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Relationship between Blood Loss during Vaginal Delivery Using Brasss-V Drape Estimation and Postpartum Haematocrit Drop in Ile-Ife Nigeria

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Abstract

Objective: *The study aimed at finding the mean blood loss following vaginal delivery using calibrated BRASSS-V drape, the average drop in haematocrit at 2hrs and 6hrs following vaginal delivery and the relationship between blood loss estimation using calibrated BRASSS-V drape and pre-weighed perineal pads.*

Methods: *One hundred eligible parturients were recruited for the study. Calibrated BRASSS-V drape was used to collect blood during vaginal delivery and the quantity read from the calibrated receptacle. Pre-weighed pads were used to collect remnants blood not directly collected by the drape, weighed and equivalence in volume added to that obtained from the drape. The haematocrit was determined at admission in labour after ruling out dehydration, repeated 2hours and 6 hours post-delivery.*

Results: *The mean value of blood loss following vaginal delivery using calibrated BRASSS-V drape estimation was 261mls and the mean haematocrit drop was 1.36% and 2.50% after 2hrs and 6hrs respectively. A correlation curve was plotted to determine the relationship between measured blood loss and haematocrit drop after 2hrs and 6hrs of delivery and the one at 6hrs correlated better (r=0.487 and r= 0.750 at 2hrs and 6hrs respectively).*

Conclusion: *There was a positive correlation between the measured blood loss at vaginal delivery and the drop in haematocrit with better correlation at 6hrs. The 6hrs haematocrit drop in well hydrated and selected parturients can be used to estimate blood loss at vaginal delivery in labour ward settings.*

Keywords: *Postpartum haemorrhage, BRASSS-V drape, Postpartum haematocrit.*

Introduction

Pregnancy and childbirth involve health risks, even for women without any pre-existing health related problems[1]. Obstetric haemorrhage is an important cause of maternal death especially in the developing countries. Postpartum haemorrhage occurs unpredictably and no parturient is immune from it and can be stated to be an opportunistic killer[2].

Traditionally, blood loss after delivery is visually estimated, with wide variations in accuracy. The importance of accurately measuring vaginal blood loss at delivery has been emphasized[3]. Birth attendants grossly makes a quantitative estimate; however, the associated amount of blood loss is often far greater than appreciated by visual estimation alone[4]. In the past, quantitative methods for estimating vaginal blood loss included direct collection of blood into bedpans or plastic bags, gravimetric methods, the acid haematin method, plasma volume determinations before and after delivery using radioactive tracer elements and finally, measuring blood loss by using Cr-tagged erythrocytes.

None of these methods was ever adopted in clinical practice because of their complicated nature or due to the effort, expense and time required to obtain results before interventions. Thus, visual estimation continues to be used clinically. Studies indicated that clinical estimates of blood loss are notoriously unreliable, with a tendency to underestimate the incidence of postpartum hemorrhage by 30–50% of actuallosses[1]. And this underestimation may delayidentification and diagnosis of postpartum haemorrhage that may result in obstetric emergency.

BRASSS-V drape is a specially designed low-cost 'calibrated plastic blood collection drape' that has been proven to objectively measure the amount of blood collected in the immediate postpartum period. It was developed by the National Institute of Child Health and Human Development, Rockville, MD, USA (NICHD)- funded Global Network collaborative team to specifically estimate postpartum blood loss[5,6].

This simple tool not only has the potential for a more accurate detection of postpartum blood loss, but will also lead to earlier interventions, with an ultimate goal of decreasing maternal morbidity and mortality due to postpartum haemorrhage. Since most developing countries use some form of under-buttock sheet, either at home, in the health center or in hospitals, drape substitution is acceptable and relatively simple.

The clinical symptoms of blood loss are often the primary indicators for intervention. However, relying on the onset of such symptoms may lead to delayed intervention, resulting in increased rates of morbidity and mortality[7].

