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Factors associated with perioperative blood transfusion in women who had postpartum haemorrhage following caesarean delivery

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Abstract

Background: Caesarean delivery is associated with intraoperative blood loss and is a common risk factor for blood transfusion in obstetric practice. Delayed diagnosis and management of obstetric haemorrhage contributes greatly to maternal morbidity and mortality, but patient safety can be enhanced by identifying those at risk.

Objective: To evaluate postpartum haemorrhage patients at greater risk for perioperative blood transfusion at caesarean delivery.

Methods: A retrospective study was conducted over a two-year period from 1st June 2021 to 31st May 2023. The study population were all consecutive women who underwent caesarean delivery after 28 weeks of gestation, diagnosed as having postpartum haemorrhage (estimated blood loss ≥1000 ml). Women were considered as having the primary outcome if they had intraoperative blood transfusion and/or postoperative transfusion within 24 hours. Data were analyzed with SPSS for Windows version 23. Association between variables were determined using the Chi-square test or Fisher's exact test as appropriate, and a p-value <0.05 was considered significant.

Results: Out of the study population, 55.6% had blood transfusion (43/76). These women received a total of 72 pints of whole blood, with 58.1% (25/43) receiving only one pint. There was a significant relationship between blood transfusion and the type of pregnancy, whether singleton or multiple gestation (P=0.032), placenta previa (P=0.002), and abruptio placenta (P=0.033).

Conclusion: Among women who underwent caesarean delivery and had postpartum haemorrhage the prevalence of blood transfusion was high, and placenta previa and abruptio placenta were associated factors for perioperative blood transfusion.

Key words: Blood transfusion; Caesarean delivery; Postpartum haemorrhage; Risk factors.

1. Introduction

Postpartum haemorrhage (PPH) following caesarean delivery (CD) is defined as blood loss ≥1000ml [1]. Many risk factors for PPH have been studied and studies have shown CD as a predominant and independent risk factor for obstetric haemorrhage [2-4]. Research has identified haemorrhage as a major cause of direct maternal death or near miss, and

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majority of these deaths occur as a result of PPH in association with CD [5,6], a procedure that carries a risk of intraoperative blood loss [7,8]. This has made CD a common indication for blood transfusion in obstetric practice.

Obstetrics is one of the major medical departments that consume large amounts of blood. Blood transfusion is recognized as one of the eight essential components of comprehensive emergency obstetric care [9]. The rate of blood transfusion is estimated at 0.4 – 1.6% of all deliveries [10,11], but emerging data has shown trends of increasing rate of PPH requiring transfusion [12-14]. Some reports have put rates of transfusion among CD women as 2.6% [15] and 3.2% [16]. However, some reports from Nigeria have reported rates as high as 12.1% [17], 12.5% [18] and 20.8% [19].

Factors predisposing to increased risk for blood transfusion, previously reported, include preoperative anaemia, previous caesarean section, and antepartum haemorrhage [18,20,21]. Various studies [17,18,21,22] have shown that antepartum haemorrhage from causes such as placenta abnormalities can lead to anaemia and are significantly associated with blood loss and an attendant risk of blood transfusion during CD. Not many studies have previously evaluated intraoperative factors such as level of expertise of the surgeon and presence of co-morbidities which predispose to anaemia in pregnancy like human immunodeficiency virus infection [23].

Delayed diagnosis and management of obstetric haemorrhage contributes greatly to maternal morbidity and mortality, and it is advocated that increased preventive measures and aggressive treatment can avoid deaths related to PPH [24,25]. Patient safety can be enhanced by identifying those at risk of obstetric haemorrhage and employing preoperative protocols in preparation for preventing or reducing the impact of PPH. The aim of this study was to evaluate PPH patients at greater risk for peripartum blood transfusion at CD, in order to identify cases for adequate preparation, early intervention and monitoring.

2. Methods

This study was carried out at the obstetric theatre and wards of the Rivers State University Teaching Hospital (RSUTH). The hospital serves as a referral center to peripheral hospitals, as well as providing antenatal care and delivery services for women registered with the hospital. The hospital has qualified teams of Obstetricians and Anaesthetists, and the availability of 24-hour blood bank services. There is an average annual delivery of about 1700 births.

A retrospective study was conducted over a two-year period from 1st June 2021 to 31st May 2023. The study population were all women who underwent CD after 28 weeks of gestation at the RSUTH, and included all consecutive women diagnosed as having PPH (estimated blood loss ≥1000 ml), those with incomplete data were excluded.

