Evaluation of Uncross-matched Blood And Its Product Transfusion Practices In Obstetric Emergencies and Application of General Linear Model For Analysis

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ABSTRACT

Objective — *To determine the frequency and outcome of uncross-matched blood transfusion in obstetric emergencies.*

Study design — *Cross sectional study.*

Place & Duration of study — *Department of Obstetrics & Gynecology Unit 2, Dr: Ruth K.M Pfau Civil Hospital Karachi & Dow University of Health Sciences (DUHS) Karachi, from November 2020 to April 2021.*

Methodology — *A total of 179 pregnant women who presented in emergency with any obstetric condition and required blood transfusion, were included. Data were collected on a pre-designed questionnaire and variables collected included gestational age, indication of blood transfusion, number and type of blood products transfused and others outcomes like length of hospital stay and death.*

Results — *The mean age of the women was 28.35±5.28 year. Frequency of uncross-matched blood transfusion in obstetric emergencies was 22.91% (n=41). The packed cell (n=32 - 78%) and fresh frozen plasma (n=23 - 56.1%) were most frequently transfused. Placenta abruption (n=15 - 36.5%), placenta previa (n=10 - 24.4%), placenta accreta (n=5 - 12%) and ruptured uterus (n=11 - 26%) were the commonest indications for uncross-matched blood in obstetric emergencies.*

Mean hospital stay of women receiving uncross-matched blood was significantly high as compared to cross-matched blood transfusion (6.39±2.44 days vs. 3.18±0.65 days). Rate of ICU admission was also significantly high in same group. Mortality was also significantly high in women with uncross-matched blood transfusion. The frequency of uncross-matched massive blood transfusion was significantly high in those women who had previous history of massive blood transfusion.

Conclusion — *The frequency of uncross-matched blood transfused in obstetric emergencies was high. In the case of acute bleeding, the choice of transfusion should be based on clinical condition of the patient. A preplanned, multidisciplinary protocol gives best results in the management.*

Key words — *Obstetric hemorrhage, Obstetric emergency, Uncross-matched blood transfusion, Packed red cells transfusion, Fresh frozen plasma.*

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INTRODUCTION:

Worldwide the major cause of maternal death is hemorrhage. When coping with potentially catastrophic obstetric crises like obstetric hemorrhage in labor and delivery, the clinical team and transfusion services have to bear extra burden. The goal of resuscitation in women with an obstetric hemorrhage include control of ongoing hemorrhage and restoration the blood volume to maintain oxygen

supply to vital organs.[1] Life-threatening complications can be avoided by delivering blood products to seriously injured patients as soon as possible.

Packed red blood cells (PRBCs) and other blood products play an important role in the management of ongoing hemorrhage.[2] Uncross-matched group O PRBCs is compatible with all the blood groups. Group AB individuals have neither anti-A nor anti-B antibodies in their plasma. Group AB plasma can therefore be given to patients of any ABO blood group and is often referred to as the universal plasma donor.[3,4] Patients who cannot wait for cross-matched blood can receive uncross-matched PRBCs. Two tests at the blood bank assess the recipient's ABO group and whether they have extra erythrocyte antibodies beyond anti-A and anti- B.[3,4] It is better to always use cross-match blood but cross-matching takes time, hence when bleeding is life threatening patients can receive uncross-matched blood.[4] According to a study 31 patients received massive transfusions.[5]

Using plasma early and aggressively for patients who need massive transfusions improves survival and prevents acute or delayed hemolysis in uncross-matched erythrocyte recipients although extravascular hemolysis can occur.[5] In an emergency transfusion, uncross-matched blood recipients have a 0.1% chance of hemolysis. Cross-matched blood is less likely to be accessible for women at risk for postpartum hemorrhage. These female patients generally receive group O negative packed red blood cells, AB or A plasma, AB or A platelets, and cryoprecipitate during an emergency release blood transfusion regimen.[6] In a study 89 women were treated with emergency release blood transfusion for postpartum hemorrhage.[7] Every unit of blood product supplied for emergency release blood transfusion for women reduces their hysterectomy risk by 12.0%. However, it is reported that 1.9% of gynecological patients got incompatible blood transfusions.[8] This study evaluated the emergency transfusion practices in our hospital. There is a paucity of literature available on the subject. This study therefore added evidence based data to the existing literature.