This study therefore aimed at finding the relationship between the objective intrapartum blood loss estimation by the use of calibrated BRASSS-V drape and pre-weighed perineal pads method during vaginal delivery and the postpartum haematocrit drop.

Methods

Study Design: This study adopted a descriptive prospective design carried out in Osun state, Nigeria.

Sample Size Determination: The sample size was calculated based on the known prevalence rate of primary postpartum haemorrhage which had been estimated to be 4.5%[8.] Using the Leslie Fisher's formula[9].

$$n = \frac{z^2pq}{d^2}$$

Where:

n = the desired sample size

z = the standard deviation, set at 1.96

p = the proportion in the target population estimated to have a particular characteristic which in this case is 4.5%

q = 1.0 – p which is 1.0 – 0.045 = 0.955

d = degree of error allowance = 0.045

Therefore,

$$n = \frac{(1.96)^2 \times 0.045 \times 0.955}{(0.045)^2} = 82$$

However, 100 subjects were recruited for the study.

Sampling Technique

An average of 105 deliveries occurred monthly at each obstetric unit of the hospital with about (63) 60% of them eligible for this study.

The sampling method followed a systematic sampling technique and a sample interval of 3 was used. The first parturient was chosen by a simple random sampling, about 21 eligible parturients were recruited monthly into the study and the minimum sample size of 82 even was actualized.

Study Procedure

Upon completion of informed consent, all study participants' baseline data were recorded in the study proforma. The states of hydration of parturients were clinically assessed. 3mls of venous blood were taken at presentation in labour and this was the first point of haematocrit check. Adequate hydration was ensured throughout labour by setting up an intravenous line with 5% Dextrose saline till delivery.

Description of the instrument (BRASSS-V drapes)

The drape (Figure I & II) has a calibrated and funneled collecting pouch, incorporated within a plastic sheet that is placed under the buttocks of the patient immediately after the delivery of the baby.

The upper end of the sheet has a belt, which is loosely tied around the woman's abdomen to optimize blood collection, particularly for deliveries performed on the floor or on a flat surface at homes or in rural primitive health posts.

The calibrated BRASSS-V drapes were removed once the blood collection into the drapes has stopped and gravimetric method in which pre-weighed pads were applied on the perineum and the difference in the weights were used to determine the amount of blood loss.

Subsequent blood losses up till 6hours postpartum were measured gravimetrically by the application of pads of known weight to the perineum. The estimated volumes were then added to the ones collected in the BRASSS-V receptacles. Haematocrit estimations were done at 2hrs and 6hours after delivery.

Exclusion Criteria

All parturient who failed to achieve vaginal delivery or had blood transfused in labour or within 6hours of delivery, those who presented with head on perineum, patients with severe pre-eclampsia, eclampsia, cardiac diseases, those with sickle cell anaemia, higher order pregnancy, retained placenta, third degree perineal tear or any other condition where the BRASSS-V drape had to be removed before time for any other definitive intervention and those who ended up with caesarean sections or required intervention in the theatre during the study hours were all excluded from the study.

Inclusion Criteria

All paturients in labour who do not fall into the exclusion group. Each of them had data form filled at presentation in labour ward once eligible.

Statistical Analysis

Data obtained at the end of the study was analyzed using the SPSS version 16. Frequency tables were made and results tested for significance using the student t-test for continuous variables with level of significance (x) set at 0.05. Correlation curves were plotted to determine the relationship between measured blood loss and haematocrit drops both at 2hrs and 6hrs after delivery.

Ethical Consideration

The ethical clearance for this study was obtained from the Research and Ethics Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife.

Result

One hundred eligible parturients were recruited for this study. The age, parity and booking status are as shown in Table I. Majority of the parturients were in the 25-29yrs(38%) age bracket, followed by age 30-34yrs(27%). 13(13%) of the parturients were primigravida, 34(34%) primipara, 50(50%) multipara and grand-multipara 3(3%) having the least. 74% of them were booked and 26% un-booked.

Table II, shows the mean pulse rates and blood pressures at admission, 2hrs and 6hrs after delivery.

