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Pattern of Blood Transfusion among Women undergoing Caesarean Section in a Tertiary Health Care Centre in South India

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Abstract

Background: Obstetrics is one of the major specialities which continue to consume large of blood. Blood transfusion is one of the key components of comprehensive emergency obstetric care. Routine request for cross matching for women undergoing caesarean section is often customary in many facilities.

Objectives: The study was conducted from a tertiary center in South India to assess the pattern of blood transfusion practice among women who underwent caesarean section and to identify the association of blood transfusion pattern with clinico-demographic factors among them.

Materials and Methods: This was a retrospective cross sectional study between July 2014 and December 2014. The demographic data, indications for caesarean section, type of caesarean sections, type of transfusions and indications for blood transfusion and its complications were analyzed in detail.

Results: There were a total of 7876 deliveries and among them 1397 were caesarean sections. The blood transfusion rate among those who underwent caesarean section was 5.01%. A total of 202 units were transfused for 70 women and majority were packed cells followed by FFP. In majority of them it was an emergency caesarean section (82.9%) and in 44% of them it was done under general anaesthesia. The most common indication for caesarean section was fetal distress followed by placenta praevia. The RR for placenta praevia was 4.01 ($p < 0.0001$). The most common medical risk factors were hypertension and anemia whereas previous caesarean section followed by antepartum hemorrhage were the common obstetric risk factors. For packed cells, the Cross match to transfusion ratio (C/T ratio) was 12.25, Transfusion probability was 5.01 and Transfusion Index was 0.081.

Conclusion: The high cross match –transfusion ratio in the study showed that the majority of the cross matched blood were not transfused. Reserving the same group for routine caesarean section and requesting cross matching in high risk situations would be appropriate. However multidisciplinary audit of blood transfusions with local guidelines would help in improving appropriate utilization of blood and its components in medical practise.

Keywords: Caesarean section; Blood transfusion; Transfusion index

Introduction

The first successful blood transfusion in a human was to treat postpartum hemorrhage (PPH). Obstetrics continues to have the highest indication of blood transfusion because of pregnancy complications and disorders of parturition; caesarean section (CS) being more specifically so [1,2]. In fact, one of the important factors which made caesarean section safe in this era is blood transfusion . Obstetric hemorrhage is usually fatal when the circumstances in which blood or blood products are not readily available for transfusion [3]. Recent advances in the field of medicine and surgery have changed the outcome of obstetric haemorrhage with appropriate medical and conservative surgical methods including intervention radiology but when bleeding occurs blood transfusion remains an important part of clinical care. PPH is the single most leading cause of maternal deaths worldwide [4]. In India, PPH attributes to almost a clean quarter of causes of maternal mortality [5]. It is true that blood transfusion saves lives in obstetrics, but it is not uncommon to find inappropriate ordering and usage of blood during CS and 74% of transfusions in adults are inappropriate as per the WHO data [6,7]. Not only is such risky, it also increases the cost of medical care [8,9]. Preventing unnecessary transfusion is an essential part of quality and evidence based care in medicine. Some studies have demonstrated that the blood transfusion increases the morbidity and mortality [10].

Generally, the blood loss during child birth is well tolerated because of the specific changes that occur in maternal vascular system during pregnancy. Existing compensatory mechanisms owing to chronic anemia, as is the case with many rural mothers, or physiological anemia of pregnancy, allows for the tolerance of low Hb levels. In Food and Drug Administration (FDA) drug bulletin in 1989 it was stated that "adequate O_2 carrying capacity can be met by a Hb of 7g/dl or even less, when intravascular volume is adequate for perfusion" [11]. Also severe hemorrhage requiring blood transfusion can be predicted in majority of patients on the basis of antenatal risk factors [12]. But in majority of the institutions it is customary to send cross matching for a woman who is scheduled for caesarean section. Various strategies have been developed to reduce the inappropriate use of blood and blood components in all specialties. These include guidelines as well as monitoring of transfusion practice, education and self-audit by clinicians [13]. Blood transfusion is recognized as one of the eight essential components of the Comprehensive Emergency Obstetric Care module [14].

This study, done on a retrospective basis, evaluates all patients who underwent caesarean section from our institute over a period of 6 months and variables associated with blood transfusion in them. Blood, if can be called a medical resource, is definitely limited and its use should be subjected to audit and monitoring as rational employment of blood is imperative in medical practice. The aim was to assess the pattern of blood transfusion practice among women who underwent caesarean section and it is expected that the knowledge will aid proper use of blood during caesarean section.