Women were considered as having the primary outcome if they had intraoperative blood transfusion and/or postoperative transfusion within 24 hours. Information extracted from the hospital records included sociodemographic and obstetric data (maternal age, parity, booking status, gestational age at delivery, previous uterine scar, current singleton or multiple gestation and urgency of CD), pregnancy and labour complications (abruptio placenta, placenta previa, cephalopelvic disproportion, transverse lie, breech presentation), maternal comorbidities (pregnancy-induced hypertension, gestational/diabetes mellitus, uterine fibroid, human immunodeficiency virus infection), and intraoperative factors (duration of surgery, cadre of surgeon, and additional procedure like repair of extension of the uterine incision or hysterectomy).

Most caesarean sections in our center were performed through a transverse lower uterine segment incision and under regional (spinal) anaesthesia. The placentae were removed by controlled cord traction, or manually removed if the former was difficult. The cadre of surgeon varied, according to the indication and time of day, between consultants and resident doctors. In our hospital, the blood loss was measured based on amount of fluid in the suction apparatus, measurement of blood expelled from the vagina after CD, counting the number of gauze-packs/dressing that were soaked, and visual estimation of blood staining the drapes. The decision to transfuse blood was jointly made by the anaesthetist and surgeon, and was based on preoperative haemoglobin concentration, estimated blood loss and clinical state of the patient.

Data were checked, coded, and analyzed with SPSS (Statistical Package for Social Sciences) for Windows version 23 (SPSS Inc., Chicago, Illinois, USA). Non-continuous measurements were given as numbers and percentages, and continuous measurements as mean and standard deviation. Association between independent and dependent variables were checked using the Pearson chi-square test or Fisher's exact test as appropriate, and a p-value <0.05 was considered as a significant factor.

3. Results

There were a total of 2072 CD during the two-year study period, of which 78 women had PPH, giving a prevalence of 3.8%. Only 76 cases had complete data (retrieval rate of 97.4%) and were included for further analysis. Mean maternal age ± SD was 33.99±5.17 (range 20-45 years), the mean gestational age at delivery (weeks) ± SD was 36.71±2.47 (range 28-41 weeks), and the median Parity was 2 (range 0 – 6).

Out of the study population, 55.6% had blood transfusion (43/76). These women received a total of 72 pints of whole blood, with majority 25(58.1%) receiving only one pint, 10(23.3%) of the women received two pints, 5(11.6%) received three pints and 3(7.0%) of the women received ≥4 pints of blood. The comparison of the maternal characteristics and need for blood transfusion is as shown in Table 1. There was no significant relationship between the need for blood transfusion and maternal age (P=0.592), parity group (P=0.405), gestational age at delivery (P=0.846), and booking status (P=0.579).

Table 1 Maternal characteristics and blood transfusion among women with post-partum haemorrhage who underwent caesarean delivery

	Blood transfusion		
Variables (N = 76)	**Yes n (%)**	**No n (%)**	**Total n (%)**
Maternal age			
≤25 years	3 (75.0)	1 (25.0)	4 (100.0)
26 – 34 years	20 (60.6)	13 (39.4)	33 (100.0)
≥35 years	20 (51.3)	19 (48.7)	39 (100.0)
	Fisher's exact test = 1.165; p-value = 0.592		
Parity			
Para 0	7 (41.2)	10 (58.8)	17 (100.0)
Para 1	9 (56.3)	7 (43.8)	16 (100.0)
Para 2 – 4	26 (61.9)	16 (38.1)	42 (100.0)
Para ≥5	1 (100.0)	0 (0.0)	1 (100.0)
	Fisher's exact test = 2.835; p-value = 0.405		
Gestational age			
<37 weeks	16 (55.2)	13 (44.8)	29 (100.0)
≥37 weeks	27 (57.4)	20 (42.6)	47 (100.0)
	Chi Square = 0.038; p-value = 0.846		
Booking status			
Booked	26 (54.2)	22 (45.8)	48 (100.0)
Un-booked	17 (60.7)	11 (39.3)	28 (100.0)
	Chi Square = 0.309; p-value = 0.579		

Table 2 relates to the comparison of the obstetric characteristics of the women and need for blood transfusion. There was a statistically significant relationship (P=0.032) between the type of pregnancy, whether singleton or multiple gestation, and blood transfusion. However, there were only 4 cases of twin pregnancy, and none of them were transfused. The relationship of need for blood transfusion and class of CD (elective or emergency) and previous uterine scar was not statistically significant, P=0.773 and P=0.223 respectively.