Table III, shows the mean haematocrit drop which was 1.36% and 2.5% after 2hrs and 6hrs respectively.

Table IV, shows the mean value of blood loss following vaginal delivery using calibrated BRASSS-V drape estimation which was 261mls and those following 2hrs and 6hrs estimations were 377.78ml and 411.88mls respectively.

Table V, shows the relationship between estimated blood loss following vaginal delivery and haematocrit drop at 2hrs and 6hrs.

A total of 90 (90%) parturients had blood loss below 500mls and 10(10%) of them had blood loss between 500-1000mls as measured directly using the calibrated drape. 3(3%) of the parturients had estimated blood loss >1000mls after 2hrs of delivery which increased to 5(5%) after 6hrs.

77(77%) parturients had haematocrit drop 2hrs after delivery and the remaining 23(23%) had no change in haematocrit. However considering the 6hrs post-delivery, a total of 99(99%) parturients had drop in their haematocrits (with further drops in those with initial drop, and those initially unchanged at 2hrs) with only one(1%) having no change in the haematocrit.

Table VI, shows the obstetric outcomes in the study. 6(6%) of them had augmentation of labour, 6(6%) had episiotomies, genital lacerations occurred in 3(3%) and only 1(1%) of them had polyhydramnios.

Figures III and IV, shows the correlation curves which revealed the relationship between the calibrated BRASSS-V drape blood estimation and pre-weighed perineal pads and postpartum haematocrit drops at 2hrs and 6hrs respectively.

Table I: Socio-demographic Details

Variable	Frequency	Percentage	Mean ± SD
AGE (Years)			
20-24	20	20.0	28.77 ± 4.65
25-29	38	38.0	
30-34	27	27.0	
35-29	15	15.0	
Total	100	100.0	
PARITY			
Primigravida	13	13.0	1.83 ± 1.28
Primipara	34	34.0	
Multipara	50	50.0	
Grandmultipara	03	03.0	
Total	100	100.0	
BOOKING STATUS			
Booked	74	74.0	
Unbooked	26	26.0	
Total	100	100.0	
HYDRATION STATUS			
Mild dehydration	43	43.0	
Moderate dehydration	19	19.0	
Severe dehydration	2	2.0	
No dehydration	36	36.0	
Total	100	100.0	

Table II: Pulse Rates and Blood Pressures at Admission, 2hrs and 6hrs after Delivery

Vital signs	At admission		2hrs after delivery		6hrs after delivery	
	Mean	SD	Mean	SD	Mean	SD
Pulse rate (bpm)	82.87	7.18	87.61	26.54	82.37	5.90
Blood pressure						
Systolic	111.60	10.61	114.00	9.74	108.90	7.51
Diastolic	69.85	9.39	70.15	7.50	67.40	7.33

Table III: Haematocrit and drop in Haematocrits level

Variable	At admission		2hrs after delivery		6hrs after delivery	
	Mean	SD	Mean	SD	Mean	SD
Haematocrit (%)	34.72	3.36	33.49	3.44	32.19	3.21
Drop in Hct	-	-	1.36	1.07	2.50	1.28

Table IV: Estimated Blood Loss

Estimated blood loss (mls)	Using BRASSS-V drape (n = 100)	2hrs after delivery (n = 100)	6hrs after delivery (n = 100)
< 500	90 (90.0)	83 (83.0)	81 (81.0)
500-999	10 (10.0)	14 (14.0)	14 (14.0)
≥ 1000	0.(0.0)	3 (3.0)	5 (5.0)
Mean (SD)	261.03 (181.02)	377.78(231.76)	411.88 (237.87)

Table V: Relationship between estimated blood loss and HCT drop at 2hrs and 6hrs

Variable	Mean blood loss mls	Observed Hct drop	Expected Hct drop	Difference	P-value
At 2hrs	377.78	1.36	2.27	0.91	0.000
At 6hrs	411.88	2.50	2.47	0.03	0.000