Method of Data Collection

This was a retrospective cross - sectional study done on all women who underwent caesarean section from July 2014 to December 2014. We reviewed each case record in detail and the all the details like demographic parameters, obstetric details, medical and obstetric risk factors, type of anaesthesia, nature of caesarean section, indication for caesarean section, amount of blood loss, intraoperative complications, indication for blood transfusion, documentation and details of blood transfusion were note down.

Results

A total of 7876 deliveries were conducted in our hospital during the study period, of which 1397 were Caesarean deliveries and the CS rate was 17.7%. Of 1397 women who underwent CS 70 women received blood transfusion for various indications. The elective CS was performed on 279 (19.97 %) women and emergency CS was done on 1118 (80.03%) women The transfusion rate was 5.01%. A total of 202

blood units were utilized, of which 114 were packed red cells (pc), 72 were fresh frozen plasma (FFP) and 16 were platelets (plt). For packed cells, Cross match to transfusion ratio (C/T ratio) was 12.25, Transfusion probability was 5.01 and Transfusion Index was 0.081.

Majority (99.4%) of them were booked during their ante natal period. The mean age of the women who received transfusion was 26.28 ± 4.49 and it was 25.32 ± 5.32 in those who did not receive transfusion. Out of 70 women who received transfusion 81% were ≤ 30 years and the percentage of primi gravidae in the transfusion group was 34%. Table 1 shows the demographic characters.

On detailed analysis of demographic factors, it was found that the transfusion rate was significantly more in those who were >30 years and who were G4 or more. Medical risk factors like pre eclampsia/ HELLP syndrome and diabetes (labour abnormalities/polyhydramnios) were responsible for such increased transfusion rate in women of >30 years. Out of 38 women who were >30 years, 13 received transfusion (34.2% Vs 65.8% RR 7.4) which gives p value of 0.0001. Similarly for gravidity of 4 or more the risk ratio (RR) was 2.48 (P value of 0.012) because of placental abnormalities like placenta praevia and abruption (35%).

The mean preoperative Hb was 9.3(±2.07)g/dl. The mean postoperative Hb was 8.6(± 2.1) g/dl. Maximum Hb dropped was 5.1g/dl and minimum was 0g/dl. The maximum positive difference was 5.5g/dl and 28 patients had a difference of ≥2g/dl. The mean Hb in the transfusion group was 8.9 ± 1.4gm/dl and in the non - transfusion group was 10.2 ± 1.1gm/dl. A total of 45.7% of women had blood loss of >1000ml during caesarean section in the transfusion group and it was 13.4% in the non- transfusion group.

Hypertensive disorders of pregnancy (HDP) was the commonest medical risk factor (n=17; 24%) followed by anemia and diabetes mellitus (each n= 11; 16%). The most common obstetric risk factor was previous CS (n=23; 32.8%) followed by ante partum hemorrhage (APH) (n= 16; 22.8%). Among 29 (41%) women had PPH, 24 (82.7%) of them had risk factors like APH, over distension of uterus, coagulopathy, anemia and GA. In the blood transfusion group 77% were term and it was repeat caesarean section in 36%.

Out of 70 women who received blood transfusion, 17.1% (n=12) had undergone elective caesarean sections and it was emergency caesarean section in 82.9% (n=58) of women. The caesarean sections were done under general anaethesia (GA) in 44% (n=31) of women. It was found that the type of anaesthesia influenced blood transfusion significantly.The risk ratio for blood transfusion for women undergoing CS under GA was 6.65 (p value 0.0001) (Table 2).

Among the women who received blood transfusions the mean body weight was 60.7(+/-12.4) kg and 18 (25.8%)women were ≤50 kg . Number of women who were ≥70 kgs were 9(12.85%).

The common indication for CS in the transfusion group was fetal distress (34.28%) followed by placenta praevia (20%). Previous CS &

Table 1: Association of blood transfusion with demographic characteristics.

