie chart of indications of single unit transfusion among the study population (N=57)

Table 2: Descriptive analysis of massive blood transfusion in the study population (N=57)

Massive blood transfusion	Frequency	Percentage %
Yes	2	3.5%
No	55	96.5%

Discussion

Single Unit Transfusion: Among the study population, 26.32% was found to be the single-unit transfusion rate in the current study, which was considered higher. On further analysis of single unit transfusion among the study participants, the two major indications where single units were given are anemia complicating pregnancy and PPH, which could have been avoided by maximizing the haemoglobin level during ante-natal period and minimizing the amount of blood loss during delivery and post-partum period. Because those who were given single unit transfusion involve young

otherwise low risk patients who will be able to tolerate a haemoglobin value of even upto 7g/dl without any hemodynamics changes unlike older patients or those with any cardiac or respiratory problems who will be requiring supports even at a lower threshold. Thus, a mere asymptomatic anemia with haemoglobin upto 7gm/dl and a blood loss during delivery which sufficed the requirement with just one-unit blood could have been corrected with parental hematinics if required in the post-partum period.

On comparison with other similar studies, (Table 3), in the study done by Bangal *et al.* [1], the rate of single unit transfusion was 13.77%. The rate is lower compared to our study, and restrictive transfusion policy of the care provider or of their hospital protocol may be the possible reason for their judious and optimal use of blood, which is strongly recommended. In the study done by Anjali *et al.* [10] and Chowdhury *et al.* [11], the rate of single unit transfusion were 44.82% and 69.6%, which have shown a higher rate compared to our study. Though Anjali *et al.* [10] gives the rate of single unit transfusion, analysis has not been done for its use among their study population. In the study done by Chowdhury *et al.* [11], blood transfusion was found inappropriate in many cases especially among those who received single unit transfusion and thus required creation of awareness among junior doctors, obstetrician and nurses through regular education programs.

Massive blood transfusion (MBT)

In the current study, out of 57 participants, two of the patient had massive obstetric haemorrhage, in accordance with the definition of considering massive obstetric haemorrhage as when 4 or more units of PRBC transfusion is required in 24 hours, which is accepted in most of the studies. One was a case of previous LSCS with placenta previa with placenta increta who was taken up for caesarean peri-partum hysterectomy with balloon catheterisation of internal iliac vessels and the other was a case of HELLP syndrome with fetal distress, where emergency caesarean section was done who had atonic PPH intra-partum and DIC in the post-partum period. Thus, the rate of massive blood transfusion in my study accounts for 3.5%.

On comparison with similar other studies (Table 4), there were no patients who required massive blood transfusion in the study done by Chawla *et al.* [12]. The rate calculated from the present study is much lower compared to the study done by fazal *et al.* [13] whose rate was 27.4%. This can be explained on the basis that my study area involved a closed railway population, where most of them include booked cases who will be given good ante-natal care starting from their first visit and any high-risk will be diagnosed and adequately treated or kept under control and will be followed up frequently where they give birth in an appropriate setting with a registered birth. So, the chances of patient having any massive blood transfusion for any specific indication would be relatively less. There were also only few high-risk referrals during this study period of 18 months. Chowdhury *et al.* [11] have almost similar rate as the present study and their indication among participants who required >10 units alone were analysed and were found to be placenta increta who required an obstetric hysterectomy and again a case of placenta increta.

On comparison with the study done by R.I. Anorlu *et al.* [14], the rate of massive transfusion was 20.2% and their causes were found to be rupture uterus followed by sickle cell anemia, vaginal and cervical lacerations. Also, in the study done by Fazal *et al.* [13], the rate of massive transfusion was 27.4% which is higher compared to the present study. The possible explanation could be, the study was conducted in a tertiary care center, Government Medical college, Trivandrum, which was a referral

hospital where all high risk obstetric patients and increased complexity of cases were received even unbooked or also due to the reason of better access to all products in a government medical college set up. Analysis of the causes of major blood transfused showed the majority of them had study participants with placenta previa, abruption placenta, atonic PPH, rupture uterus and inversion of uterus. Anjali *et al*. [10] and bangal *et al*. [1] have only studied the rate and further analysis into their cause has not been done.

Table 3: Discussion on Single Unit transfusion

Studies	Single unit transfusion (%)
Current study	26.32%
Bangal *et al*. [1]	13.77%
Anjali *et al*. [10]	44.82%
Chowdhury *et al*. [11]	69.6%

Table 4: Discussion on Massive transfusion rate among various studies

Massive blood transfusion	Percentage%
Current study	3.5%
Chawla *et al*. [12]	0%
Chowdhury *et al*. [11]	6.3%
Anjali *et al*. [10]	12%
R.I. Anorlu *et al*. [14]	20.2%
Bangal *et al*. [1]	22.5%
Fazal *et al*. [13]	27.4%

Conclusion

Thus, the rate of single unit transfusion was 26.3% and the two major indications were anaemia in pregnancy and postpartum haemorrhage. The rate of massive blood transfusion was 3.5% and the indications among the study participants were caesarean peri-partum hysterectomy and HELLP syndrome.

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