Table VI: Obstetric Outcomes

Variable	Frequency	Percentage
Labour augmentation	6	6.0
Episiotomy	6	6.0
Genital Laceration	3	3.0
Polyhydramnios	1	1.0

Figure I: BRASSS-V blood collection drape with Calibrated receptacle

Figure II: Collection of blood using BRASSS-V blood collection drape with calibrated receptacle immediately after delivery

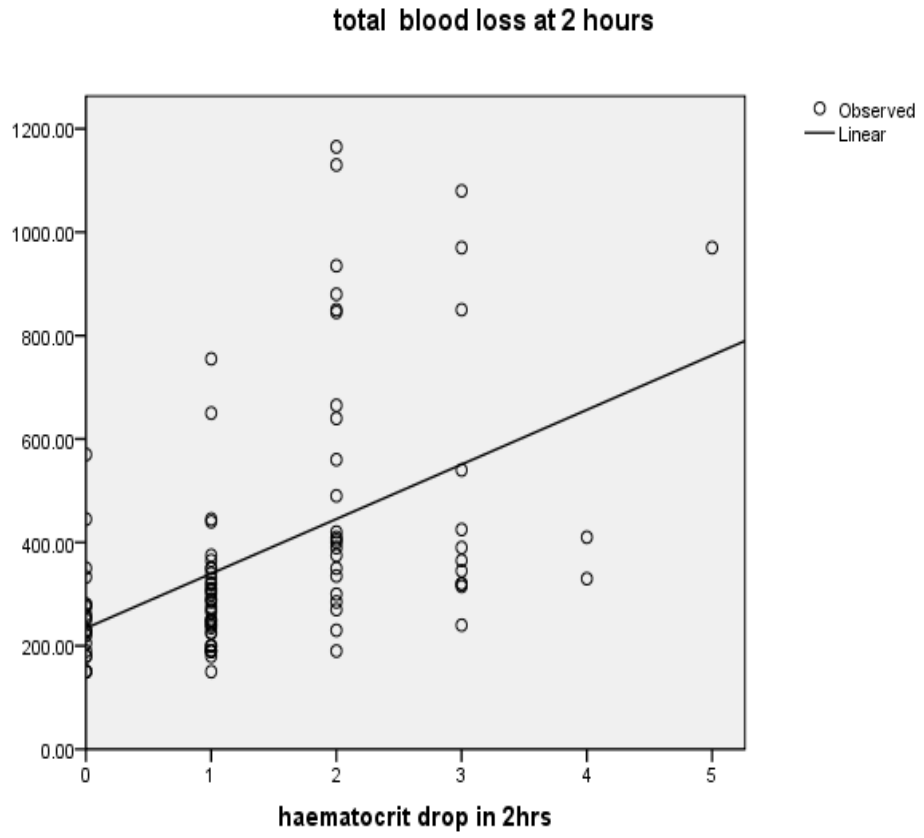

Figure III: The correlation curve showing the relationship between the calibrated BRASSS-V drape blood estimation and postpartum haematocrit drops at 2hrs**.**