METHODOLOGY:

It was a cross sectional study conducted at Obstetrics & Gynaecology Unit 2, Dr. Ruth K.M Pfau Civil Hospital Karachi & Dow University of Health Sciences Karachi, from November 2020 to April 2021. Sample size was calculated using open Epi sample size calculator using reference from a recent study in which frequency of uncross-matched blood was 5%.[1] Sample size obtained was 179 with 95% confidence interval and 3.2% margin of error. Women who presented in obstetrics emergency and required blood transfusion and those who presented in a state of shock with a need of blood for resuscitation and surgery to improve maternal condition, were included. Women in need of blood transfusion with gynecological indications were excluded.

Data collection were started after taking an approval of synopsis of the research protocol from the College of Physicians & Surgeons Pakistan. Informed consent was taken. Data were collected on a pre-designed form. Data were analyzed with statistical analysis program (IBM-SPSS- Version 24). Mean±SD was used to present quantitative variables like age, gestational age, parity, shock index, vital signs, blood loss, number of unit transfused and length of hospital stay. Frequency and percentage were computed for qualitative variables like uncross-matched blood transfusion, indications for uncross-match blood transfusion and outcomes (mortality, ICU admission). Effect modifiers such as age, parity, gravida, blood loss, comorbid condition, shock index, indication of uncross-matched transfusion were controlled through stratification or multivariable techniques like general linear model (GLM) and multivariate logistic regression. Student t-test and Chi-square tests were applied. A value of =0.05 was considered as statistically significant.

RESULTS:

During this study, 179 pregnant women presented in emergency and required blood transfusion. The mean age of the women was 28.35±5.28 years. The demographic characteristics are presented in table I.

Previous history of blood transfusion was noted in 18 (10.06%) women. Frequency of uncross-matched blood in obstetric emergencies was 22.91% (n=41). Placenta abruption (n=15 - 36.5%), placenta previa (n=10 - 24.4%), placenta accreta (n=5 - 12%) and ruptured uterus (n=11 - 26%) were the commonest indications for uncross-matched blood in obstetric emergencies. Regarding blood products, packed red blood cells (n=32 - 78%) and fresh frozen plasma (n=23 - 56.1%) units were transfused.

Mean hospital stay of women receiving uncross-matched blood in obstetric emergencies was significantly high as compared to cross-matched blood transfusion (6.39±2.44 days vs. 3.18±0.65 days). Rate of ICU admission was also significantly high in uncross-matched blood than cross-matched blood transfusion (90% vs. 10%) .

Table I: Demographic Characteristics of the Patients

Variables	Mean	Standard Deviation	Minimum	Maximum
Age (Years)	28.35	5.28	18	45
Gestational age (week)	36.70	1.32	34	39
Parity	1.84	0.81	1	6
Gravida	3.01	0.97	2	7
Shock Index	0.98	0.12	0.8	1.2
Estimated blood loss	716.03	374.99	500	2000

Table II: Frequency of Uncross-matched Blood Transfusion In Obstetric Emergencies Stratified By Demographic and Other Variables

Variables	Cutoff	Uncross-matched Blood Transfusion				Total	P-value
		Yes		No			
		Count	%	Count	%		
Age Groups(Years)	<30	26	19.7%	106	80.3%	132	0.087
	>30	15	31.9%	32	68.1%	47	
Gravida	<3	34	25.2%	101	74.8%	135	0.204
	>3	7	15.9%	37	84.1%	44	
Parity	Primiparous	18	26.9%	49	73.1%	67	0.329
	Multiparous	23	20.5%	89	79.5%	112	
Shock Index	<0.99	31	24.2%	97	75.8%	128	0.500
	>0.99	10	19.6%	41	80.4%	51	
Previous history of Blood Transfusion	Yes	15	83.3%*	3	16.7%	18	<0.001*
	No	26	16.1%	135	83.9%	161	
Blood Loss (ml)	<1000ml	5	3.5%	138	96.5%	138	<0.001*
	>1000ml	36	100%	0	0	36	

Mortality was low (1.7%) but it was also significantly high in women with uncross-matched blood transfusion. Stratification analysis was performed and noted that the rate of uncrossed-matched massive blood transfusion was significantly high in those women who had previous history of massive blood transfusion (table II).