Table 2 Obstetric characteristics and blood transfusion among women with post-partum haemorrhage who underwent caesarean delivery

	Blood transfusion		
Variables (N = 76)	**Yes n (%)**	**No n (%)**	**Total n (%)**
Type of pregnancy			
Singleton	43 (59.7)	29 (40.3)	72 (100.0)
Multiple	0 (0.0)	4 (100.0	4 (100.0)
	*Fisher's exact p-value = 0.032**		
Class of CD done			
Emergency CD	30 (57.7)	22 (42.3)	52 (100.0)
Elective CD	13 (54.2)	11 (45.8)	24 (100.0)
	Chi Square = 0.083; p-value = 0.773		
Previous scar			
Yes	23 (63.9)	13 (36.1)	36 (100.0)
No	20 (50.0)	20 (50.0)	40 (100.0)
	Chi Square = 1.488; p-value = 0.223		

*Statistically significant (*p<0.05*); CD = caesarean delivery.

The relationship between pregnancy and labour complications found in the women and need for blood transfusion is shown in Table 3. There was a statistically significant association (P=0.002) between placenta previa and blood transfusion; among the women with placenta previa 12(92.9%) received blood transfusion compared to 1(7.1%) who did not. Likewise, there was a significant association (P=0.033) between abruptio placenta and blood transfusion, with all 6(100%) of the women who had abruptio placenta requiring blood transfusion. There was, however, no significant relationship between blood transfusion and cephalopelvic disproportion (P=1.000), Breech presentation (P=0.231) and Transverse lie (P=0.647).

Table 3 Pregnancy/labour complications and blood transfusion among women with post-partum haemorrhage who underwent caesarean delivery

	Blood transfusion		
Variables (N = 76)	**Yes n (%)**	**No n (%)**	**Total n (%)**
CPD			
Yes	5 (55.6)	4 (44.4)	9 (100.0)
No	38 (56.7)	29 (43.3)	67 (100.0)
	Fisher's exact p-value = 1.000		
Placenta previa			
Yes	12 (92.9)	1 (7.1)	14 (100.0)
No	30 (48.4)	32 (51.6)	62 (100.0)
	*Chi Square = 9.194; p-value = 0.002**		
Abruptio placenta			
Yes	6 (100.0)	0 (0.0)	6 (100.)
No	37 (52.9)	33 (47.1)	70 (100.0)
	*Fisher's exact p-value = 0.033**		

Breech presentation			
Yes	2 (33.3)	4 (66.7)	6 (100.0)
No	41 (58.6)	29 (41.4)	70 (100.0)
	Fisher's exact test = 1.433; p-value = 0.231		
Transverse lie			
Yes	2 (40.0)	3 (60.0)	5 (100.0)
No	41 (57.7)	30 (42.3)	71 (100.0)
	Fisher's exact test = 0.599; p-value = 0.647		
Others			
Yes	4 (57.1)	3 (42.9)	7 (100.0)
No	39 (56.5)	30 (435)	69 (100.0)
	Fisher's exact p-value = 1.000		

*Statistically significant (*p<0.05*); CPD = cephalopelvic disproportion.

There was no significant relationship between blood transfusion and maternal comorbidities such as pregnancy-induced hypertension (P=0,190), coexisting uterine fibroid (P=1.000), gestational diabetes mellitus (P=0.434), and human immunodeficiency virus infection in pregnancy (P=1.000), as shown in Table 4. Likewise, there was no significant relationship between blood transfusion and the various cadre of surgeons (P=0.523), duration of surgery longer than 60 minutes (P=0.329), and the occurrence of additional procedures (P=0.083), as depicted in Table 5. The additional procedures that occurred were, repair of extension of uterine incision with 8(72.7%) transfused and 3(27.3%) not transfused, and 4(100%) of the women who had hysterectomy for uncontrollable haemorrhage and were all transfused.

Table 4 Maternal comorbidities and blood transfusion among women with post-partum haemorrhage who underwent caesarean delivery

	Blood transfusion		
Variables (N = 76)	**Yes n (%)**	**No n (%)**	**Total n (%)**
PIH			
Yes	1 (25.0)	3 (75.0)	4 (100.0)
No	42 (58.3)	30 (41.7)	72 (100.0)
	Chi Square = 1.714; p-value = 0.190		
Fibroid			
Yes	3 (50.0)	3 (50.0)	6 (100.0)
No	40 (57.1)	30 (42.9)	70 (100.0)
	Fisher's exact p-value = 1.000		
GDM			
Yes	0 (0.0)	1 (100.0)	1 (100.0)
No	43 (57.3)	32 (42.7)	75 (100.0)
	Fisher's exact p-value= 0.434		
HIV			
Yes	1 (100.0)	0 (0.0)	1 (100.0)
No	42 (56.0)	33 (44.0)	75 (100.0)

	Fisher's exact p-value= 1.000		
Others			
Yes	0 (0.0)	3 (100.0)	3 (100.0)
No	43 (58.9)	30 (41.1)	73 (100.0)
	Fisher's exact p-value = 0.678		

PIH = pregnancy-induced hypertension, GDM = gestational/diabetes mellitus; HIV = human immunodeficiency virus.