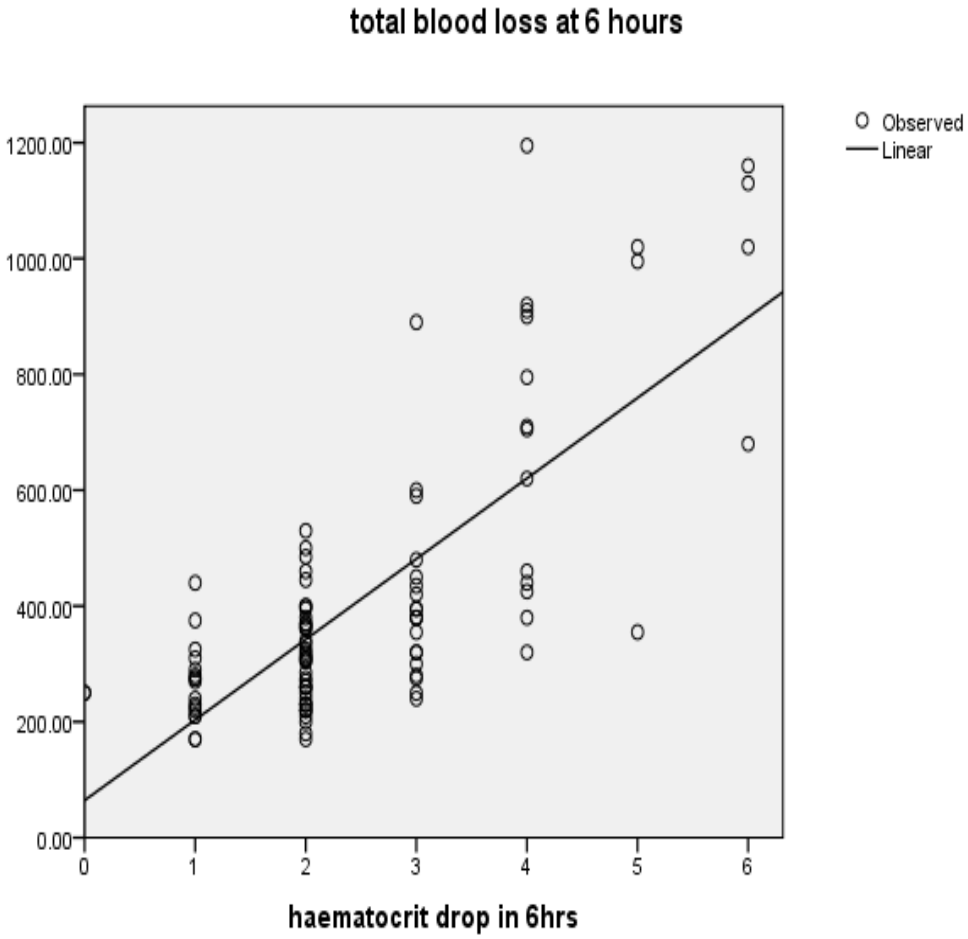

Figure IV: The correlation curve showing the relationship between the calibrated BRASSS-V drape blood estimation and postpartum haematocrit drops at 6hrs.

Discussion

The greater number of parturients (58%) were in the 20-29yrs age bracket, primigravida constituted 13%, 34% were primipara, 50% multipara and grand multipara(3%) having the least. The features are representative of findings in this environment as reported by previous studies[10,11].

The mean blood loss following vaginal delivery using calibrated BRASSS-V drape blood estimation in this study was 261.03mls. This is close to the findings of Kodkany and Derman in their study where 343ml was found[12].

The prevalence of primary PPH in this study group was 10% which is close to what Gharoro and Enabudoso found in their study where 7.8% was recorded[13] using the traditional definition of blood of 500mls or more following vaginal delivery[14,15]. In our centre, active management of third stage of labour has significantly reduced blood loss following vaginal delivery as evidenced in this study (Table IV) when compared with loss following passive management.

It has generally been accepted that a unit of whole blood when transfused increases the haematocrit by 3% thus the corollary will also be true that a drop of 3% in haematocrit will be equivalent to the loss of a "unit" of blood (500mls of whole blood) and studies have been published to actually document this[16].

The mean postpartum haematocrit drop in this study (Table 3) was 1.36% (corresponding to mean volume of 377.78ml) and 2.5%

(corresponding to mean volume of 411.88ml) at 2hrs and 6hrs respectively (Table 5). The 6hrs change in haematocrit was closer to the known standardin terms of haematocrit for volume. The 6hrs change in haematocrit in this study is close to the findings of Mark et al though the haematocrit change was determined after 24hrs following blood transfusion where 3.2% change in haematocrit was found after transfusion with 1 "unit" of blood[17.]

In this study 77% of paturients have a drop in haematocrit, the remaining 23% had no change in haematocrit after 2hrs and no increase in haematocrit was recorded as opposed to the study by Gharoro and Enabudoso that reported some increases in their study series[14]. The 6hrs assessment showed that nearly all parturients (99%) had a decrease in their haematocrit except one(1%) who still had an unchanged haematocrit.