Factor	(n=1397)	Number of women who received Blood transfusion N (%) (n=70)	Number of women who did not receive Blood transfusion N (%) (n=1327)	Risk difference	Risk ratio (RR)	P value
Age (Years)						
<20	91	2** (2.2)	89 (97.8)	-2.4	0.47	0.41
20-25* -	688	32 (4.7) 656 (95.3) - 1.00	656 (95.3)	-	1.00	-
26-30	580	23 (4.0)	557 (96.0)	-0.6	0.85	0.58
>30	38	13 (34.2)	25 (65.8)	29.5	7.4	0.0001**
Gravidae						
G1 and G2*	984	44(4.4)	940(95.6)	-	1.00	-
G3	341	18(5.2)	323(94.8)	-0.8	1.18	0.54
G4 and above	72	8(11.1)	64(88.9)	6.6	2.48	0.012**
Period of gestation (weeks)						
</=34	102	5(4.9)	97(95.1)	5.6 1	1.13	0.79
34-36	162	11(6.8)	151(93.2)	2.4 1.56 0.17	1.56	0.17
37-40*	923	40(4.3)	883	-	1.00	-
>40	210	14(6.7)	196	2.3	1.53	0.15
Body weight (Kg)						
≤50	419	18(4.2)	401	-6.7	0.86	0.6
50-75*	866	43(5.3)	823	-	1.00	-
>/=75	112	9(8.0)	103	3.1	1.62	0.17

*reference group

Table 2: Association of blood transfusion with clinical characteristics.

Factors	(n) (n=1397)	Number of women who received Blood transfusion N(%) (n=70)	Number of women who did not receive Blood transfusion N (%) (n=1327)	Risk difference	Risk Ratio (RR)	P value
Type of anaesthesia						
Spinal*	1250	39(3.1)	1211 (96.9)	-	1.00	1
General	147	31(21.1)	116 (78.9)	0.18	6.75	0.0001
Caesarean section – Elective /Emergency						
Elective*	279	12(4.3)	267(95.7)	-	1.00	-
Emergency	1118	58(5.1)	1060 (94.9)	0.9	1.21	0.54
Caesarean section – Primary / Repeat						
Primary*	1033	45(4.4)	988 (95.6)	-	1.00	-
Repeat	364	25(6.7)	339 (93.3)	2.5	1.58	0.06

*reference group

Table 3: Indications for caesarean section among those who received blood transfusion.

Indications	In numbers	In percentage (%)
Fetal distress	24	34.28
Previous caesarean section	8	11.42
Placenta praevia	14	0.2
Breech/transverse lie	6	8.57
Failed induction	3	4.85
Failed instrumentation	2	2.85
NPOL/CPD*	8	11.42
SPE#/ eclampsia	2	2.85
Abruption	2	2.85
Triplet	1	1.43

*NPOL /CPD– Non progress of labour / Cephalo pelvic disproportion
SPE – Severe Pre eclampsia

non progress of labour/ CPD each contributed 11.4% of all CS. The indication was not clearly mentioned in 9 women (12.9%). On analysis of indications for caesarean section among both groups, it was found placenta praevia was more significantly associated with transfusion when compared to other factors. The risk ratio for placenta praevia was 4.77 (p value 0.0001).

Majority (>80%) received transfusion either preoperatively or post operatively than during CS. There were totally 202 blood units were utilized, of which 114 were packed red cells(PC), 72 were fresh frozen plasma(FFP) and 16 were platelets (Plt). Majority (n=42; 60%) received single unit transfusion. Three women received ≥ 4 units of PCs; of them 2 had massive PPH one had APH because of placenta praevia. Fifteen(21%) of them had blood loss of ≥1500ml during CS. Out of 70 women who had transfusions, 38.5% (27) received transfusion intraoperatively and 7% (5) of women received transfusions postoperatively and one woman had secondary PPH for which she received transfusion on post op day 9. One woman had peripartum hysterectomy for placenta praevia which was planned electively. FFP was the next maximum utilization of blood component after packed cells in the present study. Eighteen (25%) of them received a total of 72 FFPs.

Discussion

Blood transfusion being a part of essential obstetric care, with rising CS in the recent years is an important area for blood consumption in obstetrics. Various studies from both developing and developed countries have studied the factors associated with blood transfusion during CS. The reasons for lower trend on blood usage inspite of rising CS can be well explained by advances in the field of anaesthesia and better understanding of maternal physiology [15]. Also correction of anemia because of early booking and wide spread usage of parentral iron (iron sucrose) have minimized the number of blood transfusions.

The CS rate in the present study was 17.7% which is low when compared to other institutions and urban hospitals in India as well in developed countries. A large Nigerian study had shown CS rate of 40% which is much higher than WHO's accepted limit of CS rate (5-15%) in any facility.[16] Even an Indian study from north India has showed CS rate of 26% [17]. The blood transfusion rate in the present study was 5.01%. The transfusion rate described in worldwide literature varies from 1-14%. The rate was much lower than Nigerian study by Oluwarotimi et al and more than Rouse et al. [16,18].