General linear model showed the relationship between length of hospital and uncross-matched blood transfusion after controlling the effect of demographic, shock index, comorbid and blood loss. Beta coefficient of uncross-matched blood transfusion revealed that the average length of hospital stay was 2.560 times significantly high in women with uncross-matched blood as compared to cross-matched blood transfusion after controlling the effect of others characteristics of women (table III).

DISCUSSION:

Obstetrics emergencies can occur at any time and endanger not only the life of the mother but fetus too. WHO reported that 88-98% of maternal fatalities might be prevented with emergency obstetric care and a referral network. Transfusions can save women's life. Mismanaging obstetric situations requiring blood transfusions might cause consequences. Postpartum bleeding is unpredictable therefore blood transfusion facility is one of the top eight essential elements in health care settings.[9]

In our study the mean age of the women was 28.35±5.28 years, which is similar to other studies.[10,11] Major indication of blood transfusion in studies was anemia correction. In our study previous history of blood transfusion was observed in 10.6% which is similar to findings of another study.[12] In index study 22.91% of obstetric patients received uncross-matched blood. Placenta abruption and

Table II: General Linear Model Showing the Relationship Between Length of Hospital Stay and Uncross-matched Blood Transfusion After Controlling The Effect of Other Variables

Parameter	Unadjusted B coefficient (95 % CI)	P-Value	Adjusted â coefficient (95% CI)	P-Value
Uncross-matched Blood Transfusion Yes vs. No	3.209 (2.755-3.663)	<0.001	2.560 (2.087 -3.033)	<0.001
Age, <30 vs >30	0.489 (-0.135-1.113)	0.124	--	--
Gravida <3 vs>3	-0.733(-1.365--0.100)	0.024	--	--
Parity Primi vs.Multipara	-0.778 (-1.337--0.219)	0.007	-0.521 (-0.882 -0.160)	0.005
Shock Index <0.99 vs.>0.99	0.177 (-0.495 -0.729)	0.706	--	--
Hypertension Yes vs. No	3.214 (2.454-3.975)	<0.001	--	--
GDM Yes vs. No	1.671 (0.734-2.607)	0.001	--	--
Dyslipidemia Yes vs. No	1.340 (0.253 -2.428)	0.016	--	--
Previous HBT Yes vs. No	3.552 (2.799 -4.305)	<0.001	1.759 (1.098-2.421)	<0.001
Blood Loss <1000 vs >1000	-3.130 (-3.640--2.620)	<0.001	--	--

anatomical position with uterine rupture remained the most common condition that required transfusion. Other studies reported similar indications like abruption placenta, atonic postpartum hemorrhage, placenta previa and other obstetrical conditions.[13,14] In our study 78% women received PRBCs. Other studies reported similar results however 87.2% received PRBCs.[15]

Serious obstetric hemorrhage is defined as the transfusion of more than four units of blood. Most of the patients presented with mild obstetric hemorrhage that constitutes about 85% of cases and required about 4-6 units of PRBCs. About 10% cases were of moderate type and 5% of severe variety requiring more than 10 units of PRBCs. The lower frequency of blood transfusion was mainly due to better management of antenatal risk factors.[16] Most common indication of blood transfusion remained PPH, while in another study severe anemia and obstetric hemorrhage were the most common reasons for blood transfusions in obstetric emergencies.[16,17] WHO recommends a countrywide system, voluntary contributions, blood testing, and preventing unnecessary transfusions.[18] This study highlights availability of enough blood and products to deal with obstetric emergencies. Life-threatening anemia or severe bleeding during or after labor requires blood transfusions.

CONCLUSION:

In present study frequency of uncross-matched blood in obstetric emergencies was high. In the case of acute bleeding, the choice of transfusion should be based on clinical condition of the patient. A preplanned, multidisciplinary protocol gives best results in this condition.

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