Table 5 Intra-operative factors at surgery and blood transfusion among women with post-partum haemorrhage who underwent caesarean delivery

	Blood transfusion		
Variables	**Yes n (%)**	**No n (%)**	**Total n (%)**
Cadre of Surgeon			
Registrar	5 (41.7)	7 (58.3)	12 (100.0)
Senior registrar	23 (59.0)	16 (41.0)	39 (100.0)
Consultant	15 (60.0)	10 (40.0)	25 (100.0)
	Fisher's exact test = 1.296; p-value = 0.523		
Duration of surgery			
≤60 minutes	13 (52.0)	12 (48.0)	25 (100.0)
>60 minutes	30 (58.8)	21 (41.2)	51 (100.0)
	Chi Square = 0.318; p-value = 0.329		
Additional procedure			
None	31 (50.8)	30 (49.2)	61 (100.0)
Extension of incision	8 (72.7)	3 (27.3)	11 (100.0)
Hysterectomy	4 (100.0)	0 (0.0)	4 (100.0)
	Fisher's exact test = 4.646; p-value = 0.083		

4. Discussion

The reported rates of blood transfusion in CD patients overall, in previous studies from similar resource poor settings, have varied from 12.5% [18], 20.8% [19] and 25.2% [22]. These rates were for all CD irrespective of the indication and not specific of the intraoperative blood loss. The blood transfusion rate in this study of 56.6%, which was much higher, was only among the patients that developed postpartum haemorrhage following CD.

The major risk for blood transfusion in our study was placenta previa and abruptio placenta, the major causes of antepartum haemorrhage. A study by Eyelade et al [26] reported the odds of receiving blood transfusion in these cases as up to 38.2%, and this odd further increased (OR 43.07) with blood loss ≥1000ml, as was the criteria in our study. Similar findings have also been reported in the study by Akinlola et al [18] and Imarengiaye et al [21]. Similarly, Akinlusi et al [19] found that majority of blood transfusions in their study was indicated for antepartum haemorrhage and reported that out of 63 patients with placenta previa 51 were transfused (OR 32.7), and out of 56 with abruptio placenta 46 were transfused (OR 25.35).

Repeated antepartum bleeding episodes which may cause anaemia putting the patient close to transfusion threshold, and low-lying placenta which may provoke increased intraoperative blood loss, have been suggested as reasons necessitating blood transfusion in cases of placenta previa. In cases of abruptio placenta, complications such as uterine

atony from Couvelaire uterus and disseminated intravascular coagulopathy, in addition to blood loss, would further increase the need for blood transfusion.

The history of previous uterine scars was not associated with the need for blood transfusion in our study. While Imarengiaye et al [21] reported that a previous caesarean scar increased the need for blood transfusion at CD, our finding is supported by the study of Eyelade et al [26] and Saidu et al [27], who found no association between repeat caesarean section and the risk of blood transfusion.

Also, the cadre of surgeon in this study was not associated with the need for blood transfusion, contrary to the reports of Eyelade et al [26] who found that caesarean sections performed by surgeons with more than 4 years' experience were likely to require blood transfusion. Their possible explanation was that lead surgeons with more years of experience were likely to attend surgery where blood transfusion is required because of the complexity that may be associated with such surgery. They were quick to add that they did not take cognizance of residents who might have learnt the caesarean section skills before commencing residency training.

The highest frequency of blood units transfused in our study was one pint. This is contrary to the findings of Akinlusi et al [19] who reported that the majority of their patients were transfused with three pints of blood. Routine provision of crossmatched blood made available in the theatre may inadvertently result in unnecessary transfusion irrespective of indication. Transfusing only one pint of blood might be suggestive of inappropriate use of blood as their anaemia could have been managed effectively by other means [28,29]. One pint of blood may not have caused a significant change in the PCV but would have been enough to cause complications of blood transfusion, especially where one unit of crystalloid or colloid would have achieved the same effect [28,29].

Limitation

Being a retrospective study, known risk factors such as antepartum anaemia and previous history of PPH were not included, as a sizeable number of patients were referred from peripheral health institutions and their medical records were not known. A larger sample size might have provided additional power to show statistically significant differences for some of the risk factors.

5. Conclusion

Among women who underwent caesarean delivery and had postpartum haemorrhage the prevalence of blood transfusion was high, and placenta previa and abruptio placenta were significant factors for perioperative blood transfusion. A careful evaluation of patients for such associated factors prior to surgery, coupled with adequate perioperative preparations for blood transfusion, would ensure optimal blood utilization and better maternal outcome.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent from individual participants was not obtained being a retrospective study.

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