The cross match to transfusion ratio in the present study was 12.25 which states that majority of cross matched blood were not transfused. It is customary to send cross matching for all patients who undergo CS in our institute. Considering large number of deliveries and low transfusion rate for CS the policy of routine cross matching needs to be reviwed. Considering demographic characters like age, parity, body weight it was found that the blood transfusion rate was significantly more in women of >30 years and Gravida 4 or more. As expected it may be more common to have medical and obstetric risk factors in women with advanced maternal age because of which the transfusion rate was higher in those women. Grand multi itself is an important risk factor both APH and PPH which may be the reason for increased transfusion rate in those groups. Presence of thrombocytopenia and coagulopathy in women with HDP (24%) have associated with increased consumption of platelets and FFPs.

Almost 99% of women were booked. However, 54.5% of women in the present study received transfusion in the antenatal period. Optimization of Hb in the antenatal period especially for those who are scheduled for CS or undergoing labour induction would probably minimize the transfusions.

Rouse et al observed that there was slight increase in the transfusion rate of women who were obese. Similarly in a study by Imarengiaye also found a statistically significant between obesity and blood transfusion [19]. While comparing obstetric characteristics like gestational age, timing of caesarean section and primary/ recurrent CS it was found none of them were significantly associated with blood transfusion among women undergoing CS. But type of anaesthesia influenced the transfusion rate.

The transfusion rate was 21.1% among those who had CS under GA compared to 3.1% who had it under spinal anaesthesia (p value 0.0001). Almost half (44%) of the women received transfusion were undergone CS under GA. Even though GA per se is a risk factor for PPH, it may be due to the fact that conditions like placenta praevia, APH, coagulopathy etc GA would obviously have been preferred. Apart from indications, such CS are done under emergency situations would increase the chance of blood loss. Moreover, surgical and anaesthesia expertise also would influence the amount of blood loss and maintenance of hemodynamic stability during CS. Similar observation was found by Goundan et al also, a study from North India.[17] Almost half of the patients in their study underwent CS under GA.

In a large study from Nigeria, the transfusion rate was found to be more in primary caesarean section. This is on contrary to a study by Imarengiaye where he observed statistically significant transfusion rate in repeat CS group [16,19]. This was mainly attributed to their study population, in Nigerian women more number of CS were done for CPD. The present study did not observe any such differences in those groups. The common indication for CS among those who received transfusions was fetal distress (34%) followed by placenta praevia.

Even though previous caesarean (33%) was the commonest obstetric risk factor among those who received transfusion the association was not statistically significant. On univariate analysis it was found the transfusion rate was significantly associated only with placenta praevia and not others (RR 4.7, p value 0.0001). Overall there were 40 cases of placenta praevia of which 35% (14) received transfusion. Similar observation was found in many studies.

Almost half of the women (49%) received transfusion in the present study for PPH. More than two third of the patients (82.7%) had risk factors for PPH. More than one third (38.5%) of women received transfusion intraoperatively. More than half of them (60%) received single unit transfusion. If the pre-operative Hb is optimized which would increase their tolerability towards blood loss during CS/delivery; thereby single unit blood transfusions can be avoided.

In 9 (12.8%) women who underwent CS the indication for transfusion was not mentioned clearly and all of them received single transfusion in the immediate post-operative period could be due to inaccurate estimation of blood loss. May be such patients would have tolerated blood loss better if the Hb was optimized or might be the candidates for iron therapy. None of them developed any transfusion reactions.

Surprisingly 18.4% of patients the records were found to be incomplete. In future, 100% aim at documenting the indication for transfusion along with local regular auditing will help in prompt usage of blood and its products. Treatment of prenatal anemia using 4 to 6 doses of parentral Iron before delivery, vigilant supervision of high risk cases and prompt recognition of PPH will help further to reduce the blood transfusion rate without compromising quality care in obstetrics. Since cross match to transfusion ratio is considered as one of the significant means of blood transfusion services the routine policy of sending cross matching for women undergoing CS has to be reviewed in future.

Conclusion

The blood transfusion rate among those women who had CS was 5.01% in our institute which had a CS rate of 17.7% during the same period. There were certain risk factors like elderly gravida, grand multi, placenta praevia and caesarean section under general anaesthesia associated with increased risks of transfusion. Optimization of Hb in the antenatal period before delivery would increase their tolerability for blood loss. The high cross match – transfusion ratio in our study suggests that majority of cross matched blood was not transfused. It may be unnecessary sending cross matching for all patients undergoing caesarean section. However reserving a same group may be appropriate and cross matching can be done in high risk patients who are the likelihood candidates for blood transfusion. However local guidelines have to be formed.

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