All (100%) of the paturients that participated in the study had singleton pregnancies and the third stage of labour was actively managed. Six(6%) parturient had their labours augmented on account of slow progress in labour and the only one(1%) with polyhydramnios had in addition to active third stage management 20i.u oxytocin added into 500mls of intravenous fluid (5% Dextrose water) to run slowly for 2hrs. This was to enhance adequate uterine contraction and thus preventing primary postpartum haemorrhage. Also, 6(6%) paturients had episiotomy given and 3(3%) had genital lacerations which were promptly repaired. All these measures were put in place in other to reduce the possibilities of these various obstetric outcomes from influencing the course and outcome of this study.

13 paturients were excluded from this study and new ones selected. 12 of them had caesarean sections done for different obstetric indications and one had manual removal of placenta done in the theatre.

There were positive correlations between the calibrated BRASSS-V drape blood collection and pre-weighed perineal pad blood and the haematocrit drop estimations for both 2hrs (r=0.487) and 6hrs (r =0.750) (where "r" is the correlation coefficient) as shown in figures I and II respectively. However, there was a better correlation with the 6hrs observation compared to the 2hrs following vaginal delivery though the haematocrit for volume loss in both cases were significant (p-value<0.000).

The implication of this is that, since the calibrated BRASSS-V drape is not readily available in this environment, haematocrit drop at 6hrs can give a better estimation of blood loss at vaginal delivery. Nelson et al have also demonstrated that peak drop in haematocrit is possible at 8hrs after delivery[18].

Some authors however do not agree that any appreciable change in haematocrit can occur less than 24hrs post-delivery, this is particularly based on the argument that it takes 24-48hrs for the physiologic response to stress to ensure homeostasis following delivery[19].

Other factors like dehydration can affect the haematocrit value, but this was reduced in this study by clinically assessing the hydration status using the wetness or dryness of the oral mucosa, thirst and preservation or loss of skin turgor. Good hydration was ensured before determining the admission haematocrit in labour and also putting adequate measures in place to ensure adequate hydration status was maintained throughout labour.

Based on the above explanation, 36% of the parturients had no dehydration and the remaining 64% had different degrees of dehydration (Table 1) at presentation in labour.

It was also shown in this study that the mean blood loss of parturients who showed no change in haematocrit after 2hrs of delivery was 170mls, 219mls for those who had haematocrit drop of between 1-2% and 520mls for hematocrit change between 3-5%.

Furthermore, most of the parturients (81%) at 6hrs post-delivery still had estimated blood loss below 500mls. It can therefore be inferred that there is no added advantage for repeating haematocrit level in a clinically stable parturient with normal

delivery and blood loss less than 500mls, the fact which was also supported by Nicol and Swaim et al[20]. Also, if calibrated BRASSS-V drapes are used to assess blood loss, because of its proven accuracy[5,6], haematocrit estimation after delivery confers no benefit if measured blood is less than 500ml with no anemia at presentation.

The correlation curves especially the one at six hour can be used to estimate how much blood has been lost once the patients fits into the inclusion criteria. The blood loss can be extrapolated from the curve. This is particularly possible since facilities for determining the level of haematocrit is readily available even in poor-resource settings.

Further studies are needed to standardize the 6hrs correlation curve so that it can be used for blood loss estimation at delivery in poor-resource settings (by extrapolating from the curve) where cost and availability makes the use of the calibrated BRASSS-V drapes a challenge.

Conclusion

This study has shown a positive relationship between the measured blood loss at delivery using a combination of the calibrated BRASSS-V drape and differential pad weighing, and haematocrit drop at 6hrs postpartum. This suggests that haematocrit drop at 6 hours postpartum can reflect the magnitude of actual blood loss during vaginal delivery in a well hydrated parturient.

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Conflicts of interest

Author declared no conflict of interest

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